MODEL USER'S GUIDE
UPDATES AND REVISIONS

Product 10.3 Final

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT
ALTERNATIVES ANALYSIS

prepared for:
City and County of Honolulu

prepared by:
Parsons Brinckerhoff Quade & Douglas, Inc.

September 2007

User's Guide to Model Application

Revised August 15, 2007

A. Introduction

A. Introduction

1.1 Overview

This part of the document serves as a user's guide to application of the models. The user's guide includes six sections following this introduction:

B. Transportation System Models
C. Models of Resident Travel
D. Other Transportation Models
E. Network Assignment and Reporting
F. Land Use Models
G. Utility Programs

1.2 Procedures Guide

The models are set up to run via "batch" files for each model component. This document lists the model components that need to be run for each alternative and how to invoke each model component's respective batch file. The batch files should be run in the order specified below. All of the alternative model batch files, controls, and outputs are stored in subdirectories under the "altname" directory. The User's Guide to Model Application should be referenced for additional information on setting up model application controls and interpreting outputs.

Figure 1 depicts the sequence of model procedures in flowchart form.

1.2.1 Highway Network Building

To invoke the highway network build procedure batch file for alternative "zzz" type "hwybldal zzz" at the command prompt from the "hwybld" directory.

1.2.2 Highway Path Building and Skimming

To invoke the highway path build and skim procedure batch file for alternative "zzz" type "skall zzz" at the command prompt from the "hwy" directory.

1.2.3 Transit Path Building and Skimming

To invoke the transit path build and skim procedure batch file for alternative "zzz" type "skall zzz" at the command prompt from the "trn" directory.

1.2.4 Walk and Bicycle Path Building and Skimming

To invoke the auxiliary path build and skim procedure batch file for alternative "zzz" type "skall zzz" at the command prompt from the "axl" directory.

1.2.5 Trip Generation

To invoke the trip generation procedure batch file for alternative "zzz" type "tgall zzz" at the command prompt from the "tg" directory.

1.2.6 Trip Distribution

To invoke the trip distribution procedure batch file for alternative "zzz" type "tdall zzz" at the command prompt from the "td" directory.

1.2.7 Mode Choice

To invoke the mode choice procedure batch file for alternative "zzz" type "mcall zzz" at the command prompt from the "mc" directory.

1.2.8 Time of Day and Directional Factoring

To invoke the time of day and directional factoring procedure batch file for alternative "zzz" type "dfall zzz" at the command prompt from the "tod" directory.

1.2.9 Airport Access Trips

To invoke the airport access trip batch file for alternative "zzz" type "apall zzz" at the command prompt from the "air" directory.

1.2.10 Visitor Trips

To invoke the visitor trip batch file for the alternative "zzz" type "visnew zzz" at the command prompt from the "vis" directory.

1.2.11 Truck Trips

To invoke the truck trip batch file for the alternative "zzz" type "trkall zzz" at the command prompt from the "trk" directory.

1.2.12 Highway Assignment and Reporting

To invoke the highway assignment and reporting procedure batch file for alternative "zzz" type "asall zzz" at the command prompt from the "hwy" directory.

1.2.13 Transit Assignment and Reporting

To invoke the transit assignment and reporting procedure batch file for alternative "zzz" type "asall zzz" at the command prompt from the "trn" directory.

1.2.14 Feedback

The OMPO regional model is run using a feedback process, in which the travel times resulting from the highway assignment are used as input to the subsequent iteration of the model. These link travel times affect trip distribution and mode choice results in the next iteration, which in turn results in changed travel demand results, which in turn have an impact on the final assignment and the resulting congested speeds. The feedback process is continued until no further significant changes are apparent between the current model iteration, and the average of subsequent iterations. Change is measured in terms of both link volume and zone-to-zone volume, the latter summarized by district. In this way, equilibrium is assured between the travel times input and the resulting estimated demand.

A program called "feedback" does the comparison between previous and current model iterations. This is a C-based program that compares both link and trip-table based volumes of the current and past iterations. In order to pass, 90 percent of the current set of link volumes and district-to-district volumes must be within 10 percent of the average of the previous iterations' corresponding links or cells. Volumes below a specified minimum are ignored. Both link and trip-table based data must pass before the model is declared converged. If these criteria are not met, the program increments a system variable, called iter, by one. If the criteria are met, the system variable iter is set to 0, and another system variable, liter is set to the last iteration. The liter variable is used in the final highway and transit assignment steps to tell the programs where to find the latest trip table information.

To accommodate the feedback routine, the master program control file, run_ompo.bat has been modified to automatically loop back through the model as long as the feedback program indicates that convergence has not been reached. In addition, after each iteration, reports and output files specific to that iteration are moved to an iteration-specific subdirectory within each major model subdirectory. This iteration-specific subdirectory is named 1, 2, 3, etc, based on the iteration being stored. For example, in the mode choice subdirectory, mc, subdirectories 1,2 and 3 will exist after the model run that converges after 3 iterations. In application, while there is no need to delete these subdirectories for each new alternative run, it is probably a good idea, since all the files will be overwritten, and it will avoid confusion.

Shown below is the main DOS command file used to implement feedback. Note that a maximum of 30 iterations are allowed. The base year model converges after 3 iterations. Also note that the system variable, iter, is initially set to 1, a requirement. The run_ompo.bat file is invoked by typing run_ompo <alt> at a dos prompt, where <alt> is the 3-letter alternative designator.

The final two exhibits show the feedback control file, and a user's guide to the parameters.

```
rem OMPO Travel Demand Models
set alt=%1
set iter=1
rem Build Highway Network
cd hwybld
call hwybldal %1
rem Highway Paths and Skims
cd ..\hwy
call skall %1
rem Transit Paths and Skims
cd ..\trn
call skall %1
rem Auxiliary Paths and Skims
cd ..\axl
call skall %1
rem Trip Generation
cd ..\tg
call tgall %1
:fbloop
rem Trip Distribution
cd ..\td
call tdall %1
rem Mode Choice
cd ..\mc
call mcall %1
rem Time of Day
cd ..\tod
call dfall %1
rem Airport Access Trips
cd ..\air
call apall %1
rem Visitor Trips
cd ..\vis
call visnew %1
rem Truck Trips
cd ..\trk
call trkall %1
rem 2-hr AM and 16-hr off-peak assignment
cd ..\hwy
call asall2 %1
rem feedback processing
cd ..\fdb
call fdbck %1
if %iter% == 0 goto fbend
if %iter% == 31 goto fbend
rem re-build highway network with cong speeds
call rebuild %1
rem congested skims for highway
call skhall %1
rem congested skims for transit
call sktall %1
rem Auxiliary Paths and Skims
cd ..\axl
call skall %1
goto fbloop
:fbend
rem Highway Assignment and Reporting
cd ..\hwy
call asall %1
rem Transit Assignment and Reporting
cd ..\trn
call asall %1
rem MODEL STREAM COMPLETE
```

```
[FILES]
LoadedNetwork=amLoad.txt
InputMatrix=amDist.txt
InputPreviousMatrix=amPrev.txt
InputLogFile=curram.log
NewSpeedCapacity=..\..\generic\hwy\luxxxxau.def
VdfScriptFile=vdxxxxau.con
ReportFile=fdbackam.report
OutputNetwork=amNext.txt
OutputLogFile=nextam.log
OutputBatchFile=setIteration.bat

[PARAMETERS]
OdPercentComply=90
OdPercentTolerance=10
OdIgnoreLessThan=100
VolumePercentComply=90
VolumePercentTolerance=10
VolumeIgnoreLessThan=50
MatrixDimensions=25
NumberFacilityTypes=10

[OPTIONS]
UseOd=true
UseVolumes=true
UseWeights=false
UseTollVariables=false
PrintPercentRange=5
AverageAllThenCurrent=true
AkcelikVdf=false
ConicalVdf=true
ReadScriptVdf=false

[WEIGHTS]
WeightIteration01=1.00
WeightIteration02=1.00
WeightIteration03=1.00
.
.
.
WeightIteration30=1.00

[AKCELIK]
TimeParameter=0.25
JaFacilityType01=0.8
JaFacilityType02=0.8
JaFacilityType03=1.6
JaFacilityType04=3.2
JaFacilityType05=3.2
JaFacilityType06=6.4
JaFacilityType07=12.8
JaFacilityType08=12.8
JaFacilityType09=0.8
JaFacilityType10=12.8

[CONICAL]
AlphaFacilityType01=10.0
AlphaFacilityType02=6.5
AlphaFacilityType03=5.2
AlphaFacilityType04=5.2
AlphaFacilityType05=5.2
AlphaFacilityType06=4
AlphaFacilityType07=10.0
AlphaFacilityType08=5.3
AlphaFacilityType09=-10.0
AlphaFacilityType10=10.0
```

[NOTES]
03/01/06 [dto]
0. The "readVdfScript" routine is not yet ready to be used
1. The "weights" only apply to the volumes in the log file. The weight applied to the current iteration, in the loaded network file, is always 1.00.
2. The free-flow speed for each of the links is assumed to be in the "spdc" variable and the feedback program does not see speed changes made during assignment.

Brief User's Guide:

1. Files Section
   a. Loaded Network -- a text version of the am loaded highway network (produced by outNet.set)
   b. Input Matrix -- a text version of the O/D matrix used to load the am highway network, compressed into a district-to-district matrix (produced by outMat.set)
   c. Input Previous Matrix -- Input Matrix from previous "feedback" runs
   d. Input Log File -- Input Log File from previous "feedback" runs
   e. New Speed Capacity -- Input file of MinuTP format updates to speed/capacity table
   f. VDF Script File -- Input file from assignment script to read VDF functions (not yet ready), vdxxxxau.con
   g. Output Network -- a text output network, contains the same variables as Loaded Network, with the volume, congested time, and congested speed replaced with computed values from the successive averages method
   h. Output Log File -- A log file of link volumes (does not contain the output, calculated volume)
   i. Output Batch File -- MS DOS batch file used to reset the "iter" DOS environment variable
   j. Report File -- Re-states the input and gives information about the model run

2. Parameters Section
   a. O/D Percent Comply -- This share of the O/D Matrix cells must meet the Percent Tolerance Criteria
   b. O/D Percent Tolerance -- Change from one iteration to the next of O/D Matrix cells must be less than this value to count towards compliance
   c. O/D Ignore Less Than -- O/D Matrix cells less than this value are not checked for compliance
   d. Volume Percent Comply -- Same as O/D for the link volumes
   e. Volume Percent Tolerance -- Same as O/D for the link volumes
   f. Volume Ignore Less Than -- Same as O/D for the link volumes
   g. Matrix Dimensions -- Number of Districts, O/D Matrix cells in "Input Matrix"
   h. Number Facility Types -- Number of Facility types used in the Akcelik section

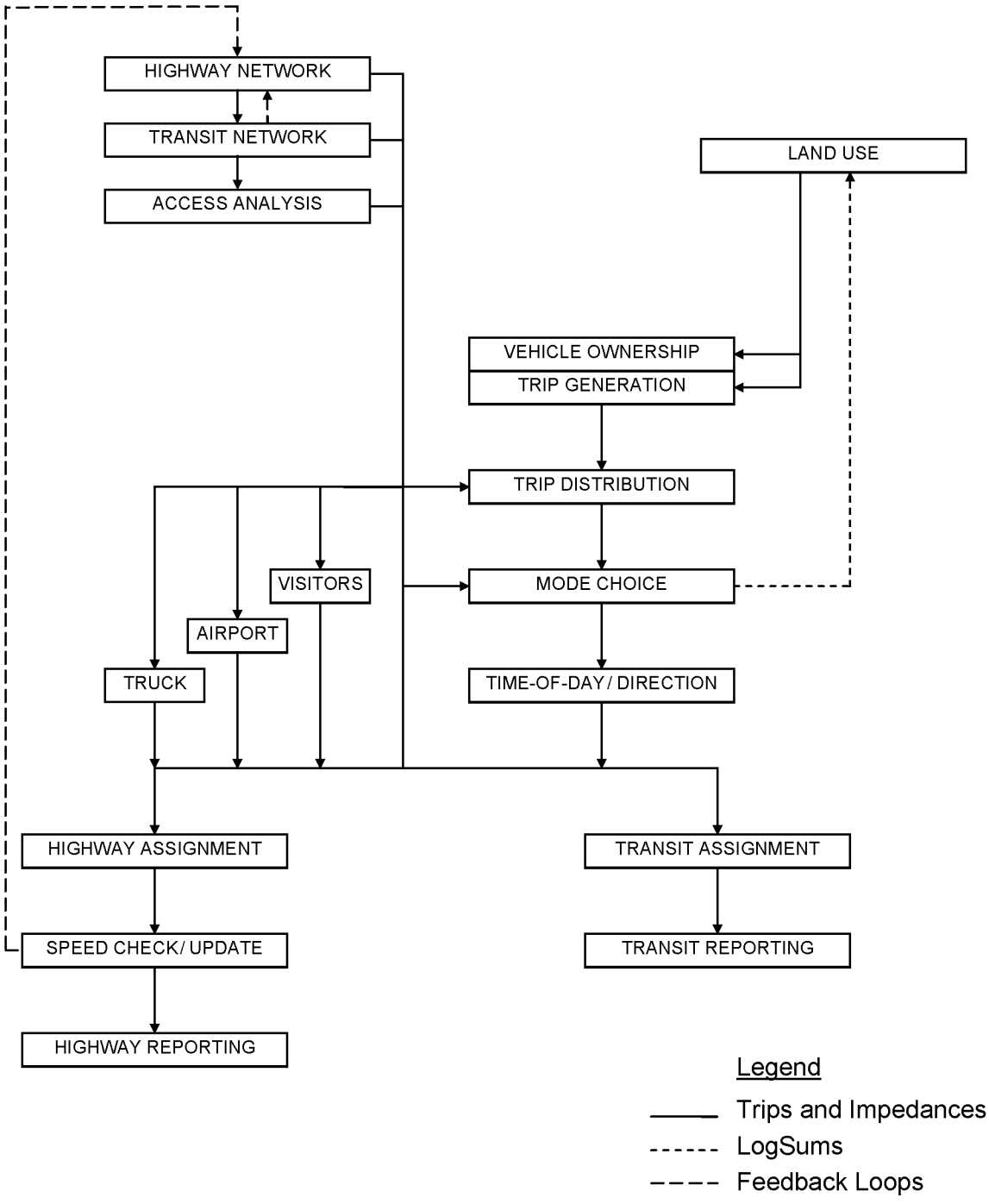
3. Options Section
   a. Use O/D -- If "true", the O/D test will be applied
   b. Use Volumes -- If "true", the volumes test will be applied (Loaded Network still required)
   c. Use Weights -- If "true", iteration weights, as discussed in next section, will be used
   d. Print Percent Range -- The report file summarizes the O/D and Volume Errors by this increment, from 0 to 100 percent
   e. Average All Then Current -- If "true" (Use Weights must then be false), the volumes of the previous iterations are averaged, and that value is then averaged with the current volume
   f. Akcelik VDF -- If "true", Akcelik vdf functions are used With Akcelik parameters specified in that section
   g. Conical VDF -- If "true", Conical vdf functions are used With Conical parameters specified in that section
   h. Read VDF Script -- If "true", vdf functions are read from the Input scrips (Not yet ready to be used)
   i. Use Toll Variables -- If "true", the link Files are read and written assuming the toll variables are present, (in the future year) and not present If false (in the Base Year)

4. Weights Section
   a. Each of the "WeightIterationXX" variables is applied to the volume in the XX iteration, to allow different iterations to carry more weights than the others. To implement the weights,
   b. you will need a separate control file for each of the "feedback.exe" runs, and the batch file, "FDBCK.BAT" would have to modified.
   c. The maximum number of weights is 30.

5. Akcelik Section
   a. Contains the parameters of the Akcelik volume-delay functions. These values may or may not be the same as those used in the AM Assignment. They will differ if we want to change the feedback speed, to allow for quicker closure.
   b. A Ja value of 3.2 is used for facility types greater than Number Facility Types in the parameter section.
   c. If a negative Ja value is specified, the new congested time will be set to the old congested time.

6. Conical Section
   a. Contains the parameters of the Conical volume-delay functions. These values may or may not be the same as those used in the AM Assignment. They will differ if we want to change the feedback speed, to allow for quicker closure.
   b. A alpha value of 10.0 is used for facility types greater than Number Facility Types in the parameter section.
   c. If a negative alpha value is specified, the new congested time will be set to the old congested Time (For fixed Time Links).

Figure 1



1.3 Directory Structure and File Naming

Correct operation of the travel models depends on a specified directory structure and set of file-naming conventions. This directory structure serves to uniquely identify the location of files for each analysis year and alternative. The directory structure is described below and displayed in Figure 2.

Example dir	Directory
Models	main models location
Models\generic	common to all application scenarios, including programs
Models\altname	specific alternative
Models\altname\zd	zonal data
Models\altname\hwybld	highway network records
Models\altname\hwybld\data	highway link and node data
Models\altname\hwybld\atype	zonal data
Models\altname\hwybld\makeclas	highway link records
Models\altname\hwy	highway networks, skims, assignments, and reports
Models\altname\hwy\data	highway network penalty records
Models\altname\trn	transit networks, skims, assignments, and reports
Models\altname\trn\acc	transit access-link development
Models\altname\trn\data	transit line records
Models\altname\axl	auxiliary-mode (walk, bike) networks and skims
Models\altname\tg	socioeconomic and trip-generation files
Models\altname\td	trip-distribution files
Models\altname\mc	mode-choice files
Models\altname\tod	time-of-day/direction files
Models\altname\air	airport access trips files
Models\altname\trk	truck trip files
Models\altname\vis	visitor trip files

Standard file name: ffttppdd.zzz

where: ff = file type
tt = time period
pp = trip purpose
dd = details
zzz = alternative designator

Extension: .eqv = equivalency file
.ctl = application control file
.rpt = application report file

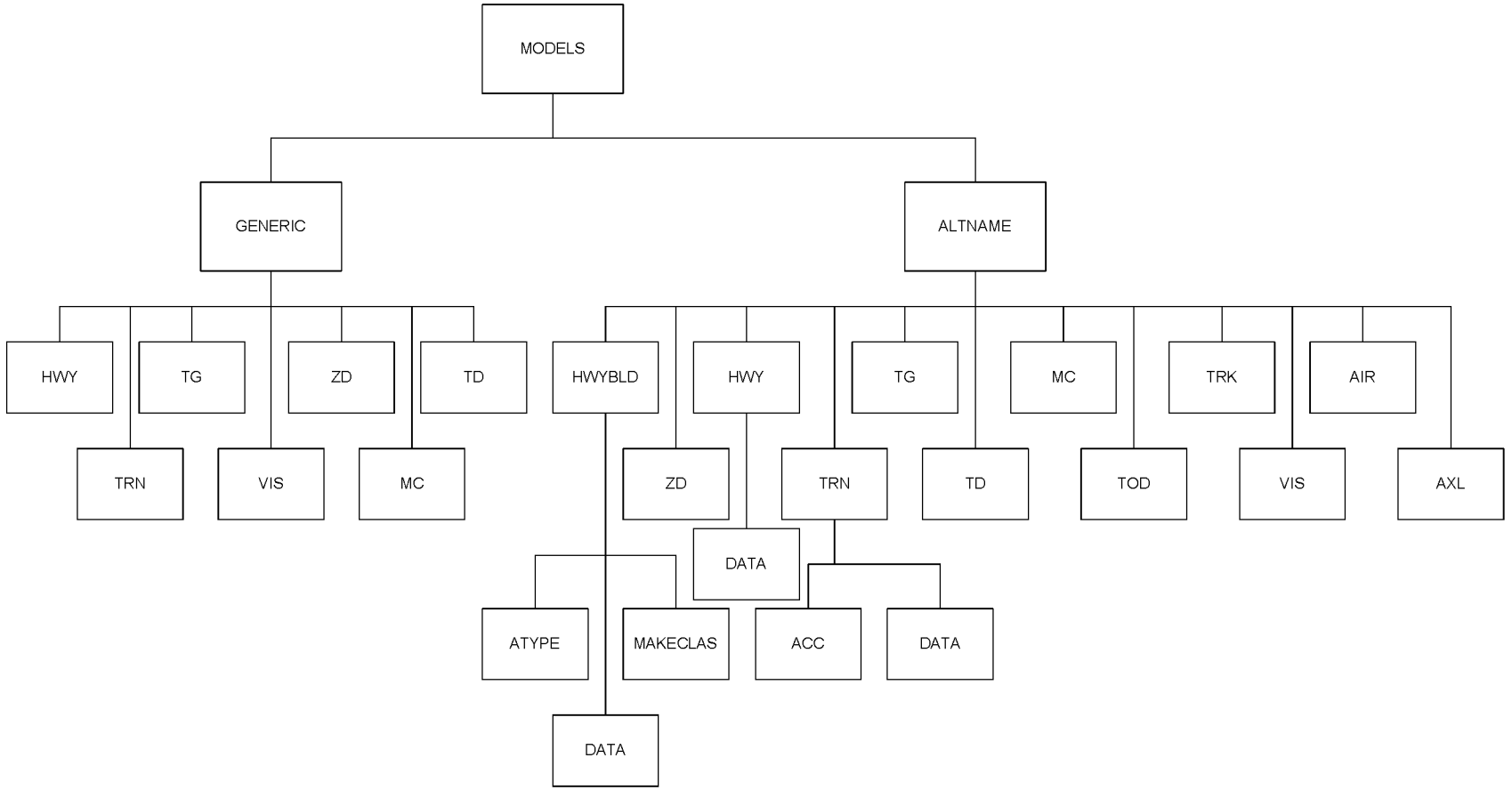
Components

ff nt network (details indicate which kind)
lu look-up table
sk skim (impedances)
pe person-trip ends
pp person-trip table in production/attraction format

	po	person-trip table in origin/destination format
	vp	vehicle-trip table in production/attraction format
	vo	vehicle-trip table in origin/destination format
	zd	zonal data
	kf	k-factors
	tp	turn penalties
	tl	trip-length frequency distributions
	vd	volume-delay functions
	as	assignment
	sl	screenline
	df	directional factoring
	tb	transit boards
	tn	transit network
	ts	transit network, sorted
tt	am	am-peak
	md	mid-day
	pm	pm-peak
	ev	evening
	tt	each time period
	pk	peak periods
	op	off peak periods
	xx	not time-period-specific
pp	wh	journey-to/from -work, home-based work
	wo	journey-to/from -work, home-based other
	wn	journey-to/from -work, non-based
	ww	journey-to/from-work, work-based
	aw	journey-at-work, work-based
	an	journey-at-work, non-based
	nk	not-work-related, home-based k-12 school
	nc	not-work-related, home-based college
	ns	not-work-related, home-based shop
	no	not-work-related, home-based other
	nn	not-work-related, non-home-based
	wp	all work-related trip purposes
	np	all non-work-related trip purposes
	pp	each trip purpose
	xx	not trip-purpose-specific
	wf	worker-flow table
details	o1	occupancy 1
	o2	occupancy 2+
	hw/au	highway/auto
	hu	highway network – unloaded
	hl	highway network – loaded
	wb	walk-to-bus
	wr	walk-to-rail
	dt	drive-to-transit
	tr	transit
	mm	each mode

nm	non motorized
bk	bike
wk	walk
kr	kiss-n-ride
dr	drive
ca	capacity
hi	household income
hs	household size
hv	household vehicle-ownership
is	household income by size
pr	production rates
ar	attraction rates
aa	attraction rates by area type
sq	squeezed (district-level) information, not zone-level
xx	no details
ae	accessibility to employment
h3	households as joint distribution by size, income, and number of workers

Figure 2



1. Highway Network Building

1.1 Purpose

The analyst may wish to build the highway network starting with a non-binary MINUTP network or simply a map. This basic information can be used to build a MINUTP network given a set of programs, described in this section, and some zone level data. This section describes the three programs used in this highway building procedure. It will also describe the batch file process of invoking the programs and the directory structure required for invoking the programs.

The first section discusses program ATYPE, which classifies the traffic analysis zones into 8 categories depending on the population and employment density of the zone.

The second section discusses program MAKECLAS that uses a set of highway link records and the area type definition to produce a set of highway link records with the required data fields required for this set of travel demand procedures.

The third section discusses program procedure ATRHWY.set with uses the highway link records, from program MAKECLAS, to build a MINUTP binary highway network.

The fourth and final section discusses the directory structure required and the batch file used to run the programs as a complete procedure.

1.2 Program AREA TYPE (ATYPE)

This program reads the land use data and a set of zone level coordinates and produces a zone level file containing the area type of the zone, as described in the Build Highway Procedures section of the documentation.

Input Files: Area Definition file (ATMAT2.csv)
Coordinate file (zone level file) (e.g. BASEXY.dat)
Land Use data file (zone level file) (e.g. SUMM764.dat)

Output File: Zone level file with area type (ATYPE%%.txt)

Report File: ATYPE%%.rpt

Program Files: ATYPE.ctl (control file)
ATYPE.exe Program (FORTRAN)

Source Code: ATYPE.for

1.2.1 Control File

To run the program the analyst must build a control file. This file can have a set of title records to identify the run. The file must have three logical records (which may be many physical records). These logical records are: (1)a &files record which specifies the input and output files; (2) a &specs record which specifies the parameters and options for the program; and (3) a

&classes record which specifies the employment and population "breaks" for the density categories. Each of these records must start with an "&files" (or &specs or &classes) and end with a "/". Between the &xxxx and the / can be many records. Between the &xxx and the / are also the keywords which control the program. The keywords are specific words which the program recognizes and the value after the "keyword = " is the value assigned to the keyword.

The keywords for the &files record are:

1. fn_atdef: This is the name of the area definition file. The name must be enclosed in single quotes.

2. Fn_xycrd: This is the name of the coordinate file.

3. Fn_demog: This is the name of the land use file

4. Fn_out: This is the name of the output file containing the zone level data

5. Fn_rpt: This is the name of the report file.

An example of this logical record is as follows:

```
&files
  fn_atdef    = 'atmat2.csv'
  fn_xycrd    = 'basexy.dat'
  fn_demog    = 'summ764.dat'
  fn_out      = 'atype95.txt'
  fn_rpt      = 'atype95.rpt'
/
```

The keywords for the &specs record are:

1. Coordcnv: This is the factor to convert the coordinates to miles. The coordinates are divided by this value to obtain coordinates in miles. This value will default to 52.8. Be careful about this parameter. Normally the x and y coordinates are obtained using the MINUTP coordinates and these may not have any specified units. For example in the base year, the conversion parameter was 790.20.

2. Max_zone: This is the maximum number of traffic analysis zones in the region. For the base year this was 764 zones.

3. Radius: This is the radius (in miles) that will be used to estimate the densities for a traffic analysis zone. For the base year this value was 0.5. Do not change this keyword variable unless the area type model has been revised.

4. Num_class: This is the number of classes for the employment and population densities. In the base year the number of classes was 8. Do not change this keyword variable unless the area type model has been revised.

5. Year: This is the year of the forecast. See the next keyword for a more detailed description.

6. Base: This is the base year. If both these years (year and base) have the same value then employment 1 and population 1 (see land use data file) will be used. If the two years are

different, then employment 2 and population 2 will be used. Note this was simply a method of allowing the user to place the base year data and the future year data on one file and use the future year data for the analysis. Normally the analyst will simply code both years the same number and use employment and population 1 on the lane use data. The default value for these keywords is 1995.

7. Debug: If this keyword is set to true (t or T) then the report file will contain zone level data. The default is false (F).

An example of this logical record is as follows:

```
&specs
  coordcnv = 790.20
  max_zone = 764
  radius   = 0.50
  num_class= 8
  year     = '1990'
  base     = '1990'
  debug    = F
/
```

The keywords for the &classes record are:

1. Eclass: This is a set of eight values (separated by commas) that show the break points for the employment categories.
2. Pclass: This is a set of eight values that show the break points for the population categories.

An example of this logical record is as follows:

```
&classes
  eclass = 12. ,  93.,  397., 1615.,  6202., 22630., 78500., 900000.
  pclass =  0.1, 192., 1623., 4975., 11588., 24000., 42866., 200000.
/
```

The values shown on the example should always be used in the application of the program, unless the area type model has been revised.

1.2.2 Input File Descriptions and Formats

Area Definition File (ATMAT2.csv)

This is a card image file containing the area types for each employment density and population density category. There are eight records in this file, one for each employment category. Each record has nine values, separated by a comma. The first value of the record is the employment category. The next eight values of the record are the area type for the eight population density categories, in order. This file should look like this:

```
1,8,8,7,6,4,4,2,1
2,8,8,6,6,4,4,2,1
3,7,7,7,6,4,4,2,1
4,7,7,7,7,4,4,2,1
5,5,5,5,5,5,4,2,1
6,5,5,5,5,5,5,2,1
7,3,3,3,3,3,3,3,1
8,3,3,3,3,3,3,3,1
```

The employment categories and population density categories that define each area type are as follows:

Area-Type Definitions Based on Population and Employment Densities

Employment Category (Employees per Square Mile)		1 ≤12	2 ≤93	3 ≤397	4 ≤1,615	5 ≤6,202	6 ≤22,630	7 ≤78,500	8 >78,500
Population Category (Population per Square Mile)									
1	0	8	8	7	6	4	4	2	1
2	≤192	8	8	6	6	4	4	2	1
3	≤1,623	7	7	7	6	4	4	2	1
4	≤4,975	7	7	7	7	4	4	2	1
5	≤11,588	5	5	5	5	5	4	2	1
6	≤24,000	5	5	5	5	5	5	2	1
7	≤42,866	3	3	3	3	3	3	3	1
8	>42,866	3	3	3	3	3	3	3	1

Coordinate File (BASEXY.dat)

This is a card image file containing the coordinates for each zone. There should be one record per zone in this file and each record should have the following data:

Columns	Description	Format
1-6	Zone Number	I6
7-14	MINUTP X coordinate	F8.0
15-22	MINUTP Y coordinate	F8.0

Land Use Data File (SUMM764.dat)

This is a card image file containing the population, employment and area for each zone. There should be one record per zone in this file. Each record should have the following data:

Columns	Description	Format
1-16	Zone Number	I16
17-22	Employment 1	I6
23-28	Employment 2	I6
29-34	Population 1	I6
35-40	Population 2	I6
41-50	Area (Sq. Miles)	F10.4

There are two employment categories and two population categories. These are intended to be the employment (population) for the base year (category 1) and for the future year (category 2). Only one of these categories will be used in the program and it is suggested that the population and employment for the forecast year be placed in the first category (employment 1 and population 1). The use of the 1 and 2 categories will be described in the keyword section. The area must be in square miles. The format in the program is F10.4 but if the decimal point is coded in the record any number of decimal points is allowed (as long as the total number is within columns 41 to 50.

1.2.3 Output File Description and Format

Zone Level File with Area Type (ATYPE%%.dat)

This is a card image file containing the land use data, coordinates, area, density measures and area type for each zone. The file contains a header record specifying the data on each record, followed by a record for each zone. The zone records contain nine variables that are separated by commas. The nine variables are: (1) zone number; (2) X coordinate; (3) Y coordinate; (4) population; (5) employment; (6) area; (7) population density; (8) employment density; and (9) area type. An example of this file is shown below:

```
"id","xcoor","ycoor","pop","emp","area","pden","eden","atype"
    1,32760., 2812.,  714.,   25.,  .5821,  1227.,    43.,  7
    2,32130., 3103., 1194.,   25.,  .9689,  1232.,    26.,  7
    3,32126., 2504.,  238.,   25.,  .2424,   982.,   103.,  7
```

1.2.4 Report File (ATYPE%%.rpt)

The report file will provide the analyst with a summary of the density categories and of the zones in each of the area types. If the analyst sets the keyword debug to true (T), the report will also provide a listing of the zone level data. The report looks like:

```
Summary of Results
------------------
Area Type       Total
         1          36
         2          65
         3          61
         4          72
         5         275
         6          45
         7         163
         8          45
         9           0
        10           0
       999           0
```

1.3 Program MAKECLAS

This program reads a set of highway link records and the area type, by zone, and produces a set of highway link records update with speed and capacity codes.

Input Files: Zone level file with area type (from pgm ATYPE) (ATYPE%%.txt)
Highway Network link records
Highway Network node files
Free Flow Speed Table
Capacity Table
Congested Speed Table
Transit Factor Table

Output File: Updated Highway link records

Report File: MAKECLAS.rpt

Program Files: MAKECLAS.ctl (control file)
MAKECLAS.exe Program (FORTRAN)

Source Code: MAKECLAS.for

1.3.1 Control File

To run the program the analyst must build a control file. This file can have a set of title records to identify the run. The file must have two records (which may be many physical records). These logical records are: (1) a &files record which specifies the input and output files; (2) a &options record which specifies the one option for the program,and (3) a &params record which specifies the number of zones and a coordinate conversion factor. Each of these records must start with an "&files" (or &options) and end with a "&end". Between the &xxxx and the &end can be many records, containing the keywords which control the program. The keywords are specific words which the program recognizes and the value after the "keyword = " is the value assigned to the keyword.

The keywords for the &files record are:

1. Fatypein: This is the name of the zone level data with the area code. The name must be enclosed in single quotes. Since this file is normally built by program ATYPE the standard coding for this file is '.\ATYPE\ATYPE%%.txt'

2. Ffspdcin: This is the name of the file for the freeflow speed codes. If the program is applied using the standard approach this file would be coded as 'FSPED.hnl'

3. Fcspdcin: This is the name of the file of the congested speed codes. If the program is applied using the standard approach this file would be coded as 'CSPED.hnl'.

4. Facapcin: This is the name of the file for the capacities codes. If the program is applied using the standard approach this file would be coded as 'ACAPA.hnl'.

5. Fmdspcin: This is the name of the file for the transit factors. If the program is applied using the standard approach this file would be coded as 'AMDSP.hnl'.

6. Flinkin: This is the name of the file for the input highway network links. If the program is applied using the standard approach this file would be coded as '..\DATA\HNTTLINK.bas'

7. Fnodein: This is the name of the file for the input highway network nodes. If the program is applies using the standard approach this file would be coded as '..\DATA\HNTTNODE.bas'

8. Flinkout: This is the name of the output file for the highway link records. If the program is applied using the standard approach this file would be coded as 'HNTTLINK.%%%'

9. Freport: This is the name of the output file for the report.

An example of this logical record is as follows:

```
&files
  fatypein = '..\atype\atype95.txt'
  ffspdcin = 'fsped.hnl'
  fcspdcin = 'csped.hnl'
  facapcin = 'acapa.hnl'
  fmdspcin = 'amdsp.hnl'
  flinkin  = '..\data\hnttlink.bas'
  fnodein  = '..\data\hnttnode.bas'
  flinkout = 'hnttlink.zzz'
  freport  = 'makeclas.rpt'
&end
```

The keywords for the &params record are:

1. max_zon: This identifies the maximum zone number in the network. Currently, it is 764.

2. coordcnv = This is the coordinate conversion factor, used to calculate the zone number of the link, based on node coordinates. It is currently 790.20 and should not be changed.

An example of this logical record is as follows:

```
&params
  max_zone = 764
  coordcnv = 790.20
&end
```

The keyword for the &options record is:

1. Hovfix: This is a logical variable (i.e. either f or t). If the keyword is t, the program will look for the letters HOV in the name field (there can be other letters in the name field) and make the link a facility type 13 link. In which case the analyst must have included speed and capacity values for this facility type in the speed and capacity tables. The normal procedure is to have HOV lanes as facility types 1 (freeways) or 3 (expressways) and limit the vehicles using the limit codes.

An example of this logical record is as follows:

```
&options
  hovfix   = f
&end
```

1.3.2 Input File Descriptions and Formats

Zone Level File with Area Type (ATYPE%%.txt)

This is the zone level output file from program ATYPE.

Highway Network Link Records

This is a card image file containing the basic data for the highway links. This is a standard MINUTP link record and the format of the record is shown on Table 1.1

The Free Flow, Capacity, Congested Speed, and Transit Factor Tables

These tables allow the program to insert the speed and capacity codes into the link records based on area type and facility type. These tables are described in more detail below. The user would normally use the tables provided in the base procedures of the model set, unless the assignment procedures have been modified.

Free Flow Speed Table (FSPED.hnl)

The format of the free flow speed table records is as follows:

Field	Columns	Description	Format
1	1	Card Number (always a 1 for free flow speed)	I1
2	2-6	Facility Type (1 to 13) (for following speed codes)	I5

3	7-11	Speed code for area type 1	I5
4	12-16	Speed code for area type 2	I5
5	17-21	Speed code for area type 3	I5
6	22-26	Speed code for area type 4	I5
7	27-31	Speed code for area type 5	I5
8	32-36	Speed code for area type 6	I5
9	37-41	Speed code for area type 7	I5
10	42-46	Speed code for area type 8	I5

Free Flow Speed records used in standard application of model are as follows:

```
1   01   60   61   61   62   62   63   63   63
1   02   54   57   58   59   60   60   61   61
1   03   25   25   25   37   37   41   45   47
1   04   25   25   25   34   35   40   42   47
1   05   25   25   25   32   33   37   40   47
1   06   25   25   25   30   30   35   39   46
1   07   25   25   25   28   28   33   38   45
1   08   12   17   18   19   20   25   30   32
1   09   50   50   51   51   52   52   55   57
1   10   25   30   30   30   30   35   35   37
1   12   12   17   18   19   20   25   30   32
```

Note: The MINUTP speed codes have a maximum value of 63. For speeds higher than this, the speeds are entered using the SPED keyword in the assignment setups.

Table 1.1
Format of the Highway Record (as a card image)

Name	Column	Description	Source (1)
A-Anode	1-5	Standard A node	U
B-Bnode	6-10	Standard B node	U
DIR	12	User specified (not required)	U
DIST	14-17	Distance of link (implied decimal xx.xx)	U
TSIN	18	Speed – Time indicator (T/S/)	U
TSVA	19-21	Time (x.xx) or speed (xx.x)	U
SPDC	23-24	Speed Class	P
CAPC	26-27	Capacity Class	P
LANE	29	Number of lanes (maximum of 7)	U
CNT	31-33	Count on link	U
REV	35	Reverse indicator (1 for one way)	U
FACTYPE	37-38	Facility Type (3)	U
FNCLASS	40	Function Class(5)	U
LANEA	42	Number of lanes in the morning peak	U
LANEM	44	No. of lanes in the mid-day (off-peak)	U
LANEP	46	No. of lanes in the evening peak	U
LIMITA	48	Restrictions for the morning peak (2)	U
LIMITM	50	Restrictions for the off-peak (2)	U
LIMITP	52	Restrictions for the evening peak (2)	U
SCRNLN	54-56	Screenline number (not required)	U
NAME	74-93	Name of Highway	U
UPD	94-95		U
ZONE	96-99	The zone the link is in	P
CSPDC	100-102	Congested Speed Table	P
MDSPC	103-105	Speeds used in the transit network (4)	P
ATYPE	106-108	The area type the link is in	P

(1) The U stands for user input and the P stands for input by programs (such as MAKECLAS). All fields with a U must be coded prior to running program MAKECLAS.
(2) There can be four "legal" restriction values that are: 1 – meaning all vehicles can use link; 2- single occupancy vehicles and trucks are prohibited (i.e. HOV 2+ lanes); 3 – single occupancy vehicles, vehicles with 2 occupants and trucks are prohibited (HOV 3+ lanes and 6 – trucks prohibited. Codes 4, 5, 7, 8, and 9 can be used for links that are not used in the highway skim building or assignment process. For example code 8 is usually used to show roadway links needed for the transit network but not the highway network (transit support links). For the base year code 4 represents bus and transit only links, code 5 represent bus / transit / bike / and walk links, and code 7 represent bike and walk links.
(3) The facility codes are: 1 – Freeways; 2 – Expressways; 3 – Class I arterials; 4 – Class II arterials; 5 – Class III arterials; 6 – Class I collectors; 7 – Class II collectors; 8 – local streets; 9 – High speed Ramps; 10 – Low Speed Ramps; 12 – centroid connectors; 13 – HOV lanes.
(4) These speeds were intended to be used as mid-day speeds but are not used in the present application.
(5) The funclass codes are: 1=freeway;2=expressway;3=principal arterial;4=minor arterial;5=major collector;6=minor collector;7=local;8=freeway ramp;9=centroid connector

Congested Speed Table (CSPED.hnl)

To begin the travel demand process, an estimate of congested times is required. In this case, representative speeds, developed from previous analyses, should be used. This table contains these representative congested speeds. The format of the congested speed table records is the same as the free flow speed table records, except to use a "2" in column 1.

Congested Speed records used in standard application are as follows:

```
2   01   24   30   30   45   45   63   63   63
2   02   22   24   24   30   30   37   37   42
2   03   19   22   22   25   25   37   37   42
2   04   16   17   17   20   20   28   28   40
2   05   14   16   16   18   18   24   24   37
2   06   12   15   15   17   17   21   21   35
2   07   09   12   12   15   15   21   21   31
2   08   09   12   12   15   15   20   20   25
2   09   12   15   15   18   18   24   24   34
2   10   06   09   09   12   12   18   18   28
2   12   09   12   12   15   15   20   20   25
```

Capacity Table (ACAPA.hnl)

The format of the capacity table records is as follows:

Field	Columns	Description	Format
1	1	Card Number (always a 3 for capacity)	I1
2	2-6	Facility Type (1 to 13) (for following capacities)	I5
3	7-11	Capacity for area type 1 (vehicles / lane / hour)	F5.0
4	12-16	Capacity for area type 2 (vehicles / lane / hour)	F5.0
5	17-21	Capacity for area type 3 (vehicles / lane / hour)	F5.0
6	22-26	Capacity for area type 4 (vehicles / lane / hour)	F5.0
7	27-31	Capacity for area type 5 (vehicles / lane / hour)	F5.0
8	32-36	Capacity for area type 6 (vehicles / lane / hour)	F5.0
9	37-41	Capacity for area type 7 (vehicles / lane / hour)	F5.0
10	42-46	Capacity for area type 8 (vehicles / lane / hour)	F5.0

Capacity records used in standard application of model are as follows:

```
3   01 2200 2200 2200 2200 2200 2200 2200 2200
3   02 1500 1550 1550 1550 1600 1650 1750 1850
3   03 1100 1100 1150 1150 1200 1300 1400 1450
3   04 1050 1050 1100 1100 1150 1200 1250 1350
3   05 1000 1050 1050 1050 1100 1150 1200 1300
3   06  850  850  850  850  900  950 1000 1050
3   07  650  700  700  700  750  800  850  950
3   08  650  700  700  700  750  800  850  950
3   09 1600 1700 1800 1800 1900 1900 2000 2000
3   10  400  400  450  450  500  500  600  650
3   12 3150 3150 3150 3150 3150 3150 3150 3150
```

Note: The capacities on the table are vehicles per lane per hour. The program will divide these capacities by 50 to obtain MINUTP capacity codes.

Transit Factor Table (AMDSP.hnl)

The format of the transit factor table records is as follows:

Field	Columns	Description	Format
1	1	Card Number (always a 4 for transit factor)	I1
2	2-6	Facility Type (1 to 13) (for following factors)	I5
3	7-11	Transit Factor for area type 1	F5.0
4	12-16	Transit Factor for area type 2	F5.0
5	17-21	Transit Factor for area type 3	F5.0
6	22-26	Transit Factor for area type 4	F5.0
7	27-31	Transit Factor for area type 5	F5.0
8	32-36	Transit Factor for area type 6	F5.0
9	37-41	Transit Factor for area type 7	F5.0
10	42-46	Transit Factor for area type 8	F5.0

These factors are not used in the normal application procedures. The factors are used in the program MAKECLAS to place a value in the MDSPC field of the highway link, using the formula: MDSPC = ((Factor – 1.0) / 0.025) + 1.5. At one time this was to be the mid-day transit speed, but the present application does not use this formula or this field.

1.3.3 Output File Descriptions and Formats

Updated Highway Link Records (HNTTLINK.zzz)

This is a card image file containing the updated highway link records. It has the same format as the input highway link records, except the area type and the speed and capacity codes have been added to the record. The updated variables are shown with a P in the last column of the list of variables in Table 1.1.

1.3.4 Report File (MAKECLAS.rpt)

The report file will provide the analyst with very little value. It will print out speed and capacity codes that exceed the limit. These error messages will also be printed when a facility type is not included in the input data (such as facility type 11, which is a null facility type). It will always list at least 40 errors that are the specifications for facility type 11. Check the report if there are more than 40 errors.

1.4 Program Procedure ATRHWY.set

This program procedure calls the MINUTP programs netbld and netmrg to build the basic binary MINUTP highway network for the travel demand procedures.

Input Files: Updated Highway Link Record File
Node Coordinates

Output File: MINUTP binary highway network

Report File ATRHWY.prn

Program Files: NETBLD.exe (MINUTP)
NETMRG.exe (MINUTP)

1.4.1 Control File

The control file must be named ATRHWY.set. It will call the highway link records from directory MAKECLAS and the node list from the HWYBLD directory. The control file will name the output network hnttxxxx.%%% where "%%%" is the three letter combination used when invoking the batch file.

An example of the control file is shown below:

```
$
$>del pcor*.dat >nul
$>echo. > pcor07.dat
$
*pgm netbld 5000,764
lnku makeclas\hnttlink.%alt%
xyf hnttnode.bas,n=1-6,x=7-12,y=13-18
def factype=37-38
def fnclass=40
def lanea=42
def lanem=44
def lanep=46
def limita=48
def limitm=50
def limitp=52
defa name=74-93
def upd=94-95
def zone=96-99
def cspdc=100-102
def mdspc=103-105
def atype=106-108
$
*pgm netmrg hnttxxxx.%alt%,pcor20.dat
$ cvf991105 linktype= atypemod*10 + factypemod
$ atypemod 1= atype 1,2,3; 2= 4,5; 3= 6,7,8
$ factypemod 1,2,3= factype 1,2,3; 4= 4,5; 5= 6,7,8,9,10,11,12
comp linktype=0
@ atype=1-3 comp linktype=10
@ atype=4-5 comp linktype=20
@ atype=6-8 comp linktype=30
@ factype=1-3 comp linktype=linktype+factype
@ factype=4-5 comp linktype=linktype+4
@ factype=6-12 comp linktype=linktype+5
comp t.cnt=1.
tab t.cnt,linktype=0-40
$>copy pcor*.prn atrhwy.prn       >nul
$>del  pcor*.prn                  >nul
$>del  pcor20.dat                 >nul
*
```

1.4.2 Input File Descriptions and Formats

Updated Highway Link Record File

This is the updated highway link record file from program MAKECLAS.

Node Coordinates

This is a standard MINUTP node coordinate file.

1.4.3 Output File Descriptions and Formats

Binary Highway Network (HNTTXXXX.%%%)

This is a MINUTP binary highway network.

1.4.4 Report File

ATRHWY.prn: This report describes the highway network. It provides a list of the network variables and summary statistics about these variables. It also has a listing of the number of links by area type and facility type, using the following definition:

Link Type Definition for Build Highway Network Tabulation					
Area Type	Facility Type				
	1	2	3	4-5	6-12
1 – 3	11	12	13	14	15
4 – 5	21	22	23	24	25
6 – 8	31	32	33	34	35

An example of this listing is as follows:

```
LINKTYPE         T.CNT
--------------------
11-11               18
12-12                4
13-13              174
14-14              392
15-15             1202
21-21              236
22-22              102
23-23              222
24-24              512
25-25             3126
31-31               76
32-32               76
33-33               92
34-34              202
35-35             1142
             ----------
                  7576
```

1.5 Batch Application

The programs can be run by typing at the dos prompt "hwybldal %%%; where %%% is the suffix name for the alternative. This command invokes the batch file HWYBLDAL.bat.

This batch file assumes the following directories and files:

1) That it is in directory HWYBLD

2) That there are three subdirectories in directory HWYBLD which are
   a) ATYPE
   b) DATA
   c) MAKECLAS

3) That in directory ATYPE there are the following files with the following names:
   a) ATYPE.exe – the executable for program ATYPE
   b) BASEXY.dat – the coordinates of the zones
   c) SUMM764.dat – the land use data
   d) ATYPE.ctl – the control file for program ATYPE
   Note: the user can change the names of BASEXY.dat and SUMM764.dat if the names are also changed in the control file

4) That in directory DATA there are the following files with the following names:
   a) HNTTNODE.bas – the node coordinate file for use in building the network
   b) HNTTLINK.bas – the input highway link records for program MAKECLAS

5) That in directory MAKECLAS there are the following files with the following names:
   a) MAKECLAS.ctl – the control file for program MAKECLAS
   b) MAKECLAS.exe – the executable for program MAKECLAS
   c) ACAPA.hnl – the capacity table file
   d) AMDSP.hnl – the transit factor table file
   e) CSPED.hnl – the congested speed table file
   f) FSPED.hnl – the free flow speed table file

6) That in the main directory (HWYBLD) there will be the following file with this name:
   a) HWYBLDAL.bat – the highway network building batch file

The main highway network batch file is shown below:

```
@echo off
@echo Build highway base network
rem
rem set alt designator
set alt=%1
rem
rem get area type
cd atype
atype atype.ctl
cd ..
cd makeclas
makeclas makeclas.ctl
ren hnttlink.zzz hnttlink.%1
cd ..
rem network
call do atrhwy
copy hnttxxxx.%1 ..\hwy\hnttxxxx.%1
@echo.
```

This batch file first calls program ATYPE, then program MAKECLAS. At this point it renames the network link records to HNTTLINK.%alt% (user specified suffix). It then calls program ATRHWY. At this point it copies the binary highway network into the directory HWY for later use.

2. Highway Path-Building and Skimming

A single MINUTP setup file, HWY\SKTTXXAU.set, builds best-paths from an input highway network and prepares skim files for use by the demand models. This setup builds six separate paths; for single-occupant vehicles or SOV, two-occupant vehicles or HOV2, and three-or-more-occupant vehicles or HOV3+; for time-periods AM-peak and midday.

2.1 Purpose

Path-building and skimming convert network information, comprised of nodes and links, into matrices of skimmed network characteristics. The models operate on zones and zone-to-zone interchanges. Therefore, network information must be summarized at that level for the models to access it. The path-building step searches the network to find the best paths from each node to each other node, with "best" defined in this case by minimum travel time. The best-path between a pair of zones consists of a series of nodes in the order traversed. The skimming step follows this best-path, accumulating link and node characteristics for each interchange.

The highway network variables skimmed for use by the demand models include travel time and distance. Separate best-paths for SOV, HOV2, and HOV3+ travel are built for each time-period. Characteristics of the AM-peak highway network represent all peak travel, while those of the midday network represent all off-peak travel.

2.2 Control File

2.2.1 Setup for Non-Toll Skims

The setup HWY\SKTTXXAU.set contains two calls each to modules NETMRG and PTHBLD, and one call to MATRIX. The full text follows of HWY\SKTTXXAU.set. For a detailed explanation of MINUTP syntax, see the MINUTP manual.

```
$ Honolulu Models
$ hwy path building
$ cvf990924
$
*pgm netmrg hnamxxcs.%alt%,hnttxxxx.%alt%
comp lane=lanea
@ lane=0 comp lane=1
comp spdc=cspdc
*read ..\..\generic\hwy\luxxxxau.def
$
*pgm pthbld hnamxxcs.%alt%,103,1
*id hwy skims
*unit 11=skpkxxau.tmp
par impfac=0
$ set limits on links usable: 0= all modes, 1= no walk/bike, 2=hov2+, 3=
hov3+
$   4= bus/trn only, 5= bus/trn/bike/walk only, 6= no trucks, 7= bike/walk
only
$   8= trn support link (bus only b/c not on hwy net)
par flagvar=limita
flagfac 1,0,P,P,P,P,0,P,P,P
```

```
flagfac 2,0,0,0,P,P,0,P,P,P
flagfac 3,0,0,0,0,P,0,P,P,P
$
penfile tpamxxau.%alt%,list=y,dupl=w,miss=w,form=n
$
*pgm netmrg hnmdxxfs.%alt%,hnttxxxx.%alt%
comp lane=lanem
@ lane=0 comp lane=1
comp spdc=spdc
*read ..\..\generic\hwy\luxxxxau.def
$
*pgm pthbld hnmdxxfs.%alt%,103,1
*id hwy skims
*unit 11=skopxxau.tmp
par impfac=0
$ set limits on links usable: 0= all modes, 1= no walk/bike, 2=hov2+, 3=
hov3+
$   4= bus/trn only, 5= bus/trn/bike/walk only, 6= no trucks, 7= bike/walk
only
$   8= trn support link (bus only b/c not on hwy net)
par flagvar=limitm
flagfac 1,0,P,P,P,P,0,P,P,P
flagfac 2,0,0,0,P,P,0,P,P,P
flagfac 3,0,0,0,0,P,0,P,P,P
$
penfile tpmdxxau.%alt%,list=y,dupl=w,miss=w,form=n
$
*pgm matrix
*unit 11=skpkxxau.tmp
*unit 12=skopxxau.tmp
*unit 14=skopxxo1.%alt%
*unit 15=skopxxo2.%alt%
*unit 16=skopxxo3.%alt%
*unit 17=skpkxxo1.%alt%
*unit 18=skpkxxo2.%alt%
*unit 19=skpkxxo3.%alt%
$ peak
get 1,101-109
int 2,-50,c=2
int 3,-50,c=2
int 5,-50,c=2
int 6,-50,c=2
int 8,-50,c=2
int 9,-50,c=2
out 3,701
out 2,702
out 6,801
out 5,802
out 9,901
out 8,902
$ offpeak
get 11,201-209
int 12,-50,c=2
int 13,-50,c=2
int 15,-50,c=2
int 16,-50,c=2
int 18,-50,c=2
```

```
int 19,-50,c=2
out 13,401
out 12,402
out 16,501
out 15,502
out 19,601
out 18,602
$
*>del *.tmp
*
```

2.2.2 Setup for Toll Skims

```
$ Honolulu Models
$ hwy path building
$ cvf990924
$ srr050724
$
*pgm netmrg hnamxxcs.%alt%,hnttxxxx.%alt%
comp lane=lanea
comp spdc=cspdc
@ limita=10 tdist1=dist
@ limita=11 tdist2=dist
@ limita=12 tdist3=dist
*read ..\..\generic\hwy\luxxxxau.def
$
*pgm pthbld hnamxxcs.%alt%,103,1
*id hwy skims
*unit 11=skpkxxau.tmp
par impfac=0
$ set limits on links usable: 0= all modes, 1= no walk/bike, 2=hov2+, 3=
hov3+
$   4= bus/trn only, 5= bus/trn/bike/walk only, 6= no trucks, 7= bike/walk
only
$   8= trn support link (bus only b/c not on hwy net)
$  10= traditional toll, all vehicles tolled, including HOT lanes where all
are tolled
$  11= hot lane where DA pays, 2-person and 3+-person autos are free
$  12= hot lane where DA, 2-person autos pay and 3+-person autos are free
$
$  paths:
$   1 = SOV, non-toll
$   2 = HOV2, non-toll
$   3 = HOV3+, non-toll
$   4 = SOV, toll
$   5 = HOV2, toll
$   6 = HOV3+, toll
$
par flagvar=limita
flagfac 1,0,P,P,P,P,0,P,P,P,P,P,P
flagfac 2,0,0,P,P,P,0,P,P,P,P,0,P
flagfac 3,0,0,0,P,P,0,P,P,P,P,0,0
flagfac 4,0,P,P,P,P,0,P,P,P,0,0,0
flagfac 5,0,0,P,P,P,0,P,P,P,0,0,0
flagfac 6,0,0,0,P,P,0,P,P,P,0,0,0
```

```
$
$  skim variables:
$  toll1:  toll applied da
$  toll2:  toll applied to 2-person Autos
$  toll3:  toll applied to 3+-person Autos
$  tdist1:  distance along toll facilities applicable to all auto occupancies
$  tdist2:  distance along tolled HOT lanes for DA
$  tdist3:  distance along tolled HOT lanes for DA and 2-Person autos
$
skim toll1,toll2,toll3,tdist1,tdist2,tdist3
$
penfile data\tpamxxau.%alt%,list=y,dupl=w,miss=w,form=n
$
*pgm netmrg hnmdxxfs.%alt%,hnttxxxx.%alt%
comp lane=lanem
comp spdc=spdc
@ limitm=10 tdist1=dist
@ limitm=11 tdist2=dist
@ limitm=12 tdist3=dist
*read ..\..\generic\hwy\luxxxxau.def
$
*pgm pthbld hnmdxxfs.%alt%,103,1
*id hwy skims
*unit 11=skopxxau.tmp
par impfac=0
$ set limits on links usable: 0= all modes, 1= no walk/bike, 2=hov2+, 3=
hov3+
$   4= bus/trn only, 5= bus/trn/bike/walk only, 6= no trucks, 7= bike/walk
only
$   8= trn support link (bus only b/c not on hwy net)
$  10= traditional toll, all vehicles tolled, including HOT lanes where all
are tolled
$  11= hot lane where DA pays, 2-person and 3+-person autos are free
$  12= hot lane where DA, 2-person autos pay and 3+-person autos are free
$
$  paths:
$   1 = SOV, non-toll
$   2 = HOV2, non-toll
$   3 = HOV3+, non-toll
$   4 = SOV, toll
$   5 = HOV2, toll
$   6 = HOV3+, toll
$
par flagvar=limitm
flagfac 1,0,P,P,P,P,0,P,P,P,P,P,P
flagfac 2,0,0,P,P,P,0,P,P,P,P,0,P
flagfac 3,0,0,0,P,P,0,P,P,P,P,0,0
flagfac 4,0,P,P,P,P,0,P,P,P,0,0,0
flagfac 5,0,0,P,P,P,0,P,P,P,0,0,0
flagfac 6,0,0,0,P,P,0,P,P,P,0,0,0
$
$  skim variables:
$  toll1:  toll applied da
$  toll2:  toll applied to 2-person Autos
$  toll3:  toll applied to 3+-person Autos
$  tdist1:  distance along toll facilities applicable to all auto occupancies
$  tdist2:  distance along tolled HOT lanes for DA
```

```
$  tdist3:  distance along tolled HOT lanes for DA and 2-Person autos
$
skim toll1,toll2,toll3,tdist1,tdist2,tdist3
penfile data\tpmdxxau.%alt%,list=y,dupl=w,miss=w,form=n
$  peak skims
*pgm matrix
*unit 11=skpkxxau.tmp
*unit 17=skpkxxo1.%alt%
*unit 18=skpkxxo2.%alt%
*unit 19=skpkxxo3.%alt%
$
$  output skim matrix format
$
$  Table   Description
$  -----   ---------------
$     1    time, non-toll path
$     2    dist, non-toll path
$     3    time, toll path
$     4    dist, toll path
$     5    distance on toll facilities
$     6    toll (in cents)
$
$ peak
get 1,101-154
int 2,-50,c=2
int 3,-50,c=2
int 11,-50,c=2
int 12,-50,c=2
int 20,-50,c=2
int 21,-50,c=2
int 29,-50,c=2
int 30,-50,c=2
int 38,-50,c=2
int 39,-50,c=2
int 47,-50,c=2
int 48,-50,c=2
add 55,M=34-36
add 56,M=43,45
out 3,701
out 2,702
out 30,703
out 29,704
out 55,705
out 31,706
out 12,801
out 11,802
out 39,803
out 38,804
out 56,805
out 41,806
out 21,901
out 20,902
out 48,903
out 47,904
out 52,905
out 51,906
$  off-peak skims
```

```
$
*pgm matrix
*unit 11=skopxxau.tmp
*unit 17=skopxxo1.%alt%
*unit 18=skopxxo2.%alt%
*unit 19=skopxxo3.%alt%
$
$  output skim matrix format
$
$  Table   Description
$  -----   ----------------
$     1    time, non-toll path
$     2    dist, non-toll path
$     3    time, toll path
$     4    dist, toll path
$     5    distance on toll facilities
$     6    toll (in cents)
$
$ peak
get 1,101-154
int 2,-50,c=2
int 3,-50,c=2
int 11,-50,c=2
int 12,-50,c=2
int 20,-50,c=2
int 21,-50,c=2
int 29,-50,c=2
int 30,-50,c=2
int 38,-50,c=2
int 39,-50,c=2
int 47,-50,c=2
int 48,-50,c=2
add 55,M=34-36
add 56,M=43,45
out 3,701
out 2,702
out 30,703
out 29,704
out 55,705
out 31,706
out 12,801
out 11,802
out 39,803
out 38,804
out 56,805
out 41,806
out 21,901
out 20,902
out 48,903
out 47,904
out 52,905
out 51,906
$
*>del *.tmp
*
```

2.3 Input Files

The skim-building setup requires a MINUTP-format built highway network with specific link attributes. The network for alternative "zzz" is named HWY\HNTTXXXX.zzz. The only other required input file, GENERIC\HWY\LUXXXXAU.def, contains default speed-class definitions.

2.4 Output Files

2.4.1 Output Non-Toll Skims

The setup produces MINUTP matrix-format files of zone-to-zone impedances. Each of the mode-specific files contains two tables, with travel time and distance respectively. The output skim files have standard names for alternative "zzz" of HWY\SKPKXXO1.zzz and HWY\SKOPXXO1.zzz for SOV paths, HWY\SKPKXXO2.zzz and HWY\SKOPXXO2.zzz for HOV2 paths, and HWY\SKPKXXO3.zzz and HWY\SKOPXXO3.zzz for HOV3+ paths. The user should perform quality-of-service (QOS) checks on the skim files produced by these procedures, as well as with all other skims produced.

2.4.2 Output Toll Skims

The output skim file names are the same as the ones for the non-toll skims except that each file contains 6 tables: (1) travel time on non-toll path, (2) distance on non-toll path, (3) travel time on toll path, (4) distance on toll-path, (5) distance on the toll facility, and (6) toll in cents. Again, the user should perform quality-of-service checks on the skim files produced.

2.5 Controls

The setup file contains all necessary controls. Invoke skim-building for the base-year scenario with batch file HWY\SKALL.bat by entering "skall zzz" at the command prompt.

2.6 Reports

A final step embedded in the setup copies all standard MINUTP report files to the same name as the setup file, retaining suffix .prn. This allows the user to more easily locate the correct output for examining the results of these procedures. This file echoes all commands, gives control totals on all matrices, and reports any problems. A sample listing of the output matrix values is shown below (with comments on the side describing each matrix).

```
OUT
  Mat              Total
  ---------------------
  401      1,075,991,994    Off Peak 1 person/car travel time
  402        917,124,542    Off Peak 1 person/car distance
  501      1,075,991,994    Off Peak 2 persons/car travel time
  502        917,124,542    Off Peak 2 persons/car distance
  601      1,075,991,994    Off Peak 3+ persons/car travel time
  602        917,124,542    Off Peak 3+ persons/car distance
  701      1,681,216,201    Peak 1 person/car travel time
  702        918,345,389    Peak 1 person/car distance
  801      1,675,169,591    Peak 2 persons/car travel time
  802        918,720,137    Peak 2 persons/car distance
```

```
901      1,675,169,591    Peak 3+ persons/car travel time
902        918,720,137    Peak 3+ persons/car distance
```

2.7 Error Messages

Since the auxiliary skim-building procedures call only MINUTP modules, only standard MINUTP errors are produced. Warnings are denoted (w) and fatal errors (f). See the MINUTP manual for clarification on specific messages. The end of each report file summarizes the maximum severity of all problems encountered, with severity 0 indicating no warnings, 4 warnings but no fatals, and 8 fatals. The user should investigate all messages.

3. Transit Path-Building and Skimming

In the models, transit networks serve two functions: provide service information for mode choice, and provide a basis for assigning trips. This chapter describes the former function, while Section E.2 describes the latter. The application modules covered include MINUTP TRNPTH and NETMRG and programs ACCLINK and NODES.

3.1 Purpose

Path-building and skimming convert network information, comprised of nodes and links, into matrices of skimmed network characteristics. The models operate on zones and zone-to-zone interchanges. Therefore, network information must be summarized at that level for the models to access it. The path-building step searches the network to find the best paths from each node to each other node, with "best" defined in this case by minimum perceived travel time. The best-path between a pair of zones consists of a series of nodes in the order traversed. The skimming step follows this best-path, accumulating link and node characteristics for each zone-to-zone interchange.

The mode-choice model separately examines five transit modes, defined by combinations of access and line-haul modes. For walk access, paths including rail are considered separately from those including only bus, and paths including express bus are considered separately from those including only local bus. For drive access, separate paths are built for parked vehicles and drop-offs, but are not differentiated by line-haul mode. These five path types are designated walk-to-guideway (WG), walk-to-express (WX), walk-to-local (WL), kiss-n-ride (KR), and park-n-ride (PR).

The overall transit network includes access links representing walk and drive access. All transit trips assume walking from the transit terminus to the final destination; therefore, the walk-access links also represent walk-egress. To build a set of skims, the user designates the access mode(s) to be considered, and weights defining zone-to-zone impedance. The skim-building procedures run independently for these five access modes and for time periods AM-peak and midday (MD).

This document details the skim-building processes for WX as representative of the five access modes, and for the other three just lists file names and points of difference. Note that WG, and in general the rail line-haul mode, is not available in the base year setting.

Transit skim-building uses the MINUTP module TRNPTH. A custom-built application program named ACCLINK allows the user full control over the development of walk- and drive-access links connecting zone centroids to transit stops. Two applications process network information for use by ACCLINK: a custom-built program named NODES processes transit line cards, and MINUTP NETMRG processes highway networks.

3.2 Control Files

Skim development requires the execution of several program steps in sequence.

1. Convert highway network from MINUTP to ASCII format

2. Convert transit network from MINUTP to NODES format
3. Produce access-links (peak and off-peak)
4. Produce paths and skims (peak and off-peak; walk-local, walk-express, walk-guideway, park-n-ride, kiss-n-ride)

Further sections of this document discuss each step.

Batch file TRN\SKALL.BAT controls skim-building for all four transit modes available in the base-year. It takes a single command-line argument, the file-extension denoting the alternative. For alternative "ZZZ", this extension is .zzz, so the transit skim-building process is invoked by navigating to the TRN directory and invoking "skall zzz" at the command prompt.

```
@echo off
@echo Build transit paths & skims for AM, MD
rem cvf990923
rem
rem set alt designator
set alt=%1
rem
rem build access links
cd acc
call accall %1
cd ..
rem
rem walk-local
call do skamxxwl
call do skmdxxwl
rem
rem walk-express
call do skamxxwx
call do skmdxxwx
rem
rem drive-pnr
call do skamxxpr
call do skmdxxpr
rem
rem drive-knr
call do skamxxkr
call do skmdxxkr
@echo.
```

Notice that TRN\SKALL.BAT calls the access-link development batch file, TRN\ACC\ACCALL.BAT.

```
@echo off
@echo Build transit access links for AM, MD
rem cvf990924
rem
rem set alt designator
set alt=%1
rem
rem use nodes to dump transit lines to nodes format
call nodes tnttxxtr.ctl
rem
rem use minutp netmrg to dump highway links to ascii
call do unbld
rem
rem use acclink to build transit access links
call acclink alamxxtr.ctl
call acclink almdxxtr.ctl
drvlinks alltransitlinesDrv.ctl
python pnrzones.py trndrv_am.out alxxxxst.%%% outstat.%%%
rem NOTE: Replace %%% with 3-character alternative specification
@echo.
```

3.2.1 Access link development

This section covers control files for steps 1 through 3 in Section 3.2 above.

The models develop two sets of access links, one each to peak-period and off-peak-period transit services. Application ACCLINK produces these access links, based on input descriptions of available highway and transit service, and on user-set parameters. The highway service description consists of links from a "built" MINUTP-format highway network, written to ASCII format using MINUTP NETMRG setup TRN\ACC\UNBLD.SET as shown below. Specified field locations must remain fixed.

```
$ Honolulu models
$ MINUTP NETMRG application to unbuild highway network to ASCII file
$ cvf990914
$
*pgm netmrg nul,..\..\hwy\hnttxxxx.%alt%
*id unbuild net to ASCII file
lsto 2,hnttlink.%alt%               out: file name
list a=1-5,b=6-10                   out: a, bnode fields
list factype=11-14                  out: facility type field
list dist=15-18                     out: distance field
list sped=19-22                     out: free-flow speed (SPED) field
list spdc=23-26                     out: speedclass (SPDC) field
list name=31-50                     out: link name
*
```

Note that this and other MINUTP setups use "tokens" imbedded in filenames and other parameters. The user can fix the value of a parameter outside the MINUTP setup (here, for

example, an alternative-designator %alt% equal to ".c9x") and have MINUTP recognize it on the fly. This allows use of unmodified setup files from alternative to alternative, providing such benefits as traceability and flexibility while maintaining fewer unique files. The designation of token values is handled by the controlling batch files TRN\SKALL.BAT and TRN\ACC\ACCALL.BAT.

The transit service description for ACCLINK consists of transit line definitions, converted from MINUTP-format by the application NODES with the control file TRN\ACC\TNTTXXTR.CTL.

```
Honolulu models
NODES control to write transit lines to ASCII
cvf990922

&files
  fline(1)='..\data\tlttxxbl.%%%'
  fline(2)='..\data\tlttxxbx.%%%'
  fline(3)='..\data\tlttxxls.%%%'
  fnodes  ='tnttxxtr.%%%'
  frpt    ='tnttxxtr.rpt'
/
NOTE: Replace %%% with 3-character alternative specification

&params
  period=0
/
&options
  reverse = f
  splice  = f
  purge   = f
  narr    = f
/
```

Application ACCLINK must be run twice, to produce access links for peak- and off-peak service. The control file for producing peak access links, named TRN\ACC\ALAMXXTR.CTL, is shown below. The ACCLINK control files employ standard FORTRAN namelist syntax, in which each parameter section begins with &name and ends with / (or optionally &end), and text outside these demarcations is treated as comments. The input sections of the ACCLINK control file include &fnames, &params, &allocs, and &options.

For a details on the access-link construction and selection algorithm, including *&options maxnaccp*, *maxnaccn*, and *minnacc*, see section 3.5 Controls.

```
Honolulu Models
cvf990920 acclink ctl for am

&fnames
  fnodes    = 'tnttxxtr.%%%'
  fhlinks   = 'hnttlink.%%%'
  fphysical = '..\data\stxxxxtr.%%%'
  falinks   = 'alamxxtr.%%%'
  fnodnames = 'hnttndnm.%%%'
  fscoding  = 'alxxxxst.%%%'
  fsdata    = 'alxxxxsd.%%%'
```

```
  freport   = 'alamxxtr.rpt'
&end
NOTE: Replace %%% with 3-character alternative specification

&params
  nzones   =   764
  maxdist1 =    50
  maxdist2 =   500
  maxdistw =   200
  capcdist =    25
  wspeed   =     3.0
  debug    =     t
&end
&allocs
  maxnode  =  5000
  maxtlpn  =   100
  maxhlpn  =    10
  maxhnpz  =  1000
  maxnmpn  =     5
&end
&options
  period   =     1
  maxnaccp =     0, 0, 0, 8, 6, 6, 0, 6, 0, 0, 0, 4, 0, 2, 2, 0, 0, 0, 0, 0
  maxnaccn =     0, 0, 0, 4, 2, 2, 0, 2, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0
  minnacc  =     0, 0, 0, 4, 2, 2, 0, 2, 0, 0, 0, 2, 0, 1, 1, 0, 0, 0, 0, 0
  noffset  =   100, 200
&end
```

The application DRVLINKS produces the potential drive access links to each park and ride lot. The output files are specified in the control file under ReportFile, and LinkFile in the &Files section. For the LinkFile output, there will be three files output, one each for the three time of day periods (AM, Midday, and PM). The following box is an example of the control file for the DRVLINKS program.

```
*
* DRVLINKS.EXE  drive access link program control file for allTransitLines
route descriptions
*
[Files]
CentroidFile    = ../data/centroids.tno
NodeFile        = ../data/buspnrnodes.tno
TransitFile     = ../data/tlttxxtr.tno
StationFile     = ../data/stxxxxtr.tno
HwyLinkFile     = ../data/hnttlink.tno

ReportFile      = trnDrv.rpt
LinkFile        = trnDrv.out

[Parameters]
NumCentroids = 1000
NumNodes = 5000
Distance = Cartesian
IndividualSearch = no
AverageDistance = no
MinDistance = 0.0
```

```
MaxDistance = 5.0
NetworkScale = 875.0
MultipleLinks = yes

[Reports]
PrintUnconnected = yes
PrintConnections = yes

[Centroid Format]
CentroidFormat = user
Number = 1-8
XCoord = 9-16
YCoord = 17-24
FirstCentroid = 1

[Node Format]
NodeFormat = user
Number = 1-8
XCoord = 9-16
YCoord = 17-24
FirstNode = 1

[Transit Format]
TransitFormat = Minutp

[New Link Attributes]
DeleteLinks = no
Modes = 1
LinkFormat = MINUTP
```

The python program PNRZONES then modifies the output station file from the ACCLINK program (ALXXXXST.ZZZ) by changing the range of zones that may have access to each park and ride lot if they meet the specified parameters in skim building. There are two input files needed for this program, (1) the output file from the DRVLINKS application, and (2) the output station file from the ACCLINK application. The third file that is specified is the new modified station file.

To run the PYTHON program, the following command is typed at the DOS prompt:

```
PYTHON PNRZONES.PY <output from DRVLINKS> <output station file from
ACCLINK> <NEW station file name>
```

3.2.2 Path and skim development

This section covers control files for step 4 in Section 3.2 above.

The MINUTP TRNPTH setups TRN\SKAMXXWL.SET, TRN\SKAMXXWX.SET, TRN\SKAMXXPR.SET, and TRN\SKAMXXKR.SET control path-building for the AM period (representing peak conditions) for the walk-to-local-bus (WL), walk-to-express-bus (WX), drive-to-park-n-ride (PR), and drive-to-kiss-n-ride (KR) mode/path combinations, respectively. Similar setups control skim-building for the midday time period, representing offpeak service. (Note that the walk-to-guideway setups are not included, since they don't exist in the base year.) Each

setup makes one call to NETMRG and one to TRNPTH. The NETMRG call simply converts the generic highway network to reflect AM-peak characteristics. The setups follow the standard MINUTP syntax; see the MINUTP manual for more detail. A similar group of setup files governs the creation of midday skims to represent offpeak service.

TRN\SKAMXXWL.SET

```
$ Honolulu models
$ Transit pathbuilding & skimming with TRNPTH
$ cvf990920
$ srr021114 factor transit times
$ hlf070403 update parameters
$
*pgm netmrg hnamxxxx.%alt%,..\hwy\hnttxxxx.%alt%
comp lane=lanea
comp cspdc=10.*cspdc
comp spdc=factype
$
*pgm trnpth hnamxxxx.%alt%,nodes=5000,links=10000,time=cspdc,delzon=1000
*par msglev=5
*unit 19=skamxxwl.%alt%
$
$----- control parameters
period=1                              use headway h1
prntuc=1                              list unconnected ij
listin=1111
$
$----- walk access
*read acc\alamxxtr.%alt%              walk-access links
link 2008-2146,22,45.0     put in freeway link which trnpth could not find
pars wlksp=3                          walk speed
pars wlkdi=1                          use only centroid links to build
zacc ,,,8-200,6-200,6-200,,6-200  build walk-access links
zono alamxxwl.%alt%
nox c,12,12
pars maxdr=0
$
$----- weights, maximums, and penalties
$ walk
mfac 2.0,0,11-15
iwalk=250                             max walk to
jwalk=250                             max walk from
$ initial wait
ifac 2.0,1-10                         weight on 1st wait time
$ in-vehicle
adjcl=-10                             composite link avg time used if delta <
mfac 1.0,1-10                         weight on in-vehicle time
mfac 0.9,6                            limited stop weight on invehicle time
$ transfers
xfac 2.0,1-10                         weight on xfer wait time
xpen=-4                               pnlty per xfer (-omits from skim)
$ total path
maxtt=300                             max wtd time (min); abandons if longer
$
```

```
$----- line cards, xfer links, etc.
fare 54,0,1-10      fares -- change from $.75 to $.45 10/24/02,srr to$.54 hlf
linp h1=0.0,h2=0.0,h3=0.0,st=0.17       ST is Stop Time for a node (minutes)
*read acc\outstat.%alt%     stn coding, use modified station python prog. hlf
*read ..\..\generic\trn\luxxxxtf.fdb    mdsp values srr 11/14/02 -- factor by
factype
*read tlttxxbl.%alt%                    line cards
*read tlttxxls.%alt%                    limited stop line cards
*read data\xfxxxxtr.%alt%               xfer links
$
$----- skims, paths, networks, and reports
apath=w                                 build walk-access path
patho=w                                 sets paths written to neto
mato 19,1(w)=wkt,2(w)=wtt,3(w)=mto,4(w)=m8,5(w)=m5
mato 19,6(w)=xfe,7(w)=far,8(w)=wti
neto t=ntamxxwl.%alt%                   output transit network
neto p=ptamxxwl.%alt%
repo -2,3,6                             transit line reports
*
```

TRN\SKAMXXWX.SET

```
$ Honolulu models
$ Transit pathbuilding & skimming with TRNPTH
$ cvf990920
$ srr021114 factor transit times
$ hlf070403 update parameters
$
*pgm netmrg hnamxxxx.%alt%,..\hwy\hnttxxxx.%alt%
comp lane=lanea
comp cspdc=10.*cspdc
comp spdc=factype
$
*pgm trnpth hnamxxxx.%alt%,nodes=5000,links=10000,time=cspdc,delzon=1000
*par msglev=5
*unit 19=skamxxwp.%alt%
$
$----- control parameters
period=1                              use headway h1
prntuc=1                              list unconnected ij
listin=1111
$
$----- walk access
*read acc\alamxxtr.%alt%              walk-access links
link 2008-2146,22,45.0     put in freeway link which trnpth could not find
pars wlksp=3                          walk speed
pars wlkdi=1                          use only centroid links to build
zacc ,,,8-200,6-200,6-200,,6-200  build walk-access links
zono alamxxwp.%alt%
nox c,12,12
pars maxdr=0
$
$----- weights, maximums, and penalties
$ walk
mfac 2.0,0,11-15
iwalk=250                             max walk to
jwalk=250                             max walk from
$ initial wait
ifac 2.0,1-10                         weight on 1st wait time
$ in-vehicle
adjcl=-10                             composite link avg time used if delta <
mfac 1.2,1-10                         weight on in-vehicle time
mfac 1.0,5                            bonus weight on express-bus ivtime
$ transfers
xfac 2.0,1-10                         weight on xfer wait time
xpen=-4                               pnlty per xfer (-omits from skim)
$ total path
maxtt=300                             max wtd time (min); abandons if longer
$
$----- line cards, xfer links, etc.
fare 54,0,1-10                        fares -- change from $.75 to $.45
10/24/02,srr to$.54 hlf
linp h1=0.0,h2=0.0,h3=0.0,st=0.17       ST is Stop Time for a node (minutes)
*read acc\outstat.%alt%                stn coding, use modified station
python prog. hlf
*read ..\..\generic\trn\luxxxxtf.fdb    mdsp values srr 11/14/02 -- factor by
fac type
```

```
*read tlttxxbl.%alt%                    line cards
*read tlttxxbx.%alt%                    line cards
*read tlttxxls.%alt%                    limited stop line cards
*read data\xfxxxxtr.%alt%               xfer links
$
$----- skims, paths, networks, and reports
apath=w                                 build walk-access path
patho=w                                 sets paths written to neto
mato 19,1(w)=wkt,2(w)=wtt,3(w)=mto,4(w)=m8,5(w)=m5
mato 19,6(w)=xfe,7(w)=far,8(w)=wti
neto t=ntamxxwp.%alt%                   output transit network
neto p=ptamxxwp.%alt%
repo -2,3,6                             transit line reports #2, #6
*
```

TRN\SKAMXXPR.SET

```
$ Honolulu models
$ Transit pathbuilding & skimming with TRNPTH
$ cvf990920
$ srr021114 factor transit times
$ hlf070403 update parameters
$
*pgm netmrg hnamxxxx.%alt%,..\hwy\hnttxxxx.%alt%
comp lane=lanea
comp cspdc=10.*cspdc
comp spdc=factype
$
*pgm trnpth hnamxxxx.%alt%,nodes=5000,links=10000,time=cspdc,delzon=1000
*par msglev=5
*unit 19=skamxxpr.%alt%
$
$----- control parameters
period=1                                use headway h1
prntuc=1                                list unconnected ij
listin=1111
$
$----- access
*read acc\alamxxtr.%alt%                walk-access links
link 2008-2146,22,45.0     put in freeway link which trnpth could not find
pars wlksp=3                            walk speed
pars wlkdi=1                            use only centroid links to build
zacc ,,,8-200,6-200,6-200,,6-200  build walk-access links
zono alamxxpr.%alt%
nox c,12,12                             allow walk-xfer movement
pars maxdr=15,drvdi=10
$
$----- weights, maximums, and penalties
$ walk
mfac 2.0,0,11-15
iwalk=250                               max walk to
jwalk=250                               max walk from
$ initial wait
ifac 2.0,1-10                           weight on 1st wait time
$ in-vehicle
```

```
adjcl=-10                          composite link avg time used if delta <
mfac 1.0,1-10                      weight on in-vehicle time
$ transfers
xfac 2.0,1-10                      weight on xfer wait time
xpen=-4                            pnlty per xfer (-omits from skim)
$ total path
maxtt=300                          max wtd time (min); abandons if longer
$
$----- line cards, xfer links, etc.
fare 54,0,1-10                     fares -- change from $.75 to $.45
10/24/02,srr to$.54 hlf
linp h1=0.0,h2=0.0,h3=0.0,st=0.17      ST is Stop Time for a node (minutes)
*read acc\outstat.%alt%               stn coding, use modified station
python prog. hlf
*read ..\..\generic\trn\luxxxxtf.fdb    mdsp values srr 11/14/02 -- factor by
fac type
*read tlttxxtr.%alt%                    line cards
*read data\xfxxxxtr.%alt%               xfer links
$
$----- skims, paths, networks, and reports
apath=d                            build path type
patho=d                            sets paths written to neto
mato 19,1(d)=wkt,2(d)=wtt,3(d)=mto,4(d)=m8,5(d)=m5
mato 19,6(d)=xfe,7(d)=far
mato 19,8(d)=pnr,9(d)=drv,10(d)=did,11(d)=wti
neto t=ntamxxpr.%alt%              output transit network
neto p=ptamxxpr.%alt%
repo -2,3,6                        transit line reports
*
```

TRN\SKAMXXKR.SET

```
$ Honolulu models
$ Transit pathbuilding & skimming with TRNPTH
$ cvf990924
$ hlf070403 updated to compare with most premium WALK to mode
$
*pgm matrix
*unit 11=skamxxwp.%alt%
*unit 12=skamxxpr.%alt%
*unit 19=skamxxkr.%alt%
get 41,101-108
get 21,201-211
$ create kr skim as modified wx skim
comp 1=41*0.50                 walk-from time is 50% of walk-to/from time
comp 2=42
comp 3=43
comp 4=44
comp 5=45
comp 6=46
comp 7=47
comp 8=0.
comp 9=41*0.30                 drive-to time is 30% of walk-to/from time
$ drive-to dist= walk-to/from time * 0.5 * 3.0mph * 1.25factor / 60min/hr
comp 10=41*0.5*3.0*1.25/60.    drive-to dist is 1.25* walk-to dist
```

```
comp 11=48
$
$ compare to pr skim and replace if pr better
comp 51=2.*(1+2+9)+3            kr (based on wx) perceived tot tt
comp 52=2.*(21+22+29)+23        pr perceived tot tt
comp 53=51-52                   pos if pr better, neg if kr/wx better
if 53,v=1-9999                  if pr better than kr/wx, use pr attribs for
kr
  comp 1=21
  comp 2=22
  comp 3=23
  comp 4=24
  comp 5=25
  comp 6=26
  comp 7=27
  comp 8=28
  comp 9=29
  comp 10=30
  comp 11=31
endif
$
$ no knr from urban zones
$if 3,i=75-76,105-107,110-137,141-246,249-269,274-281,325-327
$  comp 1,0
$  comp 2,0
$  comp 3,0
$  comp 4,0
$  comp 5,0
$  comp 6,0
$  comp 7,0
$  comp 8,0
$  comp 9,0
$  comp 10,0
$endif
out 1,901-911
*
```

3.3 Input Files

Transit access-link and skim-building requires input files describing the highway network; transit lines and facilities; and transfer and walk links. The highway network required is a built MINUTP binary-format highway network, named HWY\HNTTXXXX.ZZZ.

Transit lines are described in MINUTP TRNPTH format, including information on routing, stop patterns, headway by period, and mode code. Files TRN\TLTTXXBL.ZZZ, TRN\TLTTXXLS.ZZZ, and TRN\TLTTXXBX.ZZZ contain these records for local, limited stop and express buses, respectively. Transit facilities, such as stations, guideways, and formal park-n-ride lots, are described in an input to ACCLINK (named in the ACCLINK control file as &fnames fphysical (typically ACC\STXXXXTR.ZZZ). For the base-year (alternative "C9X") application of these models, this file only includes four records, describing existing park-n-ride facilities. For future applications, fixed-guideway information would be included, as described in the key and example file (from the Primary Corridor Transportation Project) below.

TRN\ACC\STXXXXTR.C9X

```
 node sta name   xcoor ycoor hno1 d1 hno2 d2 xno1 d1 xno2 d2 dW dP dK $$$
spcs
 ---- ---------- ----- ----- ------- ------- ------- ------- -- -- -- --- ---
-
 2643 HawaiiKai                                                  1       0
9999
 2484 MililMauka                                                 1       0
9999
 2765 Wahiawa                                                    1       0
9999
 2571 RoyalKunia                                                 1       0
9999

 fac# facname    anod bnod dist sped
 ---- ---------- ---- ---- ---- ----
```

Example facility-definition file from Primary Corridor Transportation Project

```
node sta name   xcoor ycoor hno1 d1 hno2 d2 xno1 d1 xno2 d2 dW dP dK $$$ spcs
 ---- ---------- ----- ----- ------- ------- ------- ------- -------- --- ----
 4514 pearlridge 16650 7890  2052 01         2052 01          1
 4515 aloha stad 17157 7019  2007 01 3656 06 2007 01          1 02
 4516 radford    17044 5933  1901 01 3425 07 1901 01          1
 4517 nimitz     17944 5101  1869 01         1869 01 1872 13  1
 4518 puuloa     18956 4899  1852 01         1852 01 1853 09  1
 4519 middle st  19856 4888  1664 01         1664 01          1
 4520 kalihi     20643 4441  1641 01         1641 01          1
 4521 hcc        20812 4208  1727 01 3380 02 1727 01          1
 4522 aala park  21043 3626  1468 01         1468 01 1471 12  1
 4523 maunakea/k 21082 3440  1456 01         1456 01 3308 05  1
 4524 alakea/kg  21229 3194  1405 01         1405 01 1507 01  1
 4525 punchbowl  21396 3027  1387 01         1511 01 1387 01  1
 4526 cooke/kap  21585 2823  2711 01         2711 01 1342 14  1
 4527 ward/kap   21695 2668  1352 01 1340 10 1352 01          1
 4528 ala moana  22271 2311  1363 01         3239 07 3240 20  1
 4529 conv cntr  22570 2174  1374 01         1374 01 1378 01  1
 4530 isen/kap   23105 1992  1164 01         1164 01          1
 4531 univ/king  23438 2236  1060 01         1060 01          1
 4532 univ/dole  23467 2668  1181 01 1056 15 1181 01          1
 2643 HawaiiKai                                                  1       0 9999
 2484 MililMauka                                                 1       0 9999
 2765 Wahiawa                                                    1       0 9999
 2571 RoyalKunia                                                 1       0 9999
 2007 Stadium                                                    1       0  800
 1416 Block J                                                    1       0  400
 2539 Kapolei                                                    1       0  250
 2473 Waipahu                                                    1       0  250
 4564 Ari Memori 16932 6587  2003 01

 fac# facname    anod bnod dist sped
 ---- ---------- ---- ---- ---- ----
  1   LRT-1      4514 4515 169  26
  1   LRT-1      4515 4564  58  32
  1   LRT-1      4564 4516  77  32
  1   LRT-1      4516 4517 176  43
  1   LRT-1      4517 4518 114  40
  1   LRT-1      4518 4519 109  27
```

```
  1   LRT-1       4519 4520 117  20
  1   LRT-1       4520 4521  34  20
  1   LRT-1       4521 4522  75  20
  1   LRT-1       4522 4523  27  16
  1   LRT-1       4523 4524  28  16
  1   LRT-1       4524 4525  25  23
  1   LRT-1       4525 4526  36  23
  1   LRT-1       4526 4527  22  17
  1   LRT-1       4527 4528  80  17
  1   LRT-1       4528 4529  38  17
  1   LRT-1       4529 4530  65  17
  1   LRT-1       4530 4531  52  20
  1   LRT-1       4531 4532  50  20
```

Part 1 contains station and pnr information. Fields include for each station or park-n-ride:

1. Node — node number (cols 2-5)
2. Sta name — name (7-16)
3. Xcoor — x-coordinate in MINUTP system (18-22)
4. Ycoor — y-coordinate in MINUTP system (24-28)
5. Hno1 — highway-network connection node 1 of up to 2 (30-33)
6. D1 — distance to highway-network connection node 1 of up to 2 (35-36)
7. Hno2 — highway-network connection node 2 of up to 2 (38-41)
8. D2 — distance to highway-network connection node 2 of up to 2 (43-44)
9. Xno1 — bus transfer node 1 of up to 2 (46-49)
10. D1 — distance to bus transfer node 1 of up to 2 (51-52)
11. Xno2 — bus transfer node 2 of up to 2 (54-57)
12. D2 — distance to bus transfer node 2 of up to 2 (59-60)
13. Dw — distance from highway connection to walk-intercept node (62-63)
14. Dp — distance from highway connection to PnR-intercept node (65-66)
15. Dk — distance from highway connection to KnR-intercept node (68-69)
16. $$$ — cost of parking in cents (71-73)
17. spcs — number of spaces in PnR lot (75-78)

Note that all distances are in hundredths of a mile, as is the MINUTP standard.

After a single blank line, Part 2 contains guideway facility information, including for each link:

1. Fac# — facility number (2-5
2. Facname — facility name (7-16)
3. Anod — a-end node number (18-21)
4. Bnod — b-end node number (23-26)
5. Dist — distance or length in hundredths of a mile (28-31)

6. Sped speed in miles per hour (33-36)

Again, for the base-year application, this section is blank.

Transit transfer and walk links include streets where walking between transit stops has been explicitly allowed, as well as dummy transfer links to connect stops which were split to comply with program limits. File GENERIC\TRN\XFXXXXTR.C95 provides this information.

GENERIC\TRN\XFXXXXTR.C95

```
$ cvf990426 dualized nodes
$ cvf990602 change from xfer(12) to walk(13)
walk 1501-1622  vineyard & liliha
walk 1502-1719  king & dillingham/liliha
walk 1503-1471  king & beretania
walk 1504-1468  king & iwilei
walk 1505-1466  king & hotel
walk 1506-1420  king & bishop
walk 1507-1405  king & alakea
walk 1508-1397  king & richards
walk 1509-1393  king
walk 1510-1391  king
walk 1511-1387  king & punchbowl
walk 1512-3289  king
walk 1513-1341  king & kapiolani
walk 1514-1347  king & alapai
walk 1515-1472  alapai
walk 1516-1348  beretania & alapai
walk 1517-1339  beretania
walk 1518-1389  beretania & punchbowl
walk 1519-1416  beretania & bishop
walk 1520-1408  hotel & alakea
walk 1521-1418  hotel & bishop
```

3.4 Output Files

The skim-building setups produce MINUTP matrix-format files of zone-to-zone impedances. Each of the walk-access period-specific files contains eight tables: walk time, wait time, transit in-vehicle time, guideway in-vehicle time (not currently used), and express/premium transit in-vehicle time; number of transfers; fare paid; and initial wait time. Each drive-access skim file contains three other tables: park-n-ride lot number (table 8), drive-access time (table 9), and drive-access distance (table 10). The initial wait time table in the drive-access skim file is the 11th table, not the 8th table. For alternative "ZZZ", the skim files have standard file names TRN\SKAMXXWL.ZZZ and TRN\SKMDXXWL.ZZZ for walk-to-local bus; TRN\SKAMXXWPX.ZZZ and TRN\SKMDXXWP.ZZZ for walk-to-express-bus; TRN\SKAMXXPR.ZZZ and TRN\SKMDXXPR.ZZZ for park-n-ride; and TRN\SKAMXXKR.ZZZ and TRN\SKMDXXKR.ZZZ for kiss-n-ride. The user should perform quality-of-service (QOS) checks on the skim files produced by these procedures, as well as with all other skims produced.

Other interim output files are produced in formats required for their input to ACCLINK and TRNPTH. For ACCLINK, inputs include NODES-format transit lines and NETBLD-output highway links as excerpted below. For TRNPTH, inputs include access-links and facility-coding files produced by ACCLINK, also excerpted below.

TRN\ACC\TNTTXXTR.ZZZ, transit lines in NODES format

```
   1 LRT1E     0  8 1  5.0  5.0  5.0 0 .00  19 4514  4515  4516  4517  4518
   2 LRT1W     0  8 1  5.0  5.0  5.0 0 .00  19 4532  4531  4530  4529  4528
   3 1AE       0  4 1 30.0 34.3 25.0 0 .00 116 1664  1665  1659  1658  1762
<deleted>
 275 983W      0  5 1 30.0 40.0 30.0 0 .00  13 3551  3550  3552  3553  2263
 276 984E      0  5 1 30.0 40.0 30.0 0 .00  22 2539  2484  2487  3535  2488
 277 984W      0  5 1 30.0 40.0 30.0 0 .00  21 2567  3535  3536  3537  2569
```

TRN\ACC\HNTTLINK.ZZZ, highway links in ASCII

```
    1 3039  12 116 300  30    XXX
    2 2638  12  45 300  30    XXX
    3 3029  12  42 200  20    KALOHELANI PL
<deleted>
 4042 2491   3   4 440  44    FORT WEAVER BUS EXP
 4042 4041   3 126 510  51    FORT WEAVER BUS EXP
```

TRN\ACC\ALAMXXTR.ZZZ, access links

```
link 0001-3039,025,30.0     Centroid Connector   & KALANIANAOLE HWY
link 0001-1764,100,40.8     KALANIANAOLE HWY
link 0001-1763,150,42.5     KALANIANAOLE HWY
<deleted>
link 0762-4617,062,22.5     Inode for nimitz
link 0762-1872,048,22.2     NIMITZ HWY           & RODGERS BLVD
link 0762-1887,149,33.7     NIMITZ SPUR
link 0762-1662,170,26.8     MIDDLE ST            & H-1 WB ON
```

TRN\ACC\ALXXXXST.ZZZ, facility coding

```
$
$**** coding for bus PnR HawaiiKai  **************
pnr  2643,$=26.43,t=.20,1-764
$
$**** coding for bus PnR MililMauka **************
pnr  2484,$=24.84,t=.20,1-764
$
$**** coding for bus PnR Wahiawa    **************
pnr  2765,$=27.65,t=.20,1-764
$
$**** coding for bus PnR RoyalKunia **************
pnr  2571,$=25.71,t=.20,1-764
```

The ACCLINK application also produces two utility files used by later model steps. A file of node names or descriptions is used to label reports of transit boardings after network assignment. A file of station and park-n-ride data is used by the MC (mode choice) application.

TRN\ACC\HNTTNDNM.ZZZ, node names

```
 1001  KALANIAN+NAWILIWI
 1002  CentConn+KALANIAN
 1003  KULIOUOU+KALANIAN
<deleted>
```

TRN\ACC\ALXXXXSD.ZZZ, station and park-n-ride data for MC

```
 2643 9999          0          HawaiiKai
 2484 9999          0          MililMauka
 2765 9999          0          Wahiawa
 2571 9999          0          RoyalKunia
```

The DRVLINKS application produces three files for the three time periods, AM peak period, Midday, and PM peak period. The next box shows an excerpt of the AM peak period drive access links generated from the program.

TRN\ACC\TRNDRV_AM.OUT

```
link 0001-2643,397,20.0
link 0002-2643,344,20.0
link 0003-2643,318,20.0
link 0004-2643,286,20.0
```

The python program PNRZONES produces a modified version of the ALXXXXST.ZZZ file above. It changes the ranges of possible zones that have access to each park and ride lot. The next box shows an example of the modified file called outstat.ZZZ.

```
$
```

```
$**** coding for bus PnR HawaiiKai  **************
pnr  2643,$=26.43,t=.20,1-100
$
$**** coding for bus PnR MililMauka **************
pnr  2484,$=24.84,t=.20,433-655
$
$**** coding for bus PnR Wahiawa    **************
pnr  2765,$=27.65,t=.20,461-656
$
$**** coding for bus PnR RoyalKunia **************
pnr  2571,$=25.71,t=.20,422-764
$
```

3.5 Controls

A detailed explanation of the access-link development controls follows.

The automated access-link generation procedure operates on one zone at a time. It first builds a list of all transit stop-nodes within *maxdist1* of the zone centroid, then a list of all transit lines stopping at each of these nodes. For each line stopping at a candidate node, a score is computed. Individual scores for each line stopping at the node are equal to the number of trips per hour for the line. The score is positive for the node nearest the zone centroid and negative for all more distant nodes. The total positive score for a node is the sum of the positive individual scores, ignoring the negative individual scores. For nodes with zero total positive score, the total negative score is the sum of all negative individual scores.

For each transit mode, ACCLINK first generates access links to the nodes with positive total scores, beginning with the nearest node and continuing with more distant nodes until it reaches the maxnaccP limit. It then generates access links to the nodes with negative total scores, again in ascending order by distance, until it reaches the maxnaccN limit.

If for a specific zone the minimum number of connections (minnacc) is not met, ACCLINK searches for candidate nodes further than *maxdist1* from the zone centroid, until it either meets the minimum connections for a given transit mode or reaches a distance of *maxdist2* (for auto-access) or *maxdistw* (for walk-access).

The controls *&options maxnaccp*, *maxnaccn*, and *minnacc* each take a vector of entries, where the entry's position corresponds to the transit mode to which it applies. Positions 1-10 apply to the MINUTP transit modes 1-10. Positions 12, 14, and 15 apply to MINUTP transit-support modes: 12 for transfers, 14 for walk-access to stations as defined in the input facility-definitions file *&fnames fphysical*, and 15 for drive-access to stations as defined in the input facility-definitions file *&fnames fphysical*. Other positions in these vectors are currently unused.

3.6 Reports

The skim-building procedures also produce several reports, found in .PRN and .RPT files. MINUTP setups produce report files with the same name as the setup and extension .PRN. Other applications produce report files with names designated in their control files.

3.7 Error Messages

Since transit path-building calls MINUTP modules, standard MINUTP error messages are produced. The end of each report file summarizes the maximum severity of all problems encountered, with severity 0 indicating no warnings, 4 warnings but no fatals, and 8 fatals. The user should investigate all messages and consult MINUTP documentation for details.

Applications NODES and ACCLINK each report errors in their output report files. The error messages note the severity of each error.

4. Auxiliary Path-Building and Skimming

For the auxiliary travel modes walk and bike, a MINUTP setup SKXXXXNM.set builds best-paths from an input highway network and prepares skim files for use by the demand models.

4.1 Purpose

The models consider trips made by all modes, including non-motorized. Therefore, skim tables must be built for the non-motorized modes walk and bike to summarize their characteristics on a zone-to-zone basis.

Path-building and skimming convert network information, comprised of nodes and links, into matrices of skimmed network characteristics. The models operate on zones and zone-to-zone interchanges. Therefore, network information must be summarized at that level for the models to access it. The path-building step searches the network to find the best paths from each node to each other node, with "best" defined in this case by minimum distance. The best-path between a pair of zones consists of a series of nodes in the order traversed. The skimming step follows this best-path, accumulating link and node characteristics for each interchange.

The auxiliary network variables skimmed for use by the demand models include only travel time, computed as a function of distance. A single best-distance path gets converted to walk and bike travel times by the user of appropriate average speeds. These travel times apply for all times of day.

4.2 Control File

The setup SKXXXXNM.set is a standard MINUTP-format setup (or driver) file containing one call each to modules NETMRG, PTHBLD and MATRIX. The full text of SKXXXXNM.set follows. For a detailed explanation of MINUTP syntax, see the MINUTP manual.

SKXXXXNM.set

```
$ Honolulu models
$ MINUTP Walk and Bike Skims
$ cvf990924 walk 3mph, bike 7mph, cap at 30 min (1.5mi w, 3.5mi b)
$
*pgm netmrg hnxxxxnm.%alt%,..\hwy\hnttxxxx.%alt%
if factype=1,9,10,11
  delete link
endif
$
*pgm pthbld hnxxxxnm.%alt%,102
*id non-mot skims
*unit 11=skpkxxnm.tmp
par opmat=2
par impfac=0
$
$ do best-distance paths
comp baseimp()=dist
$
$ can't restrict from limit=1 even tho def says no walk/bike
```

```
par flagvar=limita
flagfac 1,0,P,P,P,0,0,0,0,0
flagfac 2,0,P,P,P,0,0,0,0,0
$
$ Scale and order skim matrices for MC
*pgm matrix
*unit 11=skpkxxnm.tmp
*unit 18=skxxxxbk.%alt%
*unit 19=skxxxxwk.%alt%
$
$ bike under 3.5 mi at 7mph
get 1,102
if 102,v=350-999999
  rep 1,0
end
comp f3=1*(60./7.)*1000.
comp 4=f3*0.001
comp 5=0.
out 5,801
out 5,802
out 4,803
out 5,804
out 5,805
out 5,806
out 5,807
out 5,808
out 5,809
out 5,810
$
$ walk under 1.5 mi at 3mph
get 11,104
if 104,v=150-999999
  rep 11,0
end
comp f12=11*(60./3.)*1000.
comp 13=f12*0.001
out 5,901
out 5,902
out 13,903
out 5,904
out 5,905
out 5,906
out 5,907
out 5,908
out 5,909
out 5,910
$
*>del *.tmp
*
```

4.3 Input Files

The path- and skim-building setup requires as input a highway network, HNTTXXXX.zzz. No other input files are required.

4.4 Output Files

The skim-building setups produce MINUTP matrix-format files of zone-to-zone impedances. Each of the mode-specific files contains ten table slots, of which only one is currently used: table three contains travel time. The output skim files have standard names SKXXXXWK.zzz for walk and SKXXXXBK.zzz for bike, for alternative "zzz". The user should perform quality-of-service (QOS) checks on the skim files produced by these procedures, as well as with all other skims produced.

4.5 Controls

The setup file contains all necessary controls. Batch file SKALL.bat calls the skim-building setup, and should be invoked from the command line as "skall zzz" for alternative "zzz" application.

4.6 Reports

A final embedded step copies the standard MINUTP report files to SKXXXXNM.prn. This allows the user to more easily locate the correct output for examining the results of the procedures. The report is a MINUTP report describing path building and skimming of the auxiliary modes of walk and bicycle. The report shows the path building and computational steps used in the procedures and presents the total travel times generated by mode. The walk mode is for distances less than 1.5 miles (at 3 miles per hour) and the bicycle mode is for distances less than 3.5 miles at 7 mph). The report echoes all commands, gives control totals on all matrices, and reports any problems.

4.7 Error Messages

Since the auxiliary skim-building procedures call MINUTP modules, only standard MINUTP errors are produced. Warnings are denoted (w) and fatal errors (f). See the MINUTP manual for clarification on specific messages. The end of the report file SKXXXXNM.prn summarizes the maximum severity of all problems encountered, with severity 0 indicating no warnings, 4 warnings but no fatals, and 8 fatals. The user should investigate all messages.

C. Models of Resident Travel

1. Trip Generation

Program TG.exe applies the Vehicle-Ownership and Trip Generation models. The trip-ends it produces provide the subsequent Trip Distribution application with information about activity in each zone, by trip purpose and for home-based trips by vehicle-ownership class.

1.1 Purpose

Program TG turns household and employment data into trip-ends for each zone in the region. Two separable steps accomplish this. First, for each zone the Vehicle-Ownership model translates households by size, income, and workers into a distribution of households by size, income, workers, and vehicle-ownership. Second, the Trip Generation model applies production and attraction rates to households and attractors for each purpose, creating the trip-end inputs required by Trip Distribution.

1.2 Control File

Program TG reads a standard Fortran control file from the command line. Standard Fortran control files have input parameters divided into sections between &name and / (or optionally &end). The input sections of the TG control file include &files, &params, &options, and &aocoef.

The typical application will use a control file located in the TG subdirectory and named PEXXPPXX.ctl to control program TG. An annotated version of this file appears below.

```
OMPO Model Development Project
Trip Generation

&files
  faccess     = '..\zd\zdxxxxae.%%%'
  fhhdist     = '..\zd\zdxxxxh3.%%%'
  fprates     = '..\..\generic\tg\luxxpppr.bas'
  farates     = '..\..\generic\tg\luxxppaa.bas'
  fzdata      = '..\zd\zdxxxxxx.%%%'

  ftends      = 'pexxppxx.%%%'
  fvo         = 'zdxxxxvo.%%%'
  frpt        = 'pexxppxx.rpt'
  title       = 'test the trip generation program'
/
NOTE:  Replace %%% with 3-character alternative specification
       BAS extension designates modeled rates (SHOULD NOT BE MODIFIED!)

&params
  nzones      = 764
  nzdata      =  33
  zinhh       =   7
  nsdim       =   4,4,3
  zitype      =   31
  ntype       =   9
  ziarea      =  33
  ziemp       =   2
```

```
  zipop      =   1
/
&options
  detail     =  .f.
/
&aocoef
  const    =  0.0,-1.00,-2.66,-5.22
  denscoef =  0.0,-0.70,-1.83,-1.94
  inccoef=    0. , 0.  , 0.  , 0.  ,
              0. , 1.38, 1.81, 2.48,
              0. , 1.91, 3.45, 4.81,
              0. , 1.81, 3.59, 5.58
  wrksufcoef= 2.91
  othsufcoef= 1.55
/
```

In the &files section, the TG control file specifies five input data files, described in detail in section 1.3 below. It also gives names for two output data files, discussed in section 1.4, and one report, discussed in section 1.6. The &params section gives details required for reading the input files and performing vehicle-ownership calculations. The &options section allows the user to specify the level of calculation detail reported via toggle switches. The &aocoef section allows the user to specify the vehicle-ownership model coefficients.

1.3 Input Files

Each of the input data files is in ASCII text format.

File faccess provides zonal accessibility information in a standard ASCII format. Each row is for a zone. The file includes accessibilities to employment for each mode: highway, walk, and transit. The file also includes a vehicle importance measure that is the fraction of the combined highway, walk, and transit accessibility that is due to highway accessibility. An annotated excerpt from faccess= ZDXXXXAE.c9x follows.

```
        1      246        1       22       91
        2      254        1       25       91
        3      299        3       28       91
        4      273        2       36       88
        5      309        3       35       89
        6      388       10       42       88
        7      393        4       39       90
        8      341        4       28       91
        9      419        4       28       93
       10      424        9       43       89
       11      480       10       46       90
       12      559       14       50       90
       13      446        9       41       90
       14      420        3       21       95
       15      467        8       41       91
        .        .        .        .        .
        .        .        .        .        .
        .        .        .        .        .
     zone      Hwy     Walk Transit     Vehicle
        Access  Access  Access Importance
```

The file faccess is output from a MINUTP Matrix setup that computes the vehicle importance measure from the highway skim file, transit skim file, zonal employment, and zonal terminal times. The following steps are performed:

- The highway and transit travel time matrices, terminal times, and employment are read in.
- The terminal times are added to the highway travel time.
- The transit travel time is calculated as 2*out-of-vehicle time + in-vehicle time.
- The highway, transit, and walk impedance for each zone is calculated as the employment at destination/ time^2 summed over all destinations.
- The impedances are dumped into a temporary ASCII format file,
- The temporary impedance file is read in so that vehicle importance measure can be calculated. The vehicle importance measure is calculated as the hwy impedance/ (hwy+transit+walk impedances). The vehicle importance measure for each zone is then output and used as the faccess file in the TG.exe program.

The MINUTP Matrix setup that calculates the vehicle importance measure is shown below:

ZDXXXXAE.SET

```
$Setup to calculate Honolulu auto importance
$ Transit out of vehicle times double the weight of in-vehicle travel time
*PGM matrix
*UNIT 11=..\hwy\skpkxxo1.%alt%
*UNIT 12=..\trn\skamxxwl.%alt%
$read employment data and terminal times
zdat ..\zd\zdxxxxxx.c9x,L,Z=1-8,17-24
zdat ..\zd\zdxxxxtc.c9x,L,Z=1-5,2=11-15
$get highway time and add terminal times to it-term times weighted by 2
get 1,101
comp f2= 2.0*(zi2+zj2)+1/100.0
$compute walk time-weighted by 2
comp f3= 2.0*20.0*102/100.0
$compute transit time
comp f4= (2.0*201+2.0*202+203)/100.0
$compute highway f to total emp
comp f5= zj1/(f2**2.0)
comp 15= f5*10.0
$compute walk f to total emp
comp f7= zj1/(f3**2.0)
comp 17= f7*10.0
$compute transit f to total emp
comp f9= zj1/(f4**2.0)
comp 19= f9*10.0
$factor and round highway f
fac 15,0.1,b
$factor and round walk f
fac 17,0.1,b
$factor and round transit f
fac 19,0.1,b
$dump trip ends,format=zone,fhwyemp,ftrnemp,fwlkemp
```

```
tend temp.dat,z=1-8,p15=9-16,p17=17-24,p19=25-32
$
$read in accessibilities and compute auto imp
*PGM matrix
zdat temp.dat,L,z=1-8,1=9-16,2=17-24,3=25-32
if i=1-764
 if j=1
  comp 1=ZI1
  comp 2=ZI2
  comp 3=ZI3
  comp 4=100.0*ZI1/(ZI1+ZI2+ZI3)
 end
end
tend ..\zd\zdxxxxae.%alt%,z=1-8,p1=9-16,p2=17-24
tend p3=25-32,p4=33-40
$
*>del temp.dat
*
```

File fhhdist provides the input household distribution by household size, household income, and number of workers. The household distribution is a three dimensional joint distribution of households. The file is a standard ASCII format file. Each field is 5 columns wide. The first column is the zone number and subsequent columns contain households in each class within the size, income, and number of workers distribution. An excerpt from fhhdist= ZDXXXXH3.c9x follows.

1	0	100		29	63	29	39	5	65	20	17	27	99	49	0	22	…
2	64	63		77	94	90	81	82	68	9	73	79	28	75	43	8	…
3	5	71		58	42	84	75	77	63	32	49	22	76	90	57		…
4	38	79		97	23	96	30	35	81	51	89	40	33	59	84	40	…
5	90	8		40	72	77	61	0	79	98	12	23	3	26	52	56	…
6	52	82		25	84	88	62	92	18	2	87	89	1	32	53	48	…
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	…
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	…

The key to the fhhdist file follows.

Field			Format	Columns
Zone			i5	1-5
Income 0-20k	1 pers	0 wrkr	i5	6-10
Income 0-20k	1 pers	1 wrkr	i5	11-15
Income 0-20k	1 pers	2+ wrkr	i5	16-20
income 0-20k	2 pers	0 wrkr	i5	21-25
income 0-20k	2 pers	1 wrkr	i5	26-30
income 0-20k	2 pers	2+ wrkr	i5	31-35
income 0-20k	3 pers	0 wrkr	i5	36-40
income 0-20k	3 pers	1 wrkr	i5	41-45
income 0-20k	3 pers	2+ wrkr	i5	46-50
income 0-20k	4 pers	0 wrkr	i5	51-55
income 0-20k	4 pers	1 wrkr	i5	56-60
income 0-20k	4 pers	2+ wrkr	i5	61-65
income 0-20k	5+ pers	0 wrkr	i5	66-70
income 0-20k	5+ pers	1 wrkr	i5	71-75

	Field		Format	Columns
income 0-20k	5+ pers	2+ wrkr	i5	76-80
income 20-40k	1 pers	0 wrkr	i5	81-85
income 20-40k	1 pers	1 wrkr	i5	86-90
income 20-40k	1 pers	2+ wrkr	i5	91-95
income 20-40k	2 pers	0 wrkr	i5	96-100
income 20-40k	2 pers	1 wrkr	i5	101-105
income 20-40k	2 pers	2+ wrkr	i5	106-110
income 20-40k	3 pers	0 wrkr	i5	111-115
income 20-40k	3 pers	1 wrkr	i5	116-120
income 20-40k	3 pers	2+ wrkr	i5	121-125
income 20-40k	4 pers	0 wrkr	i5	126-130
income 20-40k	4 pers	1 wrkr	i5	131-135
income 20-40k	4 pers	2+ wrkr	i5	136-140
income 20-40k	5+ pers	0 wrkr	i5	141-145
income 20-40k	5+ pers	1 wrkr	i5	146-150
income 20-40k	5+ pers	2+ wrkr	i5	151-155
income 40-75k	1 pers	0 wrkr	i5	156-160
income 40-75k	1 pers	1 wrkr	i5	161-165
income 40-75k	1 pers	2+ wrkr	i5	166-170
income 40-75k	2 pers	0 wrkr	i5	171-175
income 40-75k	2 pers	1 wrkr	i5	176-180
income 40-75k	2 pers	2+ wrkr	i5	181-185
income 40-75k	3 pers	0 wrkr	i5	186-190
income 40-75k	3 pers	1 wrkr	i5	191-195
income 40-75k	3 pers	2+ wrkr	i5	196-200
income 40-75k	4 pers	0 wrkr	i5	201-205
income 40-75k	4 pers	1 wrkr	i5	206-210
income 40-75k	4 pers	2+ wrkr	i5	211-215
income 40-75k	5+ pers	0 wrkr	i5	216-220
income 40-75k	5+ pers	1 wrkr	i5	221-225
income 40-75k	5+ pers	2+ wrkr	i5	226-230
income 75k+	1 pers	0 wrkr	i5	231-235
income 75k+	1 pers	1 wrkr	i5	236-240
income 75k+	1 pers	2+ wrkr	i5	241-245
income 75k+	2 pers	0 wrkr	i5	246-250
income 75k+	2 pers	1 wrkr	i5	251-255
income 75k+	2 pers	2+ wrkr	i5	256-260
income 75k+	3 pers	0 wrkr	i5	261-265
income 75k+	3 pers	1 wrkr	i5	266-270
income 75k+	3 pers	2+ wrkr	i5	271-275
income 75k+	4 pers	0 wrkr	i5	276-280
income 75k+	4 pers	1 wrkr	i5	281-285
income 75k+	4 pers	2+ wrkr	i5	286-290
income 75k+	5+ pers	0 wrkr	i5	291-295
income 75k+	5+ pers	1 wrkr	i5	296-300
income 75k+	5+ pers	2+ wrkr	i5	301-305

File fprates provides per-household trip-production rates for each household size, income, and vehicle-ownership class. An annoatated excerpt from fprates= LUXXPPPR.BAS follows.

```
   1.052   1.175    .789    .320 P=   A=1 INC=1 HHS=1-4
    .867   1.564   1.858   2.151 P=   A=2 INC=1 HHS=1-4
    .897   2.054   2.203   3.468 P=   A=3 INC=1 HHS=1-4
    .563   1.466   1.812   2.000 P=   A=1 INC=2 HHS=1-4
    .967   1.293   1.711   1.880 P=   A=2 INC=2 HHS=1-4
   1.249   1.856   2.283   3.638 P=   A=3 INC=2 HHS=1-4
    .855   1.793   1.114   1.875 P=   A=1 INC=3 HHS=1-4
   1.160   1.531   1.806   2.250 P=   A=2 INC=3 HHS=1-4
   1.125   2.056   2.432   3.104 P=   A=3 INC=3 HHS=1-4
    .960   1.344   1.293    .558 P=   A=1 INC=4 HHS=1-4
    .889   1.708   1.838   3.220 P=   A=2 INC=4 HHS=1-4
   2.835   1.605   2.208   3.451 P=   A=3 INC=4 HHS=1-4
99999999
    .337    .386    .000    .107 P=jtw-hbnw  A=1 INC=1 HHS=1-4
    .314    .685    .459    .268 P=jtw-hbnw  A=2 INC=1 HHS=1-4
    .514    .683    .783    .562 P=jtw-hbnw  A=3 INC=1 HHS=1-4
    .289    .300    .094    .000 P=jtw-hbnw  A=1 INC=2 HHS=1-4
    .330    .540    .436    .591 P=jtw-hbnw  A=2 INC=2 HHS=1-4
    .       .       .       .          .       .    .    .
    .       .       .       .          .       .    .    .
    .       .       .       .          .       .    .    .
```

File farates contains per-attractor trip-attraction rates, with one row per combination of attractor-type and area-type. Each row has trip-attraction rates for each of the eleven trip purposes, in order (11f8), followed by the area-type to which it applies (i8) and the field in file fzdata containing the attractor-type to which it applies (i8). An annoatated excerpt from farates= LUXXPPAA.BAS follows.

```
    .000   0.06     .000 .........  0.16        0       6  TOT HOUSEHOLDS
    .000   0.00     .000 .........  0.14        0      22  STD: PRI GR13+
    .000   0.00     .000 .........  0.14        0      23  STD: PUB GR13+
    .000   0.22     .000 .........  0.21        0      24  STD: PRIV K-12
    .000   0.22     .000 .........  0.21        0      25  STD: PUBL K-12
    .000   0.58     .000 .........  1.83        0      32  retl empl
   1.15    0.12    0.34  .........  0.28        0      30 (totemp-gqemp)
99999999
       1       2       3 .........    11   atype     zi#  purpose number
     jtw     jtw     jtw .........   nwr                   journey-type
     hbw    hbnw      wb .........   nhb                   trip purpose
```

File fzdata provides data on households and attractors. It contains one row per zone. All fields in this file are 8 columns wide. In section &params, nzdata specifies the total number of fields in fzdata. It includes the following pointers to fields numbers: nitype to area type, zinhh to number of households, zitype to area type, ziarea to zonal area, ziemp to number of employees, and zidistr to area number (for area-specific seed matrices). The key to the fzdata file is shown below.

```
column# columns data
1    --   1-8     zone
2    1    9-16    population
3    2    17-24   total employment (sum of cols 11-20)
4    3    25-32   housing units
5    4    33-40   hotel rooms
6    5    41-48   residential units
7    6    49-56   group quarters residents
8    7    57-64   total households
9    8    65-72   mean persons per household
10   9    73-80   mean household income ($)
11   10   81-88   district (1-23)
12   11   89-96   puma (1-7)
13   12   97-104  military employment
14   13   105-112 government employment
15   14   113-120 hotel employment
16   15   121-128 agricultural employment
17   16   129-136 wholesale, transp., communic., & utilities employment
18   17   137-144 manufacturing employment
19   18   145-152 finance,insurance & real estate employment
20   19   153-160 service employment
21   20   161-168 retail employment
22   21   169-176 construction employment
23   22   177-184 private college students
24   23   185-192 public college students
25   24   193-200 private k-12 students
26   25   201-208 public k-12 students
27   26   209-216 number of schools
28   27   217-224 workers residing in group quarters
29   28   225-232 retail employment: resident-oriented
30   29   233-240 retail employment: visitor-oriented
31   30   241-248 total employment by workers residing in households
32   31   249-256 area type (1-9)
33   32   257-264 retail employment: resident-oriented
34   33   265-272 area of zone (in square miles)
```

1.4 Output Files

Program TG produces two output files. Both are named in &fnames as ftends and fvo. The file ftends contains one row per zone. Each row has a zone number (i5) followed by trip productions then trip attractions, in trip purpose order. Home-based trip purposes have a field for each vehicle-ownership class (3i8), while non-home-based purposes have one field (i8). Each purpose has one field of attractions (11i8).

Purpose	Columns of Productions	Columns of Attractions
JTW: HBW	1,2,3	24
JTW: HBNW	4,5,6	25
JTW: WB	7	26
JTW: NB	8	27
JAW: WB	9	28
JAW: NB	10	29

Purpose	Columns of Productions	Columns of Attractions
NWR: HBK12	11,12,13	30
NWR: HBCol	14,15,16	31
NWR: HBShp	17,18,19	32
NWR: HBOth	20,21,22	33
NWR: NHB	23	34

The file fvo is an ASCII formatted file of vehicle ownership shares calculated by the vehicle ownership model. The file contains several rows per zone, for the various household income and size categories. For each zone, the shares for each household income and household size combination is listed. The following is a key to the fvo file:

```
column# columns data
1    --   1-8     zone
2    1    9-16    household income category
3    2    17-24   household size category
4    3    25-32   Percentage of 0 vehicle households
5    4    33-40   Percentage of 1 vehicle households
6    5    41-48   Percentage of 2 vehicle households
7    6    49-56   Percentage of 3+ vehicle households
```

1.5 Controls

The sections above define the use of most controls. In addition, section &fnames provides title, which gets written to the report file. Section &params defines nzones as the number of zones and ntype as the number of area types (for area-type specific attraction rates). In section &options, detail allows more calculations written to the report file. Section &aocoef specifies the coefficients for the vehicle-ownership model.

1.6 Reports

The report file includes by default program name, user title, and timing information, along with an echo of the inputs controls and any errors encountered. The detail control in section &options allows inspection of internal calculations.

1.7 Error Messages

Program TG generates error messages for two levels of severity: error, noted (e), and fatal (f). Fatal errors cause TG to terminate immediately. Messages noted with (i) provide information, not error reports.

Rctl errors arise from problems in the control file. Rdata and Rdat3 errors indicate problems interpreting the input data.

```
mc 9000 (f): stopping because of __ error(s)
```

This message sums up all rctl and rdat3 errors encountered.

```
rctl 9002 (f) error(s) reading &____
```

Section &name has a problem in the control file.

```
rctl 9003 (f) zinhh __ not valid
```

The field number given by zinhh is outside the range (1, nzdata).

```
rctl 9004 (f) zipop __ not valid
```

The field number given by zipop is outside the range (1, nzdata).

```
rctl 9005 (f) ziarea __ not valid
```

The field number given by ziarea is outside the range (1, nzdata).

```
rctl 9006 (f) ziemp __ not valid
```

The field number given by ziemp is outside the range (1, nzdata).

```
rctl 9007 (f) zitype __ not valid
```

The field number given by zitype is outside the range (1, nzdata).

```
rdata 9007 (e) zditem __ invalid on record# __ in ______
```

In farates, the attactor-type field number is invalid.

```
rdata 9008 (e) zone __ <> record# __ in ______
rdata 9009 (e) # records __ <> nzones __ in ______
```

File fzdata must contain exactly one row per zone, in zone number order.

```
rdata 9020 (e) zone __ <> record# __ in ______
rdata 9012 (e) # records __ <> nzones __ in ______
```

File faccess must contain exactly one row per zone, in zone number order.

```
rdata 9010 (e) zone __ <> record# __ in ______
rdata 9011 (e) # records __ <> nzones __ in ______
```

File fhhdist must contain exactly one row per zone, in zone number order.

```
marg 9001 (e): mean ____ > curve upper bound ____
```

File fzdata must contain exactly one row per zone, in zone number order.

2. Trip Distribution

Program TD.EXE applies the Trip Distribution model, a logit-form destination choice model. Each trip purpose requires a separate application of program TD, including home-based trip purposes which are stratified by vehicle ownership.

2.1 Purpose

Program TD connects trip-production with trip-attractions based on the impedance among zones. The input trip-ends come from the Trip Generation application. Program TD produces zone-to-zone trips for the first time in the model sequence. The trip tables produced by program TD provide the subsequent Mode Choice application with zone-to-zone total trips to apportion among modes.

2.2 Control File

Program TD reads a standard Fortran control file from the command line. Standard Fortran control files have input parameters divided into sections between &name and / (or optionally &end. The input sections of the TD control file include &files, &params, and &options.

The typical application will use a control file located in the TD subdirectory and named (for the home-based work) PPXXWHXX.CTL to control program TD. An annotated version of this file appears below. Further discussion highlights differences between this example and the control files for other trip purposes.

```
OMPO Model Development Project
Control File for Trip Distribution Application TD.EXE
Journey-to-Work Home-Based Work Trips

&files
  ftends     = '..\tg\pexxppxx.%%%'
  fimpeds    = '..\hwy\skpkxxo1.%%%'
  fequivs    = '..\..\generic\zd\764to23.eqv'
  ftripo     = 'ppxxwhxx.%%%'
  frpt       = 'ppxxwhxx.rpt'
  fkfac      = '..\..\generic\td\kfxxwhxx.bas'
  title      = 'TD for JTW:HBW'
/
NOTE:  Replace %%% with 3-character alternative specification
       BAS extension designates calibrated data (SHOULD NOT BE MODIFIED!)

&params
  nzones     = 764
  ndists     =  23
  nfends     =   34
  nfProds    =   1,2,3
  nfAttrs    =   24
  tabimp     =   1
  nincr      =   1
  p1beg      =  -0.14,-0.17,-0.16
  p2beg      =   0.0004,0.0013,0.0013
```

```
  maxiter     =   30
  reltol      =   2
  abstol      =  10
  width       =   2
  nintervs    =  50
  scale       = 100.0
  offset      =   0.0
/
&options
  prteqv      = .false.
  calib       = .false.
/
```

In the &files section, the TD control file specifies four input data files, described in detail in section 2.3 below. It also gives names for the one output data file, discussed in section 2.4, and one report, discussed in section 2.6. The &params section gives details required for reading the input files and parameters for the Trip Distribution logit model. The &options section allows the user to see the zone-to-district equivalency table and specifies whether program TD should run in application or calibration mode. Only experienced users will need to employ calibration mode.

2.3 Input Files

File ftends contains text-format trip-ends for all trip purposes output by program TG, in one row per zone. Each row has a zone number (i5) followed by trip productions then trip attractions, in trip purpose order. Home-based trip purposes have a field for each vehicle-ownership class (3i8), while non-home-based purposes have one field (i8). Each purpose has one field of attractions (11i8). In section &params, nzones reports the number of rows in ftends and nfEnds the number of data fields.

File fimpeds holds zone-to-zone impedances in MINUTP matrix format. These impedances can represent travel times, monetary costs, generalized costs, or any other measure of the difficulty of travel from each zone to each other zone. File fimpeds must contain impedances for the number of zones reported in &params nzones. Pointer &params tabimp indicates which matrix number in file fimpeds holds the impedances to be used by program TD.

File fequivs contains a zone-to-district equivalency table, which tells program TD in which district each zone lies. Program TD uses this information to interpret the k-factors. Each row represents a district, and file fequivs needs to have the number of rows shown in &params ndists. Each row starts with the keyword 'DIST' followed by a space and the district number. An equals sign separates the district number from the zone number ranges that comprise it. A section of an example equivalency file follows.

```
DIST 1=220-228,234-270,274                          Downtown
DIST 2=176-178,185,187,198-199,202-219,229-233      Kakaako
DIST 3=186                                          Ala Moana
DIST 4=179-184,188-197,200-201                      Beretania
DIST 5=74-79,271-273,275-285                        Makiki
DIST 6=105-107,110-137                              Waikiki
```

File fkfac contains district-to-district k-factors in MINUTP matrix format for the number of districts given in &params ndists. The trip distribution model can require k-factors for interchanges where the model doesn't fully explain the magnitude of travel in a district interchange. Program TD writes fkfac in calibration mode, and reads fkfac in application mode. A matrix of 1s can fill this slot if the user does not want to apply k-factors.

2.4 Output Files

Program TD produces a single output file, named in &fnames as ftripo. This file contains zone-to-zone trips in MINUTP matrix format for the number of zones given in &params nzones. The file contains one table for purposes not stratified by vehicle ownership and contains three tables for purposes that are stratified by vehicle ownership. If the input productions for a particular purpose are stratified by vehicle ownership and only one set of parameters (one set of p1beg and p2beg) are specified then the program sums the productions across all vehicle ownership classes and applies the TD model to the summed productions. In this situation, the output file contains one table even though the input trip productions are stratified by vehicle ownership.

2.5 Controls

Other sections related to specific file types define the use of many controls. In addition, section &fnames provides title, which gets written to the report file. Section &params defines nfProds as pointers to the fields in file ftends that contain productions for this trip purpose, and nfAttrs points to the field with attractions. The parameters p1beg and p2beg define the coefficients to be used in the Trip Distribution model. Both of these parameters can read a series of three values for purposes that are stratified by vehicle ownership. The nincr switch along with &options calib define whether program TD runs in calibration or application mode. Also in section &options, prteqv turns on and off printing of the equivalency table to the report file.

2.6 Reports

The report file includes by default program name, user title, and timing information, along with an echo of the inputs controls, other informational messages, and any errors encountered.

2.7 Error Messages

Program TD generates error messages for two levels of severity: error, noted (e), and fatal (f). Fatal errors cause TD to terminate immediately. Messages noted with (i) provide information, not error reports.

Rctl errors arise from problems in the control file. Rdata and rdat3 errors indicate problems interpreting the input data. A marg error reports a problem in constructing the marginal distribution from the zonal mean.

```
td 9002 (i): summary of trial iterations
```

This message provides a header for calibration results only.

```
td 9003 (i): applying distribution model
```

This just provides a checkpoint.

```
td 9004 (i): k factor iteration __
```

This message relates which k-factor iteration is running.

```
td 9999 (f): stopping because of __ error(s)
```

This message sums up all rctl errors encountered.

```
rctl 9002 (f) error(s) reading &____
```

Section &name has a problem in the control file.

```
rctl 9003 (f) error(s) need kfac file
```

Program TD in calibration mode requires fkfac.

```
rdata 9000 (e) zone __ <> record# __ in _______
rdata 9001 (e) # records __ <> nzones __ in _______
```

File ftends must have one row per zone, in increasing zone-number order.

```
rdata 9011 (f) nfprods(_) has invalid value __
```

NfProds must lie between 1 and NfEnds.

```
tdist 9002 (i) impedances reset to max value __
```

All impedances must lie within the valid range for the logit formulation. If any impedances lies outside this range, it is reset to the nearest boundary.

Program TD generates various other informational and error messages in calibration mode. Since the user will only be running in application mode, none of these messages should be encountered.

3. Mode Choice

Program MC.EXE applies the Mode Choice model, a nested logit choice model. Each of the eleven trip purposes requires a separate application of program MC.

3.1 Purpose

Program MC assigns trips to modes, paths, and occupancies based on the relative attractiveness of the competing options. The input daily person-trip tables come from the Trip Distribution application. The mode-specific trip tables produced by MC provide the subsequent Time-of-Day application with zone-to-zone trips by mode, path, and occupancy.

3.2 Control File

Program MC reads a standard Fortran control file from the command line. Standard Fortran control files have input parameters divided into sections between &name and / (or optionally &end). The input sections of the MC control file include &files, &params, &options, &selects, and &parms.

Each scenario requires eleven applications of program MC, one for each trip purpose. Files with names of the form MC\PPXXWHMM.ctl control application of MC for each purpose (WH= JTW-HBW). An annotated version of this file appears below. Further discussion highlights differences between this example and the control files for other trip purposes.

```
OMPO Travel Forecasting Model Development Project
Mode Choice Model Application for base system
Purpose JTW-HBW (code wh)

&files
  title  = 'OMPO MC JTW-HBW (wh)'
  Fzdata = '..\zd\zdxxxxtc.%%%'
  Fsdata = '..\trn\acc\alxxxxsd.%%%'
  Ftends = '..\tg\pexxppxx.%%%'
  Ftrper = '..\td\ppxxwhxx.%%%'
  Fskoc1 = '..\hwy\skpkxxo1.%%%'
  Fskoc2 = '..\hwy\skpkxxo2.%%%'
  Fskoc3 = '..\hwy\skpkxxo3.%%%'
  Fskwn  = '..\trn\skamxxwl.%%%'
  Fskwp  = '..\trn\skamxxwp.%%%'
  Fskpr  = '..\trn\skamxxpr.%%%'
  Fskkr  = '..\trn\skamxxkr.%%%'
  Fskaw  = '..\axl\skxxxxwk.%%%'
  Fskab  = '..\axl\skxxxxbk.%%%'
  Frpt   = 'ppxxwhmm.rpt'
  Ftrmc  = 'ppxxwhmm.%%%'
/
NOTE:  Replace %%% with 3-character alternative specification

&params
  nzones  = 764
  period  = 1
  nzdata  = 5
```

```
  nsdata  = 5
  pttab   = 1,2,3
  toler   = 0.01
  mxiter  = 30
  calwgt  = 2.0
  lsoffset= 5.0
  lsscale = 650.0
  tollmdl = f
  sllimit = 500
/
&options
  dryrun  = f
  debug   = f
  calib   = f
  Tijonly = t
  geo     = f
  pnrknr  = t
  dacc    = t
  noprem  = f
  firstw  = t
/
&selects
  i       = 1,-764
  j       = 1,-764
  reports = 1,-3
  nfprods = 1,2,3
/
&parms
  DCpm    = 12.0

  Civt     = -0.0250
  Cwalkt   = -0.0500
  Cwaitt   = -0.0500
  Ccost    = -0.0042
  Cdrat    =  0.0000
  Clwaitt  = -0.0250

  Ctsav    =  0.271
  Ctdst    =  0.070
  Ctout    = -0.070
  Ctoll    = -0.001

  Clsacc   =  0.700
  Clspath  =  0.500
  Clslot   =  0.500
  Clsauto  =  0.700
  Clsocc   =  0.500
  Clsaux   =  0.700
  Clstoll  =  0.300
  Xferwt   =  248

  Izda     =  0.5280
  Izsr2    =  0.0941
  Izsr3    =  0.1128
  Izwalk   =  0.2503
  Izbike   =  0.0148
```

```
 Kocc3      =  -3.241
 K1sr       =  -0.840
 K2sr       =  -1.432
 Kgdwy      =   0.000
 Kprem      =  -0.856
 K1Knr      =   0.738
 K2Knr      =   1.195
 KPKnr      =   1.308
 K0dacc     =  -2.647
 K1dacc     =  -2.115
 K2dacc     =  -1.709
 Kauxb      =  -3.311
 K0Trn      =   3.513
 K1Trn      =  -0.201
 K2Trn      =  -1.470
 K0Aux      =   5.315
 K1Aux      =   2.027
 K2Aux      =  -0.047
/
```

When running a toll alternative, the following files need to be specified. In the &files section, the *fltol* needs to be specified. In the JTW-HBW purpose, fltol = ppxxwhtl.%%%. In the &params section, *tollmdl* needs to be set to T for true.

In the &files section, the MC control file specifies eleven input data files, described in detail in section 3.3 below. It also gives names for the one output data file, discussed in section 3.4, and one report, discussed in section 3.5.

The &params section gives details required for reading the input files, writing the output files, and controlling some calculations. *Toler* is used to specify the minimum calibration tolerance value – absolute relative error, *mxiter* is used to set the maximum number of iterations in the calibration mode, *calwgt* is the calibration weight, *tollmdl* is the on/off switch to run the mode choice model with toll as a choice, and *sllimit* is the maximum short wait time – the dividing line between short and long wait.

The &options section allows the user to use program MC to just check for the presence of all input file (dryrun), report detailed calculations (debug), run program MC in calibration or application mode (calib), consider only interchanges with trips (tijonly), switch on/off the geographic stratification (geo), switch on/off to allow for the calibration of the knr constant (pnrknr), switch on/off to allow calibration of the drive access constant (dacc), switch on/off to allow calibration of the express bus constant – Kprem (noprem) and switch on/off to use initial wait for transit skims (firstw).

Section &selects chooses which i- and j-interchanges to consider (i, j), which reports to produce (reports), and which fields in file ftends contain productions for this trip purpose (nfprods). Section &parms contains all utility function coefficients (dcpm and c*), all segment-specific constants (k*), and if running in calibration mode all observed shares (s*). Only experienced users will need to employ calibration mode.

3.3 Input Files

File fzdata contains zonal data required by program MC, in one row per zone with the number of zones given in &params nzones. Each row includes the zone number (i5) and the number of fields given by &params nzdata (in this case five): destination-type indicator (i5) (1=CBD [area type 1], 2=Other Core [area types 2 and 3], 3=Elsewhere [other area types]), auto terminal time in minutes (i5), parking costs for peak and off-peak in cents (2i5), and the percent of the zone that can walk to transit (i5). The period pointer in section &params indicates whether the peak (1) or off-peak (2) parking cost applies for this trip purpose. The box below shows an excerpt from fzdata.

```
    1    3    3   61   61  100
    2    3    3   61   61  100
    3    3    3   61   61  100
    4    3    3   61   61  100
    5    3    3   61   61  100
    6    3    2   64   64  100
```

File fsdata describes formal park-n-ride lots, in one row per station/lot. Each row includes the zone number (i5) followed by the number of fields given in &params nsdata (in this case five): highway network node where the lot is located (i5), fixed vehicle capacity (i5), starting vehicle capacity for capacity-restraint (i5), and parking cost in cents (i5). Comments such as the lot name can be included after these required fields. An excerpt is shown below.

```
    1 2643  500    0   50      Hawaii Kai
    2 2484  500    0   75      Mililani Mauka
    3 2765  500    0  100      Wahiawa
    4 2571  500    0  125      Royal Kunia
```

File ftends contains text-format trip-ends for all trip purposes output by program TG, in one row per zone. Each row has a zone number (i5) followed by trip productions then trip attractions, in trip purpose order. Home-based trip purposes have a field for each vehicle-ownership class (3i8), while non-home-based purposes have one field (i8). Each purpose has one field of attractions (11i8). In section &params, nzones reports the number of rows in ftends and nfProds points to the production columns for this trip purpose.

File ftrper is the trip-table output by program TD for this trip purpose. This file contains zone-to-zone trips in MINUTP matrix format for the number of zones given in &params nzones.

The remaining input files contain skimmed zone-to-zone impedance information in MINUTP matrix format, produced by the Transportation System applications. File fskwn includes seven skim tables for the walk-to-nonguideway transit mode, and file fskwg would include the same for the walk-to-guideway mode if it were available in this scenario. The walk-to-transit tables occur in order walk time, wait time, all-modes transit-vehicle time, guideway transit-vehicle time, premium transit-vehicle time, number of transfers, and fare. Files fskkr and fskpr represent kiss-n-ride and park-n-ride travel, respectively, and have the same first seven tables as the walk-transit files, followed by tables containing the parking lot number, drive time, and drive distance. Files fskaw and fskab represent travel by the auxiliary modes, walk and bike respectively. They each have slots for ten tables, but only the third table has non-zero values, total time.

3.4 Output Files

Program MC produces an output trip file in MINUTP matrix format, named in &files ftrmc. This file contains ten tables, one for each mode, in order: highway occupancy 1, 2, and 3+; transit walk-to-premium, walk-to-local, walk-to-guideway, park-n-ride, and kiss-n-ride; and auxiliary walk and bike.

When running the toll option, MC produces a file named in &files fltol a matrix with 6 tables in the following order: drive alone non-toll trips, drive alone toll trips, 2-person non-toll trips, 2-person toll trips, 3+ person non-toll trips, 3+person toll trips.

Program MC can also produce two types of LogSum (composite impedance) files, also in MINUTP matrix format. File flsqos contains six tables, with the LogSum for each composite mode, in order: shared ride, walk-to-transit, drive-to-transit, highway, transit, auxiliary. File flsdst contains three tables, one for each vehicle-ownership class. This information provides the Land Use models with an overall measure of the impedance between two zones. Two parameters in &params, lsoffset and lsscale, govern the range of values for the LogSum outputs. See the Mode Choice model documentation (Guide to Model Form, Chapter C.5) for more details.

3.5 Reports

The report file includes by default program name, user title, and timing information, along with an echo of the inputs controls, other informational messages, and any errors encountered.

3.6 Error Messages

Program MC generates error messages for two levels of severity: error, noted (e), and fatal (f). Fatal errors cause MC to terminate immediately. Messages noted with (i) provide information, not error reports.

Rctl errors arise from problems in the control file. Rdata and rdat3 errors indicate problems interpreting the input data. A marg error reports a problem in constructing the marginal distribution from the zonal mean.

```
mc 9001 (f): stopping because dryrun = true
```

This message sums up all rctl errors encountered.

```
mc 9002 (e) lsqoso<0 for iz,jz,t:
mc 9003 (e) lsdsto<0 for iz,jz,t:
```

These messages indicate that the scale and offset applied to LogSums yield values less than zero, which cannot be stored in a MINUTP matrix.

```
rctl 9002 (f) error(s) reading &_____
```

Section &name has a problem in the control file.

```
rctl 9003 (f) name blank for file:
```

A required file has not been correctly designated.

```
rctl 9004 (f) clsacc, clspath, clsauto, clsocc, or clsaux = 0.0
```

The LogSum coefficients cannot equal zero.

```
rctl 9005 (f) obs share = 0 for *,*,m:
rctl 9006 (f) obs share = 0 for s,*,m:
rctl 9007 (f) obs share = 0 for s,d,m:
```

Calibration mode requires observed shares greater than zero for all segments for which constants will be calibrated.

```
rctl 9008 (f) record __ of fzdata has invalid zone number
```

File fzdata must have nzones rows in order of increasing zone number.

```
rctl 9009 (f) record __ of fzdata has invalid areatype __ for zone __
```

Only destination-types of 1–3 are allowed.

```
rctl 9010 (f) record __ of fsdata has invalid station number __
```

No more than 300 station lots are allowed.

```
rctl 9011 (f) nfprods(__) has invalid value __
rctl 9012 (f) record __ of ftends has invalid zone number __
```

Program MC checks to make sure that file ftends has the format produced by program TG.

```
filopn 9007 (f) __ zones not equal to nzones: __ <> __
filopn 9008 (f) __ tabs not equal to ntabs: __ <> __
```

Each input matrix must have data for nzones zones, and must have the number of tables specified in section 3.3 as produced by the Transportation System applications.

```
getin 901 (f):  table sequence error, unit __, izone __, table __ gets __
```

An input matrix file has an internal error.

```
comp 9007 (e) output <> input (i,j,in,out,diff):
```

The internal check on conservation of trips has failed.

```
tran 9003 (e) ij ____ guideway ivt in walk to non-guideway skim
```

The walk-to-non-guideway path should not include any time spent in a guideway vehicle.

```
tran 9004 (e) ij ____ pnr ____ not in stations
tran 9005 (e) ij ____ knr ____ not in stations
```

Table 8 of one of the drive-to-transit skims has a station number that doesn't appear in fsdata.

```
kupdate ____ (f) ______ totals are zero
```

In calibrating constants, the estimated total trips equal zero.

3.7 Listing of Keywords

The control file has a series of Keywords specified in a namelist format. These keywords allow the user to specify the information the program should use. Section 3.2 presents the keywords needed to run the standard mode choice models for the base year. The program can also be used to build the LogSum variables for the land use model and to run the mode choice model using guideway skim trees for a future year scenario. This section presents a complete listing of all the keywords, their meanings, and the default value if any.

For the &files group the Keywords are as follow:

Keyword	Description	Default value
Title	The title for reports (C) [1]	None
Fzdata	The name of the mode choice zone data file (C)[2]	None
Fsdata	The name of the PnR and Station data file (C)	None
Ftends	The name of the trip end file from trip generation	None
Frpt	The name of the output report file	None
Ftrper	The name of the input person trips	None
Fskoc1	The name of the input Hwy Occ1 skim trees	None
Fskoc2	The name of the input Hwy Occ2 skim trees	None
Fskoc3	The name of the input Hwy Occ3 skim trees	None
Fskwp	The name of the input trn walk-prem skim trees	None
Fskwg	The name of the input trn walk-guideway skim trees	None
Fskwn	The name of the input trn walk-local skim trees	None
Fskpr	The name of the input Park and Ride skim trees	None
Fskkr	The name of the input Kiss and Ride skim trees	None
Fskaw	The name of the input walk skim trees	None
Fskab	The name of the input bicycle skim trees	None
Ftrmc	The name of the output modal trip tables	None
Fltol	The name of the output modal toll trip tables	None
Flsqos	The name of the output log sum for level of service	None

[1] If a keyword is a character variable, noted by (C), it should be place within single quotes as shown in section 3.2.

[2] The name of the data file can include it path, see section 3.2.

Keyword	Description	Default value
Flsdst	The name of the output log sums by car ownership	None
Fuserbn	The name of the output user benefit file used in Summit	None

For the &params group the Keywords are as follow:

Keyword	Description	Default value
Nzones	The number of zones	762
Nzdata	Number of fields in the zone data file	5
Nsdata	Number of fields in the station data file	4
period	Period for the model (1 = peak or 2 = off-peak)	1
lsoffset	The offset value for the log sum values	100
lsscale	The scale factor for the log sum values	50
Pttab	Table numbers for person tables in ftrper (3)	1,0,0
cperocc	If true divide costs by occupancy	True
minratio	Minimum allowable transit time to drive to transit time[3]	3.0
Mindrv	Minimum allowable drive to transit time (minutes)	1.0
mxiter	Maximum number of iterations for calibration	1
toler	Minimum calibration tolerance value – absolute relative error	0.01
tollmdl	On/off switch to run model with toll as a choice	True
tpurp	Name of trip purpose for User benefit file	None
tday	Time of day for User benefit file	None
altname	Alternative name for user benefit file	None

For the &options group the Keywords are as follow:

Keyword	Description	Default value
Dryrun	Check input names (T) or run the program (F)	False
Debug	Report details of computation (T)	False
Calib	Apply the model (F) or calibrate constants (T)	False
Tijonly	Only apply model to interchanges with trips (T)[4]	True
geo	On/off switch to run model with geographic stratification	False
pnrknr	On/off switch to allow calibration of the KNR constant	True
dacc	On/off switch to allow calibration of the drive access constant	True
firstw	On/off switch to use initial transit wait time in model	True
noprem	On/off switch to allow calibration of the express bus constant	False

For the &selects group the Keywords are as follow:

Keyword	Description	Default value
reports	Write standard reports[5]	None
I	Origin zones to be used[6]	None

[3] If the ratio is lower than this (for example if transit time is only twice the drive to transit time, then the drive to transit mode is not an acceptable choice.

[4] For application of the mode choice model this keyword should be true but for building log sum values the keyword should be false

[5] The reports key word was originally set-up to write up to 10 standard reports. The program at the present time though simply writes one set of reports. Please code this keyword as 1,-3.

Keyword	Description	Default value
j	Destination zones to be used[6]	None
nfprods	The field number(s) for the productions in the trip end input data	None
userben	On/off switch output user benefit file for Summit	None

[6] The user can specify up to 20 groups of zones. For ranges code the first zone of the zone and the last zone of the range with a minus sign. For example to request zones 1 to 20, zones 100 to 200, and zones 301 and 303, this keyword would be coded as I = 1,-20,100,-200,301,303. Under normal conditions the keyword is coded with the first and last zone (e.g. 1,-764).

For the &parms group the Keywords are as follow:

Keyword	Description	Default value
Dcpm	Operating cost per mile (cents/mile)	None
Civt	Coefficient on in-vehicle time	None
Cwalkt	Coefficient on walk time	None
Cwaitt	Coefficient on wait time	None
Ccost	Coefficient on cost	None
CLsacc	Nesting coefficient on the LogSum of access nest	None
CLspath	Nesting coefficient on the LogSum of path nest	None
CLslot	Nesting coefficient on the LogSum of lot nest	None
CLsauto	Nesting coefficient on the LogSum of auto nest	None
CLsocc	Nesting coefficient on the LogSum of occupancy nest	None
CLaux	Nesting coefficient on the LogSum of auxiliary nest	None
Ctsav	Coefficient for toll time savings	None
Ctdst	Coefficient for toll road distance	None
Ctout	Coefficient for toll path excess distance	None
Ctoll	Coefficient for toll cost	None
CLstollda	Nesting coefficient on the LogSum for drive alone toll nest	None
CLstollsr	Nesting coefficient on the LogSum for shared ride toll nest	None
Cdrat	Coefficient on drive-access time ratio for park and ride paths	None
Kocc3	Constant on occupancy 3 in occupancy nest	None
K1sr	Constant on shared ride for 1 car Households in auto nest	None
K2sr	Constant on shared ride for 2+ car households in auto nest	None
Kgdwy	Constant on guideway in path nest	None
Kprem	Constant on premium transit in path nest	None
K1knr	Constant on kiss and ride for 1 car households in lot nest	None
K2knr	Constant on kiss and ride for 2 car households in lot nest	None
K0dacc	Constant on drive access for 0 car households in access nest	None
K1dacc	Constant on drive access for 1 car households in access nest	None
K2dacc	Constant on drive access for 2+ car HHs in access nest	None
K0cbdtrn	Constant on transit for 0 car households for trips to CBD	None
K0othtrn	Constant on transit for 0 car HHs for trips to Other Core	None
K0elstrn	Constant on transit for 0 car HHs for trips to elsewhere	None
K1cbdtrn	Constant on transit for 1 car households for trips to CBD	None
K1othtrn	Constant on transit for 1 car HHs for trips to Other Core	None
K1elstrn	Constant on transit for 1 car HHs for trips to elsewhere	None
K2cbdtrn	Constant on transit for 2 car households for trips to CBD	None
K2othtrn	Constant on transit for 2 car HHs for trips to Other Core	None
K2elstrn	Constant on transit for 2 car HHs for trips to elsewhere	None
Kauxb	Constant on bike in auxiliary nest	None
K0cbdaux	Constant on auxiliary mode for 0 car HHs for trips to CBD	None
K0othaux	Constant on auxiliary mode for 0 car HHs for trips to Other Core	None
K0elsaux	Constant on aux. mode for 0 car HHs for trips to elsewhere	None
K1cbdaux	Constant on auxiliary mode for 1 car HHs for trips to CBD	None
K1othaux	Constant on auxiliary mode for 1 car HHs for trips to Other Core	None
K1elsaux	Constant on aux. mode for 1 car HHs for trips to elsewhere	None
K2cbdaux	Constant on auxiliary mode for 2 car HHs for trips to CBD	None
K2othaux	Constant on auxiliary mode for 2 car HHs for trips to Other Core	None
K2elsaux	Constant on aux. mode for 2 car HHs for trips to elsewhere	None
KKnr	Constant on kiss and ride	None

Keyword	Description	Default value
KPKnr	Constant for informal park and ride	None
KcbdTrn	Constant on transit for trips to CBD	None
KcbdAux	Constant on auxiliary mode for trips to CBD	None
KothTrn	Constant on transit for trips to Other Core	None
KothAux	Constant on auxiliary mode for trips to Other Core	None
KelsTrn	Constant on transit for trips to elsewhere	None
KelsAux	Constant on auxiliary mode for trips to elsewhere	None
K0Trn	Constant on transit for 0 car households	None
K0Aux	Constant on auxiliary mode for 0 car households	None
K1Trn	Constant on transit for 1 car households	None
K1Aux	Constant on auxiliary mode for 1 car households	None
K2Trn	Constant on transit for 2 car households	None
K2Aux	Constant on auxiliary mode for 2 car households	None
Sllimit	Maximum short wait time	None
Izda	Fixed intrazonal drive alone mode share	None
Izsr2	Fixed intrazonal shared ride 2 mode share	None
Izsr3	Fixed intrazonal shared ride 3+ mode share	None
Izwalk	Fixed intrazonal walk mode share	None
Izbike	Fixed intrazonal bike mode share	None
Maxwalk	Maximum walk time in hundreds of minutes	None
Maxbike	Maximum bike time hundreds of minutes	None
Xferwt	Transfer time weight in hundreds	None

4. Time-of-Day and Directional Factoring

A MINUTP setup, dfttxxxx.set, prepares trip tables output from program MC for assignment to the transit and highway networks. This setup factors trip-tables for time-of-day, direction and occupancy, and combines over trip purposes.

4.1 Purpose

The time-of-day setup tod\dfttxxxx.set converts trip tables output from the mode-choice component into trip tables usable for network assignment. This involves splitting trip tables into time-of-day categories, combining across trip purposes, and converting from production-attraction format to origin-destination format and from person trips to vehicle trips for private vehicle modes.

4.2 Control File

4.2.1 Control file for Non-toll trip table time of day factoring

MINUTP setup tod\dfttxxxx.set, a standard MINUTP control file, controls several applications of modules MATRIX and MATFAC. The following excerpt includes the header information and each call from that setup.

For a detailed explanation of MINUTP syntax, see the MINUTP manual.

```
$ Honolulu models
$ Time of Day & Directional Distribution Model Application
$ cvf990512 make sep vt for occ2, occ3+
$ cvf990520 add wg with wb factors
$ cvf991019 hov3+, trn pa & pk/op
$ cvf991022 drop guideway, keep in dfttxxwg.set
$
$ ************************************************************
$ *** NOTE: user must do global search & replace
$           of .ALT with correct alt designator (e.g., a03)
$ ************************************************************
$ *** NOTE: walk-guideway paths not included in dfttxxxx.set
$ ************************************************************
$
$ MinUTP setup dfttxxmm.set
$   time-of-day factoring, directional distribution, and occupancy factoring
$   produces o/d vehicle-trips by highway occupancy and time-of-day
$   produces p/a  person-trips on transit by path   and time-of-day
$ inputs:
$   mc outputs, p/a 24-hour ptt, file per purpose, table per mode
$       named ppxx__mm.ALT, where __ replaced by two-letter purpose code
$         jtw:hbw   wh          nwr:hbschool    nk
$         jtw:hbnw  wo          nwr:hbcollege   nc
$         jtw:wbnh  ww          nwr:hbshopping  ns
$         jtw:nb    wn          nwr:hbother     no
$         jaw:wb    aw          nwr:nhb         nn
$         jaw:nb    an
```

```
$       mode order is: occ1, occ2, occ3+, walk/exp, walk/local, walk/gdwy,
pnr,
$         knr,fringe/walk (walk), fringe/transit (bike)
$ outputs:
$   o/d vtt by occ by tod
$       vottxxo1.ALT for occ1
$       vottxxo2.ALT for occ2
$       vottxxo3.ALT for occ3
$   p/a ptt on transit by tod (am pk+sh + pm pk+sh, op md+nt)
$       ppttxxwl.ALT, ppttxxwx.ALT, ppttxxwg.ALT,
$       ppttxxkr.ALT, ppttxxpr.ALT
$     was: o/d ptt on transit by tod (am pk+sh, pm pk+sh, op md+nt)
$       were  pottxxwb.ALT, pottxxwg.ALT, pottxxkr.ALT, and pottxxpr.ALT
$   intermediate files not needed, deleted at end
$       vptt__o1.ALT vptt__o2.ALT vptt__o3.ALT, __ are 11 purps
$       vott__o1.ALT vott__o2.ALT vott__o3.ALT, __ are wr & nw
$       pptt__wb.ALT pptt__kr.ALT pptt__pr.ALT, __ are 11 purps
$       pott__wb.ALT pott__kr.ALT pott__pr.ALT, __ are wr & nw
$ steps:
$-------------------------------------
$ 1. do time-of-day factoring by purpose, for hwy and tran trips
$-------------------------------------
$ produce vt and pt/t by tod for jtw:hbw
$ produce vt and pt/t by tod for jtw:hbnw
$ produce vt and pt/t by tod for jtw:wbnh
$ produce vt and pt/t by tod for jtw:nb
$ produce vt and pt/t by tod for jaw:wb
$ produce vt and pt/t by tod for jaw:nb
$ produce vt and pt/t by tod for nwr:hbsc
$ produce vt and pt/t by tod for nwr:hbco
$ produce vt and pt/t by tod for nwr:hbsh
$ produce vt and pt/t by tod for nwr:hbot
$ produce vt and pt/t by tod for nwr:nhb
$-------------------------------------
$ 2. do directional factoring and summation over purposes
$-------------------------------------
$ produce o/d vt by tod, wr purps, occ 1
$ produce o/d vt by tod, wr purps, occ 2
$ produce o/d vt by tod, wr purps, occ 3+
$ produce o/d vt by tod, nw & all purps, occ 1
$ produce o/d vt by tod, nw & all purps, occ 2
$ produce o/d vt by tod, nw & all purps, occ 3+
$ produce p/a pt/t for wl mode by tod, wr purps
$ produce p/a pt/t by tod, nw & all purps
$ produce p/a pt/t for wp mode by tod, wr purps
$ produce p/a pt/t by tod, nw & all purps
$ produce p/a pt/t for wg mode by tod, wr purps
$ produce p/a pt/t by tod, nw & all purps
$ produce p/a pt/t for kr mode by tod, wr purps
$ produce p/a pt/t by tod, nw & all purps
$ produce p/a pt/t for pr mode by tod, wr purps
$ produce p/a pt/t by tod, nw & all purps
$-------------------------------------
$ 3. delete temp files
$-------------------------------------
```

4.2.2 Control file for Toll trip table time of day factoring

MINUTP setup tod\dfttxxtl.set, a standard MINUTP control file, controls several applications of modules MATRIX and MATFAC. The following excerpt includes the header information and each call from the time of day toll time of day setup. *This setup also only does factoring for the auto person trips. The transit person trips are factored using the non-toll setup.*

```
$ Honolulu models
$ Time of Day & Directional Distribution Model Application, with toll
$ cvf990512 make sep vt for occ2, occ3+
$ cvf990520 add wg with wb factors
$ cvf991019 hov3+, trn pa & pk/op
$ cvf991022 drop guideway, keep in dfttxxwg.set
$ srr060617 generate script for auto -- toll and nontoll
$
$
$ MinUTP setup dfttxxtl.set
$   time-of-day factoring, directional distribution, and occupancy factoring
$   produces o/d vehicle-trips by highway occupancy and time-of-day for toll
and nontoll
$ inputs:
$   mc outputs, p/a 24-hour auto ptt, file per purpose, table per mode
$       named ppxx__tl.ALT, where __ replaced by two-letter purpose code
$         jtw:hbw   wh          nwr:hbschool    nk
$         jtw:hbnw  wo          nwr:hbcollege   nc
$         jtw:wbnh  ww          nwr:hbshopping  ns
$         jtw:nb    wn          nwr:hbother     no
$         jaw:wb    aw          nwr:nhb         nn
$         jaw:nb    an
$
$       mode order is:
$  1. occ1 nontoll
$  2. occ1 toll
$  3. occ2 nontoll
$  4. occ2 toll
$  5. occ3+ nontoll
$  6. occ3+ toll
$
$ outputs:
$   o/d vtt by occ by tod
$       vottxxo1.ALT for occ1 nontoll
$       vottxxo2.ALT for occ2 nontoll
$       vottxxo3.ALT for occ3 nontoll
$       vtttxxo1.ALT for occ1 toll
$       vtttxxo2.ALT for occ2 toll
$       vtttxxo3.ALT for occ3 toll
$
$   intermediate files not needed, deleted at end
$       vptt__o1.ALT vptt__o2.ALT vptt__o3.ALT, __ are 11 purps
$       vott__o1.ALT vott__o2.ALT vott__o3.ALT, __ are wr & nw
$       pptt__wb.ALT pptt__kr.ALT pptt__pr.ALT, __ are 11 purps
$       pott__wb.ALT pott__kr.ALT pott__pr.ALT, __ are wr & nw
$ steps:
$-------------------------------------
$ 1. do time-of-day factoring by purpose, for hwy and tran trips
$-------------------------------------
```

```
$ produce vt by tod for jtw:hbw
$ produce vt by tod for jtw:hbnw
$ produce vt by tod for jtw:wbnh
$ produce vt by tod for jtw:nb
$ produce vt by tod for jaw:wb
$ produce vt by tod for jaw:nb
$ produce vt by tod for nwr:hbsc
$ produce vt by tod for nwr:hbco
$ produce vt by tod for nwr:hbsh
$ produce vt by tod for nwr:hbot
$ produce vt by tod for nwr:nhb
$------------------------------------
$ 2. do directional factoring and summation over purposes
$------------------------------------
$ produce o/d vt by tod, wr purps, occ 1 nontoll
$ produce o/d vt by tod, wr purps, occ 2 nontoll
$ produce o/d vt by tod, wr purps, occ 3+ nontoll
$ produce o/d vt by tod, nw & all purps, occ 1 nontoll
$ produce o/d vt by tod, nw & all purps, occ 2 nontoll
$ produce o/d vt by tod, nw & all purps, occ 3+ nontoll
$ produce o/d vt by tod, wr purps, occ 1 toll
$ produce o/d vt by tod, wr purps, occ 2 toll
$ produce o/d vt by tod, wr purps, occ 3+ toll
$ produce o/d vt by tod, nw & all purps, occ 1 toll
$ produce o/d vt by tod, nw & all purps, occ 2 toll
$ produce o/d vt by tod, nw & all purps, occ 3+ toll
$------------------------------------
$ 3. delete temp files
$------------------------------------
```

4.3 Input Files

The time-of-day setup requires as input the output trip files from eleven applications of program MC, one for each trip purpose. These files contain ten tables, one for each mode, in order: highway occupancy 1, 2, and 3+; transit walk-to-premium, walk-to-local, walk-to-guideway, park-n-ride, kiss-n-ride; and auxiliary walk and bike. The standard-name output files from program MC are embedded in the time-of-day setup, requiring no user intervention.

4.4 Output Files

4.4.1 Output file for Non-toll time of day matrices

The following excerpt from the header of file tod\dfttxxxx.set (also shown above) lists

```
$   o/d vtt by occ by tod
$       vottxxo1.ALT for occ1
$       vottxxo2.ALT for occ2
$       vottxxo3.ALT for occ3
$   p/a ptt on transit by tod (am pk+sh + pm pk+sh, op md+nt)
$       ppttxxwl.ALT, ppttxxwx.ALT, ppttxxwg.ALT,
$       ppttxxkr.ALT, ppttxxpr.ALT
```

The time-of-day setup produces trip-files ready to assign to the highway and transit networks. Files vottxxo1.alt, vottxxo2.alt, and vottxxo3.alt contain vehicle trips in origin-destination format

for SOV, HOV2, and HOV3+, respectively. Each file contains six trip-tables, one for each time period, in order: AM peak (6-8a), AM shoulder (5-6, 8-9a), midday (9a-2p), PM peak (3-5p), PM shoulder (2-3, 5-6p), and night (6p-5a). Files ppttxxwl.alt, ppttxxwp.alt, ppttxxwg.alt, ppttxxkr.alt, and ppttxxpr.alt contain person trips on transit in production-attraction format for walk-to-local-bus, walk-to-premium-bus, walk-to-guideway, kiss-n-ride, and park-n-ride paths, respectively. Each file contains two trip-tables, one for each combined time period, peak (5-9a, 2-6p), and off-peak (9a-2p, 6p-5a).

4.4.2 Output file for Toll time of day matrices

The following excerpt from the header of file tod\dfttxxtl.set (also shown above) lists

```
$   o/d vtt by occ by tod
$       vottxxo1.ALT for occ1 nontoll
$       vottxxo2.ALT for occ2 nontoll
$       vottxxo3.ALT for occ3 nontoll
$       vtttxxo1.ALT for occ1 toll
$       vtttxxo2.ALT for occ2 toll
$       vtttxxo3.ALT for occ3 toll
```

This time-of-day setup produces vehicle trip files ready to assign to the toll highway network. Files vottxx01.alt, vottxx02.alt, vottxx03.alt, vtttxx01.alt, vtttxx02.alt, and vtttxx03.alt contain vehicle trip tables in origin-destination format for SOV non-toll, HOV2 non-toll, HOV3 non-toll, SOV toll, HOV2 toll, and HOV3 toll, respectively. Each file contains six trip tables, one for each time period as in the non-toll skims in section 4.4.1.

4.5 Controls

The setup file contains all necessary controls. The user can invoke the setup via the DOS batch file TOD\DFALL.BAT. It takes a single command-line argument, the file-extension denoting the year and scenario. For the base-year application, this extension is .C9X, so the transit skim-building process is invoked by navigating to the TRN directory and invoking "DFALL C9X" at the command prompt.

4.6 Reports

Embedded DOS commands in the setup copy the standard MINUTP report files to file TOD\DFTTXXXX.PRN or TOD\DFTTXXTL.PRN. This file echoes all commands, gives control totals on all matrices, and reports any problems. The user should be familiar with MINUTP reports.

4.7 Error Messages

Since the time-of-day procedures call MINUTP modules, only standard MINUTP errors are produced. Warnings are denoted (w) and fatal errors (f). See the MINUTP manual for clarification on specific messages. The end of report file dfttxxmm.prn summarizes the maximum severity of all problems encountered, with severity 0 indicating no warnings, 4 warnings but no fatals, and 8 fatals. The user must investigate all messages, as the version of TOD\DFTTXXXX.SET distributed returns codes of 0.

D. Other Transportation Models

1. Airport Access Trips

1.1 Purpose

This set of procedures performs the travel demand modeling steps for air passenger ground access trips. The airport access trip procedures estimate vehicle trips generated by air travelers, to and from the airport. The estimation procedure consists of a trip generation step, a distribution step and a mode choice/time of day step. The trip generation step estimates trip ends for three "purposes" – resident air passenger trips, visitors on tours trips, and independent visitor air passenger trips. The number of daily trips for these three purposes is an exogenous variable and for the calibration year was: (1) 10,000 residential trips; (2) 16,000 visitors on tour trips; and (3) 34,000 independent visitor trips. At the non-airport end of the trip the resident trips are distributed according to the number of households in the zone; the visitors on tour are distributed according to the number of hotel rooms in the zone; and the independent visitors are distributed according to households (a weight of 1) and hotels rooms (a weight of 25).

The distribution model is simply an allocation process for build trip tables from the trip ends since all the non-airport trip ends are "hooked" to the airport trip ends. The mode choice/time of day procedure is more detailed. The mode choice consists of a number of average uses by mode.

For resident travelers these assumptions are:

1. That 80 percent of the resident air travelers will come by private automobile, with half parking at the airport and half being dropped off.
    a. The average car occupancy for these trips (air passengers per vehicle) is 1.5
    b. That the drop off trips require 2 trips (one from the airport and one to the airport)
2. That 15 percent of the resident air travelers will come by taxi
    a. The average car occupancy (air passengers) for these trips will be 2.0
    b. That the trips will require 2 trips (one to and one from the airport)
3. That 5 percent of the resident air travelers will come by shuttle van
    a. The average car occupancy for these trips will be 4.0
    b. The trips will require 2 trips (one to and one from the airport)

For independent visitors the assumptions are:

1. That 25 percent of the independent visitors will come by private automobile
    a. The average car occupancy for these trips (air passengers per vehicle) is 2.0
    b. The trips will require 2 trips

2. That 25 percent of the independent visitors will come by taxi

    a. The average car occupancy for these trips is 2.0

    b. The trips will require 2 trips

3. That 50 percent of the independent visitors will come by shuttle van

    a. The average occupancy will be 4

    b. The trips will require 2 trips

For visitors on tours the assumptions are:

1. That 25 percent of the visitors on tour will come by shuttle van

    a. The average occupancy for these trips (air passengers per vehicle) is 4.0

    b. The trips will require 2 trips

2. That 75 percent of the visitors on tour will come by tour bus

    a. The average occupancy for these trips is 15.0

    b. The trips will require 2 trips

The occupancy is used to estimate the number of vehicle trips, which is the air passenger trips divided by the occupancy. Therefore taxi, shuttle van and tour buses are included in the vehicle trip table.

The final output of these procedures are a set of air passenger vehicle trip tables; one table for the morning peak period, one table for the evening peak period and one table for the non-peak periods. These tables are used in the highway assignment procedure. There are seven program runs in this procedure. A trip generation program (FORTRAN), three-distribution program runs (FORTRAN), two report runs (FORTRAN) and a time of day program (MINUTP).

1.2 Control File

There is a control file for each program. The control files for the distribution programs are all the same with the exception of the input trip end file names.

The trip generation program control file uses standard namelist notation. There is a &files logical record, a &params logical record, a &prods logical record, a &attra logical record, and a &options logical record.

For normal operations only the &files record and (for one data item) &prods record need to be modified. The &files record has four keywords with are:

1. Fzdata: This is the zonal data file (ZDXXXXXX.%%%). The same one used in the Trip Generation program (see User's Guide to Model Application, Section C.1). Note the analyst should change the file extension name to the alternative name.

2. Ftends: This is the estimated air passenger trip end file, an output file. Its name must be AEXXPPXX.%%% – where the extension is the alternative name.

3. Fprt: This is the report file, usually named AEXXPPXX.rpt.

4. Title: This is the title of the run (not a file).

The &parms records has five keywords which are:

1. Nzones: This the number of zones (764)

2. Npurposes: This is the number of purposes (3)

3. Nzdata: This is the number of zone data items the program reads (33)

4. Zspec: This is the zone number for the airport. In the base year this was zone 764.

5. Zdind: This is the zone data items that are used with the trip rates. These zone data item numbers are shown on the fzdata file of the trip generation program description. These data items must be in the same order as the rates (described in the discussion on the &prods and &attrs records). These data items should be 4 (hotel rooms) and 7 (households).

The data on the &parms record should never be changed unless major modifications are made to the program and procedure.

The &prods and &attrs records contain the trip rates for each of the air passenger categories (resident, visitors on tour, and independent visitors). The &prods has three keywords which are prates(x), where x is the air passenger category (1 = residence, 2 = tour visitors, 3 = independent visitors).

Each of these keywords has two values after them. The first value is always a 0 (it actually is not used in the program). The second value is the daily air passengers for the air passenger category. This should be changed by the analyst depending on the estimated air passenger trips in the year of the forecast. For the base year (1995) the values were 10,000, 16,000, and 34,000.

The &attrs has three key words (arates1, arates2, and arates3). These are the trip "weights" at the non-airport end of the trip. For the resident category (1) the hotel rooms have a weight of zero and households have a weight of 1.0. For the visitors on tour the hotel rooms have a weight of 1 and the households have a weight of 0. For the independent visitors the hotel rooms have a weight of 25 and the households have a weight of 1. These rates should not be changed.

The &options record has four keywords which are:

1. Detail: This keyword, if set to true (detail = t) will produce detailed reports of the data.

2. Pspec: This keyword specifies which purpose will have special trip end treatment. The specification is 0 for no special treatment and 1 for special treatment. The 0/1 codes should be in order by purpose. In the standard procedure all purposes have a special treatment.

3. Recto. This keyword specifies for each of the three purposes which trip end (production or attraction) will control the total trip ends. If recto is a 1, then the attractions will be "normalized" to match the production regional total. If recto is a 2, then the productions will be normalized to match the attraction regional total. For the normal procedure, all purposes will have there attractions (non-airport end) trip ends "balanced" to productions (airport trip ends).

4. Aeqp: This keyword specifies for each purpose if the attractions are the same as the productions (which are to be estimated) for each zone. If the value false (f) then the attractions and productions can be different by zone. If the value is true (t) then the attractions and productions will be the same by zone. For the normal procedure, all purposes are coded as false.

An example of the trip generation control file (whose name must be AEXXPPXX.ctl) is shown in Table 1.1. Note in this example, the areas which must be changed by the user are coded with %%% for file extensions and $$$$ for the airport trip end values. This should facilitate updating this control file.

Table 1.1
Example of the Trip Generation Control file (AEXXPPXX.ctl)

```
OMPO Model Development Project
Trip Generation for Airport Access

&files
  fzdata     = '..\zd\zdxxxxxx.c25'
  ftends     = 'aexxppxx.f33'
  frpt       = 'aexxppxx.rpt'
  title      = 'apply airport-acc gen model '
&end

&params
  nzones     = 764
  npurps     =   3
  nzdata     =  33
  zspec      = 764
  zdind      =      4,      7,
&end

  zdat type:    htlrm     hld
&prods
  prates1    =     0., 10000.
  prates2    =     0., 16000.
  prates3    =     0., 34000.
&end

&attrs
  arates1    =     0.,     1.
  arates2    =     1.,     0.
  arates3    =    25.,     1.
&end
```

```
&options
  detail      =   f,
  pspec       =   1,1,1,
  recto       =   1,1,1,
  aeqp        =   F,F,F,
&end  detail      =   f,
  pspec       =   1,1,1,
  recto       =   1,1,1,
  aeqp        =   F,F,F,
&end
```

There are three trip distribution control files, one for each trip purpose. These control files are named:

1. APXXREXX.ctl – For Resident Air Passengers

2. APXXVTXX.ctl – For Visitors on Tour

3. APXXVIXX.ctl – For Independent Visitors

Each of these files has three logical records. These records are &files, &params; &options. The &files logical record have six keywords which are:

1. Ftends: this is the trip ends from the air passenger trip generation program. Be sure to code the extension as the alternative being used

2. Fimpeds: this is a matrix on ones. This file should always be ones764.tmp and should be in the generic\td directory.

3. Fequivs: this is the district to zone equivalent file found in directory generic\zd

4. Ftripo: this is the output trip table – be sure to code the extension

5. Frpt: this is the output report file

6. Title: this is the title of the run.

These keywords will be the same for each of the three runs, except for the reference to the air passenger purpose name.

The &params record has 14 keywords. These keywords have been described in the Trip Distribution program description in User's Guide to Model Application, Section C.2. The user should not change any of these keyword values.

The &options record has 2 keywords. These keywords have been described in the Trip Distribution program description in User's Guide to Model Application, Section C.2. The user should not change any of these keyword values.

An example of the trip distribution control file is shown in Table 1.2.

Table 1.2
Example of Airport Access Trip Distribution Control File (APXXVIXX.ctl)

```
Honolulu models
Control File for Trip Distribution Application TD.EXE
Airport-Access Trips: Visitors Independent

&files
  ftends     = 'aexxppxx.f33'
  fimpeds    = '..\..\generic\td\ones764.bas'
  fequivs    = '..\..\generic\zd\764to23.eqv'
  ftripo     = 'apxxvixx.f33'
  frpt       = 'apxxvixx.rpt'
  title      = 'TD for ap acc: vis ind'
/

&params
  nzones     = 764
  ndists     =  23
  nfends     =   6
  nfProds    =   3
  nfAttrs    =   6
  tabimp     =   1
  nincr      =   1
  p1beg      =   0.00
  p2beg      =   0.00
  maxiter    =   1
  reltol     =   0.005
  abstol     =  10
  width      =   2
  nintervs   =  50
  scale      = 100.0
  offset     =   0.0
/
&options
  prteqv     = F
  calib      = F
/
```

The control file to build the time of day air passenger trips is a MINUTP control file with a name of VOTTXXXX.set. This file adds the three purposes together and allocates 30 percent to the morning peak period, 30 percent to the evening peak period and 40 percent to the off-peak hours. An example of this file is shown in Table 1.3. For the normal procedures, the analyst need not change anything in this control file.

There are two report control files – APXXPPXX.ctl and VOTTXXXX.ctl . These are standard report control files. The first control file produces a district to district report of each of the individual air passenger trip tables while the second one reports the three air passenger vehicle trip tables which will go to the assignment process. The analyst must change the extension on the input files for these reports.

Table 1.3
Example of the Airport Access Time of Day Control file
(File VOTTXXXX.set)

```
$ convert per trips to veh trips, to o/d, by tod
*pgm matrix
*unit 11=apxxrexx.%alt%
*unit 12=apxxvtxx.%alt%
*unit 13=apxxvixx.%alt%
*unit 19=vpxxxxmm.%alt%
get 1,101
get 2,201
get 3,301
$ inflate by 100 to keep precision, deflate at end
$ inflate all modes (except parked) by 2 for round trips
$ assume 50% of res auto trips pick/drop, 50% parked
$ residents:auto(80%/1.5occ),taxi(15%/2.0) shuttle van (5%/4.0)
comp f11=1*0.80/1.5*100.*1.5
comp f12=1*0.15/2.0*100.*2.0
comp f13=1*0.05/4.0*100.*2.0
$ Ind. visitors:auto(25%/2.0),taxi(25%/2.0),shuttle van (50%/4.0)
comp f11=f11+3*0.25/2.0*100.*2.0
comp f12=f12+3*0.25/2.0*100.*2.0
comp f13=f13+3*0.50/4.0*100.*2.0
$ visitors on tour: shuttle van (25%/4), tour bus (75%/15)
comp f13=f13+2*0.25/4.0*100.*2.0
comp f14=2*0.75/15.0*100.*2.0
$ deflate and write
comp 21=f11
fac 21,.01,b
comp 22=f12
fac 22,.01,b
comp 23=f13
fac 23,.01,b
comp 24=f14
fac 24,.01,b
comp 25=21+22+23+24
out 21,901-905
*pgm matrix
$ convert to o>d, factor by tod
*unit 11=vpxxxxmm.%alt%
*unit 19=vottaaxx.%alt%
$ convert to o>d
trnp 1,105
get 2=105
comp 3=1+2
fac 3,.5,b
$ factor by time-of-day
comp 4=3
comp 5=3
fac 4,0.30,b
fac 5,0.40,b
out 4,901-902
out 4,903
```

1.3 Input Files

The entire airport access forecasting process uses one input data file, aside from the standard files that do not change. This file is the zonal data file (ZDXXXXXX.%%%) which is the same file used in the Trip Generation procedures (see User's Guide to Model Application, Section C.1).

1.4 Output Files

1. AEXXPPXX.%%%: The productions and attractions from the air passenger trip generation program

2. APXXREXX.%%%: Trip table containing resident air passenger trips

3. APXXVTXX.%%%: Trip table containing visitors on tour air passenger trips

4. APXXVIXX.%%%: Trip table containing independent visitor's air passenger trips

5. VPXXXXMM.%%%: Trip table (5 tables) of daily air passenger vehicle trips by mode, with:

   Table 1: Auto vehicle trips
   Table 2: Taxi trips
   Table 3: Shuttle van trips
   Table 4: Tour bus trips
   Table 5: Total vehicle trips

6. VOTTAAXX.%%%: Trip table (3 tables) of air passenger vehicle trips by time period, with:

   Table 1: Morning peak period (peak and shoulders) trips
   Table 2: Off-peak period trips
   Table 3: Evening peak period (peak and shoulders) trips
   Table 4: Morning peak period (peak 2 hour only) trips

1.5 Procedure Controls

The airport access procedure is implemented using the batch file APALL.bat. Once the control files have been modified for the alternative and the programs can be run by typing at the DOS prompt APALL %%% (where %%% is the alternative extension). A copy of the batch file is shown on Table 1.4. In addition to the main batch file there is a trip generation batch file (TGT.bat) and a trip distribution batch file (TD.bat). These batch files simply call the trip generation program and the trip distribution program.

Table 1.4
Example of the Airport Access Procedure Batch File
(File APALL.bat)

```
@echo off
@echo Airport-access TG, TD, MC, TOD
rem
rem set alt designator
set alt=%1
rem
rem TG
```

```
call tgt aexxppxx.ctl
rem
rem TD and report
call td apxxrexx.ctl
call td apxxvixx.ctl
call td apxxvtxx.ctl
call report apxxppxx.ctl
rem
rem MC and TOD and report
call do vottxxxx
call report vottxxxx.ctl
rem
@echo.
```

1.6 Reports

MINUTP Report:

1. VOTTXXXX.prn: This report is a MINUTP report describing the mode choice and time of day procedures for the air passenger model. The report shows the MATRIX commands used and shows the total trips input and output. There are two total trip summaries. The first summary shows the results of the "mode choice" procedure and the second shows the results of the time of day procedure. The first report would look like this:

Wrk Mat	(At end of zone) Total	I/P Mat	Total	OUT Mat	Total
1	10,000	101	10,000	901	16,500
2	16,000	201	16,000	902	10,000
3	34,000	301	34,000	903	10,752
11	1,650,000			904	1,600
12	1,000,000			905	38,852
13	1,075,000				
14	160,000				
21	16,500				
22	10,000				
23	10,752				
24	1,600				
25	38,852				

Where: 1, 2, 3, etc. are Work Matrices; I/P are Input matrices and OUT are Output matrices

The input matrices are: 101: Resident Air Passengers; 201: Visitors on Tour Air Passengers; and, 301: Independent Visitors Air Passengers

The output matrices are 901: Automobile Vehicle Trips; 902: Taxi Vehicle Trips; 903: Shuttle Van Trips; 904: Tour Bus Trips; and, 905: Total Vehicle Trips.

The second report summary shows the total vehicle input and the total vehicle output by time of day. The report looks like this:

Wrk Mat	(At end of zone) Total	I/P Mat	Total	OUT Mat	Total
1	38,852	105	38,852	901	11,573
2	38,852			902	15,464
3	38,682			903	11,573
4	11,573			904	6,783
5	15,464				
6	6,783				

The input matrix (105) is Total Vehicle Trips.

The output matrices are: 901: Morning Peak; 902: Off-Peak; 903: Evening Peak; and 904: Morning 2 Hour Peak.

FORTRAN REPORTS:

1. AEXXPPXX.rpt: This report is from the trip generation program for air passengers. The report shows the control files used for the program. It also has a small summary line, for each type of passenger, at the end of the report that shows the productions estimated and the initial attractions. It also shows the factors needed to reconcile the attractions to the productions. This summary line looks like this:

```
tgt 609 (i) summary of regional reconciliation step
 purp recto aeqp totprod totattr factor
 ---- ----- ---- ------- ------- ------
    1     1    F   10000  265636   .038
    2     1    F   16000   29982   .534
    3     1    F   34000 1015186   .033
```

Where purpose 1 is resident air passengers, 2 is visitor on tours and 3 is independent visitors.

2. APXXREXX.rpt:
3. APXXVIXX.rpt:
4. APXXVTXX.rpt:

These three reports are the air passenger distribution model reports, where RE is for residents, VI is for independent visitors, and VT is for visitors on tour. The report shows the control variables used to run the program. It also has, near the end of the report, a total number of productions and attractions used by the program. This summary of input attractions and productions looks like this:

```
rdata 9002 (i) total productions:      16000
               total attractions:      16010
```

5. APXXPPXX.rpt: This report summarizes the trip ends by district (from the trip generation model) by district (for the trip ends not at the airport). The summary is by resident, visitors on tour, and independent visitors.

6. VOTTXXXX.rpt: This report summarizes the air passenger vehicle trips by district to district movements, for the morning peak, evening peak and off-peak. The trips shown are in thousands of trips.

2. Visitor Trips

2.1 Purpose

The Honolulu Visitor Model is intended to supplement the "standard" four-step demand models, which capture only resident travel.

The MS-DOS batch file VISNEW.BAT executes the Honolulu Visitor Model. In general, the Batch file first prepares input files using MINUTP scripts, and then executes the custom FORTRAN program VISITOR, to apply the Visitor Model. For a detailed description of the model form (applied by VISITOR), the user should refer to the original documentation for VISITPGM, which was developed for a previous study[1].

VISITOR is a slightly modified version of the program VISITPGM. VISITOR differs from VISITPGM in its ability to handle up to 2,500 zones, its use of default parameters[2], and its re-calibration to base year data.

The VISNEW Batch file performs the following steps:

- BLDTOUR.SET – MINUTP script used to prepare a matrix summarizing the cost used for the Tour bus mode, used by the VISITOR software.
- SKTRNVIS.SET – MINUTP script that builds transit skims for the VISITOR software.
- VISITOR – Custom FORTRAN program that applies the Visitor Model.
- VISOBS.SET – MINUTP script, which combines the output from VISITOR with an additional transit trip table of visitor trips not going to the 25 key destinations, and applies time-of-day factors.

Each of these steps is discussed in more detail in the following sections.

2.2 Step 1: BLDTOUR.SET

The MINUTP script BLDTOUR.SET simply puts the "DATA\ZVS_COST.%%%" text file into a MINUTP binary matrix with the name "TOURCOST.MAT". The VISITOR software then uses this file directly.

The input file for Step 1 is:

- ZVS_COST.%%% -- Tour cost from origin zone to visitor site zones. This is a card image file with the following format: origin zone in columns 1-5, visitor site zones in columns 6–10, tour cost (in hundredths of cents) in columns 11–17. Note the base year

[1] See "Task 3.03 Service and Patronage Forecasting Methodology" Prepared for the Department of Transportation Services, Office of Rapid Transit, City and County of Honolulu, Prepared by Barton-Aschman Associates, Inc. and Parsons Brinckerhoff Quade & Douglas, Inc., March 1992

[2] The previous version required the user to input each of the parameters. The program now uses the default parameters if none are entered.

file for tour costs has approximately 19,000 records. This data was compiled from tour operators during development of the visitor model for the Rapid Transit Project. This cost represents the average amount charged by a tour operator from selected origins (generally hotel locations) to selected destination (tour venue such as the Arizona Memorial).

The output file for Step 1 is:

- TOURCOST.MAT – The tour cost as a binary MINUTP matrix
- BLDTOUR.PRN – Standard MINUTP report file

2.3 Step 2: SKTRNVIS.SET

This step builds transit skims specifically for the Visitor Model. Two sets of skims are produced, one for the local bus mode and one for the premium transit mode. The skim parameters and input files are identical as those used by the resident models Off-Peak transit skim process.

The input files for this step are:

- STXXXXTR.%%% – Park-and-Ride station file
- TLTTXXBL.%%% – Line cards for local bus routes
- TLTTXXFG.%%% – Line cards for premium (rapid bus or rail) transit routes
- XFXXXXTR.%%% – Non-centroid connector walk links
- HNTTXXXX.%%% – Binary highway network located in the HWY directory
- ALMDXXTR.%%% – Mid-day (Off-Peak) access link file for all transit networks
- ALXXXXST.%%% – Park-and-Ride lot nodes and parking costs

The output files for this step are:

- SKTRNVIS.ALT – Local bus transit skim
- SKFGVIS.ALT – Premium (rapid bus or rail) transit skim
- SKTRNVIS.PRN – Standard MINUTP report file

Both of the above transit skims are read directly by the VISITOR software, and contain 10 tables with the following time values in each:

- Tables 1–2 – Blank (all zeroes)
- Table 3 – Walk access time and initial wait time (minutes)

- Table 4 – Transfer wait time (minutes)
- Table 5 – In-vehicle travel time (all segments, expressed in minutes
- Table 6 – Premium transit in-vehicle travel time (minutes)
- Tables 7–10 – Blank (all zeroes)

2.4 Step 3: VISITOR Application

A standard FORTRAN control file operates the VISITOR software. The software applies a combination trip generation-distribution-mode choice model.

The control file uses standard namelist notation and has the following sections:

- FILES – Location of key input and output files
- PARAMS – Global parameters
- OPTIONS – Input/output and computational options
- SELECTS – Zone pair selection
- PARMS – Model parameters

The variables in each of these sections are explained in detail in the following sub-sections.

2.4.1 FILES

The FILES section contains the locations of input and output files. The section must begin with &FILES and end with a slash (/) (see Tables 2.3 and 2.4). The input file names are as follows:

- FZDATA – Zone level data file[3]
- FSKLOC – Local Bus skim
- FSKPRM – Premium Bus skim (optional, only required if RAIL is set to true, see OPTIONS)
- FSKHWY – Highway skim
- FSKFARB – Local Bus fare skim (optional, only required if TFARE is set to true, see OPTIONS)
- FSKFARR – Premium Bus fare skim (optional, only required if TFARE and RAIL are set to true, see OPTIONS)

[3] This is the zonal data file developed specifically for the visitor model. The format for this file is contained in Table 2.1. This file should include a record for each zone for consistency and accuracy.

- FSKTOUR – Tour Bus skim

The output file names are as follows:

- FVSTOUT – Modal trip tables
- FRPT – Report file

As mentioned above, the fare matrices are optional. If no matrix is specified, the fare will be considered constant for all O-D pairs and taken from the FLTFAR variable in the PARMS section.

The file names must be enclosed in a single quote, (e.g. FRPT='report.txt') and can include path information (e.g. FRPT = 'c:\data\vis\report.txt'). The total length of the file name, including the path information, cannot exceed 40 characters.

In application, these FILE variable names refer to the following input files:

- FZDATA = 'DATA\ZDXXXVIS.%%%' – This file contains input socio-economic data for the visitors. The format of the file is shown below in Table 2.1.
- FSKLOC = 'SKTRNVIS.ALT' – Local bus transit skim, from Step 2: SKTRNVIS.SET
- FSKPRM = 'SKFGVIS.ALT' – Premium transit skim, from Step 2: SKTRNVIS.SET
- FSKHWY = '..\HWY\SKOPXXOL.%%%' – Off-peak highway skim. MINUTP binary matrix file containing two tables. The first is highway time in minutes times 100 and the second is highway distance in miles times 10.
- FSKFARB – Not used in the application (must be a MINUTP binary matrix file with one table, the cost in cents).
- FSKFARR – Not used in the application (must be a MINUTP binary matrix file with one table, the cost in cents).
- FSKTOUR = 'TOURCOST.MAT' – Tour bus matrix, from Step 1: BLDTOUR.SET.

Table 2.1
Format of FZDATA file

Field	Columns	Format	Description
1	1–5	I5	Zone number
2	6–13	F8.0	Parking Cost (cents)
3	14–21	F8.0	Origin Terminal Time (minutes)
4	22–29	F8.0	Destination Terminal Time (minutes)
5	30–37	F8.0	Percent of visitors with access to an automobile
6	38–45	F8.0	Percent of visitors on a tour
7	46–53	F8.0	Hotel Rooms
8	54–61	F8.0	Resort/Condo Units

The output files are as follows:

- FPRT = 'VISIT.RPT' – Text report file summarizing VISITOR results
- FVSTOUT = 'VISITRP.ALT' – Output binary trip table, with the following person trip tables:
    - Table 1 – Auto
    - Table 2 – Local Bus
    - Table 3 – Premium or Guideway Transit (Rapid Bus or Rail)
    - Table 4 – Taxi
    - Table 5 – Tour
    - Table 6 – Walk

2.4.2 PARAMS

The PARAMS section of the VISITOR control file contains only two variables. These keywords are:

- NZONES – Number of traffic analysis zones (TAZ). This number must match the dimensions of the input matrices. The default is 762.
- NZDATA – Number of data items in the input zone data file. The default is 7 and this value should never change.

2.4.3 OPTIONS

The OPTIONS section contains a set of logical variables. These variables can be set to either true (VARIABLE = T) or false (VARIABLE=F). The following keywords are in the OPTIONS section:

- DRYRUN – If true, the program will read in the input data sets and check the control file for errors, but perform no calculations.
- DEBUG – If true, the program will produce a vast amount of output, demonstrating the calculations performed for each I–J pair. The main purpose of this OPTION is to aid programmers in analyzing the performance of the software. When using this option, it is important to limit the zones on which the calculations are performed by using the SELECTS options to avoid creating a very large report file.
- TFARE – If true, the program will read in an input fare matrix, specified by the FSKFARB and FSKFARR (if RAIL is also true) keywords in the FILES section. If false,

a flat transit fare is used – the FLTFAR variable in the PARMS section. Transit fares should be expressed in cents.

- RAIL – If true, the program will consider the premium transit mode and will expect a premium transit skim to be specified in the FSKPRM variable in the FILES section.

2.4.4 SELECTS

The SELECTS section allows the user to execute the model for a select group of zone pairs. The following two variables are in the SELECTS section:

- REPORTS – When set to 1, a table of trips by mode will be printed to the report file
- I – Specifies which origin zones will be considered in the model. The form of the input is "first zone,–last zone". For example, if the user wants to execute the model for only zones 1 through 30 and 50 to 100, the variable would be "I = 1,–30,50,–100". A maximum of 10 entries are allowed (the previous example used 4 entries). In a typical application, all zones would be considered. Thus, "I=1,–762" would be used.

2.4.5 PARMS

The PARMS section contains the model parameters. Please refer to the Guide to Model Form document for more information about the model parameters.

- CLOGSUM – Coefficient on the LogSum variable in the Frequency/Destination-Level nest. The estimated value is –0.21710.
- CIVT – Coefficient on the in-vehicle time variable in the Mode Choice-Level nest. The estimated value is –0.02712.
- COVT – Coefficient on the out-of-vehicle time and walk time less MWTIME minutes, in the Mode Choice-Level nest. The estimated value is –0.05424.
- COCOST – Coefficient on the operating cost in the Mode Choice-Level Nest. The estimated value is –0.0003816.
- CPCOST – Coefficient on the parking cost in the Mode Choice-Level nest. The estimated value is –0.007776.
- CTOUR – Coefficient on a dummy variable for those on a tour, specific to the tour bus mode, in the Mode Choice-Level nest. The estimated value is 1.30300.
- CWALKAD – Coefficient on the walk time over MWTIME minutes, in the Mode Choice-Level nest. The estimated value is –0.13220.
- KAUTO – Alternative-specific constant for the auto mode in the Mode Choice-Level nest. The calibrated value is –1.95361.

- KBUS – Alternative-specific constant for the bus mode in the Mode Choice-Level nest. The calibrated value is –5.95.
- KTAXI – Alternative-specific constant for the taxi mode in the Mode Choice-Level nest. The calibrated value is –6.29218.
- KTOUR – Alternative-specific constant for the tour bus mode in the Mode Choice-Level nest. The calibrated value is –4.53682.
- KRAIL – Alternative-specific constant for the premium transit mode in the Mode Choice-Level nest. As this mode is not present in the base year, the constant is set to the same value as KBUS (–5.95).
- RTOUR – Coefficient on a dummy variable for those on a tour, specific to the premium transit mode, in the Mode Choice-Level nest. The default value is 0.0000.
- CCPM – Operating cost per mile, in cents, of the auto mode. The default is 38.2 cents per mile.
- FLTFAR – The flat fare for the transit mode, used if a transit fare matrix is not specified. The default value is 44.0 cents.
- MWTIME – The walk time "break" point when the coefficient on walk time changes from COVT to WALKAD. The default value is 20.0 minutes.
- WSPD – Assumed speed for the walk mode, in miles per hour. The default value is 3.0 miles per hour.
- TXMIN – The boarding (initial) cost for the taxi mode. The default value is 175 cents.
- TXCPM – The cost per mile for the taxi mode. The default value is 175 cents per mile.
- AUTOCC – The average auto occupancy for the auto mode. The default value is 2.70 persons per vehicle.
- TAXIOC – The average occupancy for the taxi mode. The default value is 3.50 persons per vehicle.
- VISUNT – The average party size staying in hotel rooms and rental units. The default is 2.77 persons per unit.
- ADJUST – Adjustment factor applied to VISUNT. The default value is 0.98035. ADJUST is a calibration factor that was used to calibrate to the total number of non-resident visitor trips to the 25 key destinations.
- CONST(75) – The alternative-specific constants applied to each destination at the Frequency/Destination nest. The calibrated values for the 25 destinations are shown in Table 2.1.

Table 2.2
Visitor Sites Used in the Visitor Model

Site Name	Site Number	Zone Number	Site Coefficient
Ala Moana Park	1	207	–2.23384
Ala Moana Center	2	186	–0.78665
Aloha Stadium	3	396	–3.03093
Aloha Tower	4	234	–3.50281
Bishop Museum	5	308	–3.95056
Chinatown	6	260	–2.71094
Diamond Head	7	104	–1.76370
Dole Cannery Square	8	333	–2.43372
Central Business District	9	258	–1.89066
Hanauma Bay	10	14	–1.78691
Honolulu Zoo	11	110	–3.50003
International Marketplace	12	119	–0.39423
Iolani Palace	13	226	–3.18971
Kodak Hula Show	14	106	–3.83589
Pearl Harbor	15	390	–1.85926
Arizona Memorial	16	397	–2.21412
Pearlridge Center	17	413	–3.54949
Polynesian Cultural Center	18	668	–2.32195
Punchbowl National Cemetery	19	273	–2.18386
Royal Hawaiian Shopping Center	20	137	–1.75141
US Army Museum – Fort DeRussy	21	134	–4.65630
University of Hawaii	22	65	–3.52679
Waikiki Aquarium	23	106	–3.84432
Waikiki Beaches	24	133	0.44617
Waimea Falls Park	25	664	–2.43219

Two example control files are shown in Table 2.3 and 2.4. The control file in 2.3 allows the program to use all the default values, as described above. The control file in 2.4 specifies each of the parameters and options.

Table 2.3
Example Control File Using All the Default Values

```
&FILES
  FZDATA ='data\zdxxxvis.r25'
  FRPT   ='visit.rpt'
  FSKLOC ='sktrnvis.alt'
  FSKPRM ='skfxgvis.alt'
  FSKHWY ='..\hwy\skopxxo1.f55'
  FSKTOUR='tourcost.mat'
  FVSTOUT='visitrp.alt'
  /
&PARAMS
  NZONES=764,
  /
&OPTIONS
  DRYRUN=F,
  DEBUG=F,
  TFARE=F,
  RAIL=T
  /
&SELECTS
  REPORTS=1,
  I=1,-764
/
&PARMS
 /
```

Table 2.4
Example Control File with All Keywords Specified

```
&FILES
  FZDATA ='data\zdxxxvis.r25'
  FRPT   ='visit.rpt'
  FSKLOC ='sktrnvis.alt'
  FSKPRM ='skfxgvis.alt'
  FSKHWY ='..\hwy\skopxxo1.f55'
  FSKTOUR='tourcost.mat'
  FVSTOUT='visitrp.alt'
  /
&PARAMS
  NZONES=764,
  /
&OPTIONS
  DRYRUN=F,
  DEBUG=F,
  TFARE=F,
  RAIL=T
  /
&SELECTS
  REPORTS=1,
  I=1,-764
/
&PARMS
 /
```

```
  CLOGSUM = -0.21710,
  CIVT    = -0.02712,
  COVT    = -0.05424,
  COCOST  = -0.0003816,
  CPCOST  = -0.007776,
  CTOUR   =  1.30300,
  CWALKAD = -0.13220,
  KAUTO   = -1.95361,
  KBUS    = -5.95000,
  KTAXI   = -6.29218,
  KTOUR   = -4.53682,
  KRAIL   = -5.95000,
  RTOUR   =  0.00000,
  CCPM    = 38.20000,
  FLTFAR  = 44.00000,
  MWTIME  = 20.00000,
  WSPD    =  3.00000,
  TXMIN   =175.00000,
  TXCPM   =175.00000,
  AUTOCC  =  2.70000,
  TAXIOC  =  3.50000,
  VISUNT  =  2.77000,
  ADJUST  =  0.98035,
  CONST(1)= -2.23384,
  CONST(2)= -0.78665,
  CONST(3)= -3.03093,
  CONST(4)= -3.80281,
  CONST(5)= -3.95056,
  CONST(6)= -2.71094,
  CONST(7)= -1.76370,
  CONST(8)= -2.43372,
  CONST(9)= -1.89066,
  CONST(10)=-1.78691,
  CONST(11)=-3.50003,
  CONST(12)=-0.39423,
  CONST(13)=-3.18971,
  CONST(14)=-3.83589,
  CONST(15)=-1.85926,
  CONST(16)=-2.21412,
  CONST(17)=-3.54949,
  CONST(18)=-2.32195,
  CONST(19)=-2.18386,
  CONST(20)=-1.75141,
  CONST(21)=-4.65630,
  CONST(22)=-3.52679,
  CONST(23)=-3.84432,
  CONST(24)= 0.44617,
  CONST(25)=-2.43219,
 /
```

2.5 Step 4: VISOBS.SET

The final step in the VISNEW batch files performs three processes. The first step adds an additional transit trip table to the output from the VISITOR software. The additional trip table accounts for visitor trips not made to the 25 destinations listed in Table 2.2. A factor is included in the VISOBS.SET to grow this trip table for application in future years. The user can use any factor he/she deems reasonable, and is currently set at 1.0. This trip table is added to the Premium Transit trips to make available the maximum number of transit paths.

The second step converts the auto and taxi person trips into vehicle trips using average occupancies of 2.70 and 3.50, respectively.

The third step prepares the transit and highway trip tables for assignment by performing time-of-day factoring. The factors are as follows:

- Transit Factors
    - AM Peak = 0.14
    - Off-Peak = 0.54
    - PM Peak = 0.32
- Highway Factors
    - AM Peak = 0.12
    - AM Peak Shoulder = 0.09
    - Midday = 0.29
    - Night = 0.23
    - PM Peak = 0.13
    - PM Peak Shoulder = 0.14

The final step converts the 6 highway trip tables from production and attraction format to origin and destination format. Then combines them into 4 tables: AM Peak 4 Hour (AM Peak + AM Peak Shoulder), Off peak (Midday + Night), PM Peak 4 Hour (PM Peak + PM Peak Shoulder), AM Peak 2 Hour.

The input files for VISOBS.SET are as follows:

- VISTRN.OBS – Transit trips not going to 25 key destinations
- VISITRP.ALT – Modal person trip table output from VISITOR

The output files for VISOBS.SET are as follows:

- VOTTVSXX.%%% – Auto and taxi vehicle trips segmented by time of day
  - Table 1 – AM Peak 4-Hour
  - Table 2 – Off-Peak 16-Hour
  - Table 3 – PM Peak 4-Hour
  - Table 4 – AM 2-Hour

- PPTTVSTR.%%% – Transit trips segmented by time of day
    - Table 1 – Walk to Local AM Peak
    - Table 2 – Walk to Local Off-Peak
    - Table 3 – Walk to Local PM Peak
    - Table 4 – Walk to Premium Transit AM Peak
    - Table 5 – Walk to Premium Transit Off-Peak
    - Table 6 – Walk to Premium Transit PM Peak
- VISOBS.PRN – Standard MINUTP report file

2.6 Application

The Visitor Model can be applied by typing "VISNEW %%%" at a DOS Prompt in the \VIS directory. The "%%%" is the alternative extension. A copy of the batch file is shown in Table 2.5.

Table 2.5
Example of the Visitor Trip Procedures Batch File
(File VISNEW.BAT)

```
@echo off
@echo Visitor travel
rem dto041502
rem set alt designator
set alt=%1
call do bldtour
call do sktrnvis
call visitor visitor.ctl
call do visobs
@echo
```

3. Truck Trips

3.1 Purpose

This set of procedures performs three travel demand modeling steps for truck trips. These steps are trip generation, trip distribution, and time of day analysis. The final output of these procedures are a set of truck trip tables; one table for the morning peak period, one table for the evening peak period and one table for the off-peak period. These tables are used in the highway assignment procedure. There are eleven program runs in this procedure. A trip generation program (FORTRAN), seven distribution program runs (FORTRAN), two report runs (FORTRAN) and a time of day program (MINUTP).

3.2 Control File

There is a control file for each program. The control files for the distribution programs are all the same with the exception of the input trip end file names.

The trip generation program control file uses standard namelist notation. There is a &files logical record, a &params logical record, a &prods logical record, a &attra logical record, and a &options logical record.

For normal operations only the &files record and (for one data item) &prods record need to be modified. The &files record has four keywords with are:

1. Fzdata: This is the zone data file (ZDXXXXXX.zzz), the same one used in the trip generation program. Note the analyst should change the file extension name to the alternative name.

2. Ftends: This is the estimated truck trip end file. Its name must be TEXXPPXX.zzz – where the extension is the alternative name.

3. Fprt: This is the report file, usually named texxppxx.rpt.

4. Title: This is the title of the run (not a file).

The &parms records has five keywords, which are:

1. Nzones: This the number of zones (764)

2. Npurposes: This is the number of purposes (7)

3. Nzdata: This is the number of zone data items the program reads (33)

4. Zspec: This the zone number which are port zones. There can be 10 of these zone numbers. For the base year there were only 6, which were 234, 330, 331, 332, 347, 350

5. Zdind: These the zone data items which are used with the trip rates. These zone data item numbers are shown on the fzdata file of the trip generation program description. These data items must be in the same order as the rates (described in the discussion on the

&prods and &attrs records). These data items should be 2 (total employment), 12 (military employment), 13 (government employment), 14 (hotel employment), 15 (agricultural employment), 16 (transportation employment), 17 (industrial employment), 18 (fiscal employment), 19 (service employment), 20 (retail employment) and 21 (construction employment).

The data on the &parms record should never be changed unless major modifications are made to the program and procedure.

The &prods and &attrs records contain the trip rates for each of the employment categories. The &prods has seven keywords which are prates(x), where x is the truck purpose number. The truck purpose number definitions are as follows:

1. Garage-Based Two Axle Truck Trips
2. Garage-Based Three Axle Truck Trips
3. Garage-Based Four Axle Truck Trips
4. Non-Garage-Based Two Axle Truck Trips
5. Non-Garage-Based Three Axle Truck Trips
6. Non-Garage-Based Four Axle Truck Trips
7. Port Based Truck Trips

Each of these keywords have eleven values after them. These values are the truck trip rates (trip ends per employee) for the eleven employment categories described in the &params record. The one exception to this is the value for purpose 7 (prates7 – port based) for construction employment. This value is the total trip ends at the six port zones, described in zspec keyword. For the base year this value was 6,310. These rates should not be changed with the exception of the value for the total trip ends at the six port zones.

The &attrs has four key words (arates1, arates2, arates3 and arates7). These are the trip rates at the attraction end of the trip and are only calculated for purposes 1, 2, 3, and 7). For purposes 4, 5, and 6, the production rates are used in estimating attractions. These rates should not be changed.

The &options record has four keywords which are:

1. Detail: This keyword, if set to true (detail = t), will produce detailed reports of the data.
2. Pspec: This keyword specifies which purpose will have special trip end treatment. The specification is 0 for no special treatment and 1 for special treatment. The 0/1 codes should be in order by purpose. In the standard procedure only purpose 7 (port based trips) has a special treatment.
3. Recto: This keyword specifies for each of the seven purposes which trip end (production or attraction) will control the total trip ends. If recto is a 0, then no normalization is done. If recto is a 1, then the attractions will be normalized to match the production regional total. If

recto is a 2, then the productions will be normalized to match the attraction regional total. For the normal procedure, purposes 1, 2, 3 and 7 are set to 1 (i.e. production control).

4. Aeqp: This keyword specifies for each purpose if the attractions are the same as the productions (which are to be estimated) for each zone. If the value is false (f), then the attractions and productions can be different by zone. If the value is true (t), then the attractions and productions will be the same by zone. For the normal procedure, purposes 4,5 and 6 are coded as true.

An example of the trip generation control file (whose name must be TEXXPPXX.CTL) is shown in Table 3.1. Note in this example that the areas which must be changed by the user are coded with three %%% for file extensions and $$$$ for the port trip end values. This should facilitate updating this control file.

Table 3.1
Example of the Trip Generation Control file (TEXXPPXX.CTL)

```
        OMPO Model Development Project
         Trip Generation for Trucks

&files
  fzdata     = '..\zd\zdxxxxxx.%%%'
  ftends     = 'texxppxx.%%%'
  frpt       = 'texxppxx.rpt'
  title      = 'apply truck-trip generation model '
&end

&params
  nzones     = 764
  npurps     =   7
  nzdata     =  33
  zspec      = 234, 330, 331, 332, 347, 350
  zdind      =  2,     12,     13,     14,     15,     16,     17,     18,     19,     20,     21
&end

empl type:  total     mil     gov   hotel     agr    tran     ind    fisc     svc    retl   const
&prods
 prates1 = 0.0000, 0.0460, 0.0460, 0.0460, 0.0460, 0.0460, 0.0110, 0.0460, 0.0105, 0.0140, 0.0460
 prates2 = 0.0037, 0.0014, 0.0037, 0.0037, 0.0037, 0.0037, 0.0037, 0.0037, 0.0000, 0.0001, 0.0000
 prates3 = 0.0000, 0.0084, 0.0084, 0.0084, 0.0084, 0.0084, 0.0044, 0.0084, 0.0027, 0.0000, 0.0084
 prates4 = 0.0324, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
 prates5 = 0.0039, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
 prates6 = 0.0073, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
 prates7 = 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, $$$$.
&end
For the base year the value in const prates 7 was 6310. truck trip ends
&attrs
 arates1 = 0.0234, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
 arates2 = 0.0000, 0.0046, 0.0046, 0.0046, 0.0046, 0.0046, 0.0000, 0.0046, 0.0000, 0.0000, 0.0046
 arates3 = 0.0000, 0.0136, 0.0136, 0.0136, 0.0136, 0.0136, 0.0000, 0.0136, 0.0000, 0.0000, 0.0136
 arates7 = 0.0000, 0.0014, 0.0014, 0.0014, 0.0014, 0.0014, 0.0000, 0.0014, 0.0000, 0.0000, 0.0014
&end

&options
  detail     =   f
  pspec      =   0,0,0,0,0,0,1
  recto      =   1,1,1,0,0,0,1
  aeqp       =   f,f,f,t,t,t,f
&end
```

There are seven trip distribution control files, one for each trip purpose. These control files are named:

1. TPXXG2XX.CTL – For Garaged 2 axle trucks
2. TPXXG3XX.CTL – For Garaged 3 axle trucks
3. TPXXG4XX.CTL – For Garaged 4 axle trucks
4. TPXXN2XX.CTL – For non-garaged 2 axle trucks
5. TPXXN3XX.CTL – For non-garaged 3 axle trucks
6. TPXXN4XX.CTL – For non-garaged 4 axle trucks
7. TPXXPOXX.CTL – For port based trucks

Each of these files have three logical records. These records are &files, &params; &options. The &files logical record have six keywords which are:

1. Ftends: these are the trip ends from the truck trip generation program. Be sure to code the extension as the alternative being used
2. Fimpeds: this is the highway skim tree. Again be sure to code the extension.
3. Fequivs: This is the district to zone equivalency file found in directory generic\zd
4. Ftripo: this is the output trip table – be sure to code the extension
5. Frpt: this is the output report file
6. Title: this is the title of the run.

These keywords will be the same for each of the seven runs, except for the reference to the truck purpose number (i.e. 1 to 7).

The &params record has 14 keywords. These keywords have been described in the Trip Generation program description in Section C.1. The user should not change any of these keyword values.

The &options record has 2 keywords. These keywords have been described in the Trip Distribution program description in Section C.2. The user should not change any of these keyword values.

An example of the trip distribution control file is shown on Table 3.2.

Table 3.2
Example of Truck Trip Distribution Control File

```
OMPO Model Development Project,
Control File for Trip Distribution Application TD.EXE
Truck Trips:  Garage-based, 2-axle

&files
  ftends     = 'texxppxx.%%%'
  fimpeds    = '..\hwy\skpkxxo1.%%%'
  fequivs    = '..\..\generic\zd\764to23.eqv'
  ftripo     = 'tpxxg2xx.%%%'
  frpt       = 'tpxxg2xx.rpt'
  title      = 'TD for trucks: grg-based, 2-axle'
/
&params
  nzones     = 764
  ndists     =  23
  nfends     =  14
  nfProds    =   1
  nfAttrs    =   8
  tabimp     =   1
  nincr      =   1
  p1beg      =  -0.03
  p2beg      =   0.00
  maxiter    =  10
  reltol     =   0.005
  abstol     =  10
  width      =   2
  nintervs   =  50
  scale      = 100.0
  offset     =   0.0
/
&options
  prteqv     = F
  calib      = F
/
```

The control file to build the time of day truck trips is a MINUTP control file with a name of TOTTXXXX.SET. This file adds the seven purposes together and allocates 30 percent to the morning peak period, 30 percent to the evening peak period and 40 percent to the off-peak hours. An example of this file is shown in Table 3.3. For the normal procedures, the analyst need not change anything in this control file.

There are two report control files – TPXXPPXX.CTL and TOTTXXXX.CTL. These are standard report control files. The first control file produces a district to district report of each of the individual truck trip tables will the second one reports the three truck trip tables which will go to the assignment process. The analyst must change the extension on the input files for these reports.

3.3 Input Files

The entire truck trip estimation procedure uses two input data files. There is the zone data file (ZDXXXXXX.zzz) which is the same file used in the trip generation procedures. The other file is the peak period highway travel time file (SKPKXXO1.zzz) that is built in the highway path-building and skimming procedures.

3.4 Output Files

The procedure produces 8 output truck trip tables. These tables are:

1. TPXXG2XX.zzz: Garage-Based Two Axle Truck Trips
2. TPXXG3XX.zzz: Garage-Based Three Axle Truck Trips
3. TPXXG4XX.zzz: Garage-Based Four Axle Truck Trips
4. TPXXN2XX.zzz: Non-Garage-Based Two Axle Truck Trips
5. TPXXN3XX.zzz: Non-Garage-Based Three Axle Truck Trips
6. TPXXN4XX.zzz: Non-Garage-Based Four Axle Truck Trips
7. TPXXPOXX.zzz: Port Based Truck Trips
8. TOTTXXXX.zzz: Truck Trip table for assignment with table 1 being AM peak 4-hour, 2 is off-peak 16-hour, table 3 is PM peak 4-hour, and table 4 is AM peak 2-hour.

3.5 Procedure Controls

The truck procedure is implemented using the batch file TRKALL.BAT. Once the control files have been modified for the alternative and the programs can be run by typing at the DOS prompt trkall zzz (where zzz is the alternative extension). A copy of the batch file is shown on Table 3.4. In addition, to the main batch file there is a trip generation batch file (tgt.bat) and a trip distribution batch file (td.bat). These batch files simply call the trip generation program and the trip distribution program.

Table 3.3
Example of the Truck Time of Day Control file
(File TOTTXXXX.SET)

```
$ Honolulu models
$ Time of Day & Directional Distribution Model Application
$ Trucks
$ produce vt o/d for all purps combined
*pgm matrix
*unit 11=tpxxg2xx.%alt%                    garage-based 2-axle
*unit 12=tpxxg3xx.%alt%                    garage-based 3-axle
*unit 13=tpxxg4xx.%alt%                    garage-based 4+axle
*unit 14=tpxxn2xx.%alt%                    non-garage-b 2-axle
*unit 15=tpxxn3xx.%alt%                    non-garage-b 3-axle
*unit 16=tpxxn4xx.%alt%                    non-garage-b 4+axle
*unit 17=tpxxpoxx.%alt%                    port-based   3-axle
*unit 19=tpxxppxx.%alt%                    vt o/d all purps
$ sum mats and write to one file
get 1,101
get 2,201
get 3,301
get 4,401
get 5,501
get 6,601
get 7,701
comp 8=1+2+3+4+5+6+7
out 1,901-908
$
*pgm matrix
*unit 11=tpxxppxx.%alt%                    vt o/d all purps
*unit 19=tottxxxx.%alt%                    vt o/d all purps
$ balance to o>d
trnp 1,108
get 2=108
comp 3=1+2
fac 3,0.5,b
$ fac by tod
comp 4=3
comp 5=3
fac 4,0.30,b
fac 5,0.40,b
out 4,901-902
out 4,903
*
```

Table 3.4
Example of the Truck Procedure Batch File
(File TRKALL.BAT)

```
@echo off
@echo TG & TD for trucks
rem set alt designator
set alt=%1
rem run app TGT
call tgt texxppxx.ctl
rem
rem run app TD and report
call td tpxxg2xx.ctl
call td tpxxg3xx.ctl
call td tpxxg4xx.ctl
call td tpxxn2xx.ctl
call td tpxxn3xx.ctl
call td tpxxn4xx.ctl
call td tpxxpoxx.ctl
call report tpxxppxx.ctl
rem
rem TOD factoring and report
call do tottxxxx
call report tottxxxx.ctl
rem
@echo.
```

3.6 Reports

Each of the programs produces a short report and the two report program runs produce a set of district to district summaries of the truck trip tables.

E. Network Assignment and Reporting

1. Highway Assignment and Reporting

1.1 Purpose

There are four MINUTP program runs, which form the standard highway assignment procedures. Three assignment program runs perform equilibrium capacity constraint assignments for the morning peak period (from 5 to 9 AM), the evening peak period (from 2 to 6 PM), and the off-peak period. The fourth run is a NETMRG program run, which adds the volumes for the three time periods and outputs a daily volume network.

1.2 Control File

Each of the three assignment program runs consists of two MINUTP programs. The first program is a NETMRG program which simply reads the base highway network, moves the period number of lanes (such as lanea) to the standard lane file, and write a network to be used in the assignment procedure.

The second program is the assignment program (ASSIGN) and this program has several parameters and options in the control file. Five basic parameters are:

1. Par Pctadt=30 – This parameter sets the percent of trips the program will be using to estimate the v/c ratio. In this example, the percent is 30.

2. Par Slnk=2 – This parameter tells the program to assign all the trips

3. Par Speed=0 – This parameter tells the program to use the SPED tables values for the link SPDC class

4. Equ tol = 0.0001 – This parameter sets the tolerance for the equilibrium closure to 0.0001

5. Thet 30*0 – This parameter tells the program to run a maximum of 30 iterations, stopping sooner if it reaches closure

The assignment procedure contains some trips that can or cannot use specified links. The links are specified using the limit(x) field in the network. The specification of which links can or cannot be used are made using the flagfac record.

The format of the flagfac record is as follows:

Field	Meaning (1)	Values (1)
1	Prohibits for table specified in mati	1 to 9
2	Prohibits for table 1 (P for prohibit)	0 or P
3	Prohibits for table 2 (P for prohibit)	0 or P
4	Prohibits for table 3 (P for prohibit)	0 or P
5	Prohibits for table 4 (P for prohibit)	0 or P
6	Prohibits for table 5 (P for prohibit)	0 or P
7	Prohibits for table 6 (P for prohibit)	0 or P
8	Prohibits for table 7 (P for prohibit)	0 or P
9	Prohibits for table 8 (P for prohibit)	0 or P
10	Prohibits for table 9 (P for prohibit)	0 or P

(1) Meaning and values for these procedures – see MINUTP manual for full description

The parameter record "mati" specifies the table used by the program. For example a mati record of:

mati 101,102,201,202,301,401,501,601,602

says that the first table is the first table from unit 11, the second table is the second table from unit 11, the third table is the first table from unit 12, etc. Using the mati record and the flagfac records, the control cards instruct the program to constrain the trip tables to the specified links.

In this procedure, these instructions are as follows:

1. Table 101: This is the one/car vehicle trips for the morning peak period. These trips can use links with a limit code of 1 (all vehicles permitted) or 6 (trucks prohibited).

2. Table 102: This is the one/car vehicle trips for the morning shoulder period. These trips can use links with a limit code of 1 (all vehicles permitted) or 6 (trucks prohibited).

3. Table 201: This is the two/car vehicle trips for the morning peak period. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted) , or 6 (trucks prohibited).

4. Table 202: This is the two/car vehicle trips for the morning should period. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted), or 6 (trucks prohibited).

5. Table 301: This is the air access vehicle trips for the morning peak period and shoulder period. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted), or 6 (trucks prohibited).

6. Table 401: This is the truck trips for the morning peak period and shoulder period. These trips can only use links with a limit code of 1 (all vehicles permitted).

7. Table 501: This is the vehicle trips for visitors (including taxi trips) for the morning peak and shoulder periods. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted), or 6 (trucks prohibited).

8. Table 601: This is the three plus persons per car vehicle trips for the morning peak period. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted), 3 (only HOV 3+ permitted), or 6 (trucks prohibited).

9. Table 602: This is the three plus persons per car vehicle trips for the morning shoulder period. These trips can use links with a limit code of 1 (all vehicles permitted), 2 (only HOV 2+ permitted), 3 (only HOV 3+ permitted), or 6 (trucks prohibited).

In addition to these parameters and options, the control file also specifies reading three other files. These files are the turn penalty file, the volume delay function file, and the speed and capacity table file. The turn penalty file is a standard MINUTP turn penalty file and should always be in the directory HWY and the file name should always be TpxxXXau.zzz – with the initial xx is am, pm or md (depending on the time period) and the zzz is the alternative.

The speed and capacity files should always be in the Generic/Hwy directory and should have the name of luxxxxau.def:

```
$ Default SPED & CAPA lookup values
sped 01,,,,,,,,,,
sped 11,,,,,,,,,,
sped 21,,,,,,,,,,
sped 31,,,,,,,,,,
sped 41,,,,,,,,,,
sped 51,,,,,,,,,,
sped 61,630,650,680
capa 01,,,,,,,,,,
capa 11,,,,,,,,,,
capa 21,,,,,,,,,,
capa 31,,,,,,,,,,
capa 41,,,,,,,,,,
capa 51,,,,,,,,,,
capa 61,,,
```

In essence these SPED and CAPA records tell the program to use the speed and capacity codes directly coded on the link records as the speed or capacity value (actually the capacity codes are multiplied by 50 to obtain the vehicles per lane per hour), with three exceptions. These exceptions are:

1. For a sped code of 61, use 63 MPH,

2. For a sped code of 62 use 65 MPH and;

3. For a sped code of 63 use 68 MPH.

The volume delay functions are equations that adjust the speed on the links given a volume to capacity ratio and the previous speed. A new class of functions named *conical volume-delay functions* due to it's geometrical interpretation as hyperbolic conical sections was developed by Heinz Spiess. There are five formulations, for various facility types, plus a general formulation

and a "do nothing" formulation for centroids. The volume delay functions should always be in the Generic/Hwy directory and should have the name of vdxxxxau.def:

```
par adjivar=factype
comp tc()=$t0*(2.+(10^2*(1-$vc)^2+((2*10-1)/(2*10-2))^2)^0.5-
  10.*(1-$vc)-(2*10-1)/(2*10-2))
comp tc(1)=$t0*(2.+(10^2*(1-$vc)^2+((2*10-1)/(2*10-2))^2)^0.5-
  10.*(1-$vc)-(2*10-1)/(2*10-2))
comp tc(2)=$t0*(2.+(6.5^2*(1-$vc)^2+((2*6.5-1)/(2*6.5-2))^2)^0.5-6.5*
  (1-$vc)-(2*6.5-1)/(2*6.5-2))
comp tc(3,4)=$t0*(2.+(5.2^2*(1-$vc)^2+((2*5.2-1)/(2*5.2-2))^2)^0.5-5.2*
  (1-$vc)-(2*5.2-1)/(2*5.2-2))
comp tc(5)=$t0*(2.+(4^2*(1-$vc)^2+((2*4-1)/(2*4-2))^2)^0.5-
  4.*(1-$vc)-(2*4-1)/(2*4-2))
comp tc(6)=$t0*(2.+(2^2*(1-$vc)^2+((2*2-1)/(2*2-2))^2)^0.5-
  2.*(1-$vc)-(2*2-1)/(2*2-2))
comp tc(8)=$t0*(2.+(5.3^2*(1-$vc)^2+((2*5.3-1)/(2*5.3-2))^2)^0.5-
  5.3*(1-$vc)-(2*5.3-1)/(2*5.3-2))
comp tc(9)=$t0
```

An example of the highway assignment program, for the morning peak, is presented on Table 1.1

Table 1.1
Example Morning Peak Period Assignment Set-Up (ASAMXXAU.SET)

```
$ Honolulu models
$ AM PEAK-Period (4 hr) Capacity Restrained ASSIGNMENT
$
*pgm netmrg hnamxxfs.%alt%,hnttxxxx.%alt%
comp lane=lanea
$
*pgm assign hnamxxfs.%alt%,,1,1000
*unit 11=..\tod\vottxxo1.%alt%   vt by tod for occ1
*unit 12=..\tod\vottxxo2.%alt%   vt by tod for occ2
*unit 13=..\air\vottaaxx.%alt%   vt by tod for air acc
*unit 14=..\trk\tottxxxx.%alt%   vt by tod by trucks
*unit 15=..\vis\vottvsxx.%alt%   vt by tod by visitors
*unit 16=..\tod\vottxxo3.%alt%   vt by tod for occ3+
*unit 21=hlamxxxx.%alt%                loaded network
*id AM Peak Per Asnmt (4 hr)
$
$ Parameters
par pctadt=30                pct of trips that occur in capacity pd.
par slnk=2                   assign all trips
par speed=0                  use SPED values according to SPDC
equi tol=0.0001              equilibrium assignment w/ tolerance factor
thet 30*0                    number of iterations
$
$ Trip tables and restrictions for assignment
mati 101,102,201,202,301,401,501,601,602
par flagvar=limita           specifies multi-user asnmt variable
flagfac 1,0,P,P,P,P,0,P,P,P  no limit  2345 789 for o1
flagfac 2,0,P,P,P,P,0,P,P,P  no limit  2345 789 for o1
flagfac 3,0,0,P,P,P,0,P,P,P  no limit   345 789 for o2
flagfac 4,0,0,P,P,P,0,P,P,P  no limit   345 789 for o2
flagfac 5,0,0,P,P,P,0,P,P,P  no limit   345 789 for air
```

```
flagfac 6,0,P,P,P,P,P,P,P,P  no limit  23456789 for trk
flagfac 7,0,0,P,P,P,0,P,P,P  no limit   345 789 for vis
flagfac 8,0,0,0,P,P,0,P,P,P  no limit    45 789 for o3
flagfac 9,0,0,0,P,P,0,P,P,P  no limit    45 789 for o3
$
$ Turn penalties
penf data\tpamxxau.%alt%,form=f
$
$ SPED & CAPA definitions
*read ..\..\generic\hwy\luxxxxau.def
$
$ VDF definitions
*read ..\..\generic\hwy\vdxxxxau.def
$
$ Output controls
repo 1,2,4,14,20
$repo 8                 for detailed link calculations
*
```

An example of the highway assignment program, for the morning peak, for a toll model run is presented on Table 1.2

Table 1.2
Example Morning Peak Period Assignment Set-Up (ASAMNTAU.SET)

```
$ Honolulu models
$ AM PEAK-Period (4 hr) Capacity Restrained ASSIGNMENT
$ USING TOLL TRIP TABLES
$
*pgm netmrg hnamxxfs.%alt%,hnttxxxx.%alt%
comp lane=lanea
$  combine am peak and am shoulders trip tables
$
$  output table format:
$  1  am-peak occ1 nontoll
$  2  am-peak occ2 nontoll
$  3  am-peak occ3+ nontoll
$  4  am-peak occ1 toll
$  5  am-peak occ2 toll
$  6  am-peak occ3+ toll
$
*pgm matrix
*unit 11=..\tod\vottxxo1.%alt%   vt by tod for occ1, nontoll
*unit 12=..\tod\vottxxo2.%alt%   vt by tod for occ2, nontoll
*unit 13=..\tod\vottxxo3.%alt%   vt by tod for occ3+, nontoll
*unit 14=..\tod\vtttxxo1.%alt%   vt by tod for occ1, toll
*unit 15=..\tod\vtttxxo2.%alt%   vt by tod for occ2, toll
*unit 16=..\tod\vtttxxo3.%alt%   vt by tod for occ3+, toll
*unit 19=..\tod\vottamxx.%alt%   vt by occ/toll class for 4-hour am pk
$
comp 1=101+102
comp 2=201+202
comp 3=301+302
comp 4=401+402
comp 5=501+502
comp 6=601+602
$  save
out 1,901-906
$
*pgm assign hnamxxfs.%alt%,,1,1000
```

```
*unit 11=..\tod\vottamxx.%alt%   vt by occ/toll class for 4-hr am pk
*unit 12=..\air\vottaaxx.%alt%   vt by tod for air acc
*unit 13=..\trk\tottxxxx.%alt%   vt by tod by trucks
*unit 14=..\vis\vottvsxx.%alt%   vt by tod by visitors
*unit 21=hlamxxxx.%alt%                loaded network
*id AM Peak Per Asnmt (4 hr)
$
$ Parameters
par pctadt=30                pct of trips that occur in capacity pd.
par slnk=2                   assign all trips
par speed=0                  use SPED values according to SPDC
equi tol=0.0001              equilibrium assignment w/ tolerance factor
thet 30*0                    number of iterations
$
$ Trip tables and restrictions for assignment
mati 101,102,201,301,401,103,104,105,106     trip tables to assign
par flagvar=limita           specifies multi-user asnmt variable
flagfac 1,0,P,P,P,P,0,P,P,P,P,P,P  no limit  2345 789101112 for o1 op, nontoll
flagfac 2,0,0,P,P,P,0,P,P,P,P,0,P  no limit   345 78910  12 for o2 op, nontoll
flagfac 3,0,0,P,P,P,0,P,P,P,P,0,P  no limit   345 78910  12 for air
flagfac 4,0,P,P,P,P,P,P,P,P,P,P,P  no limit  23456789101112 for trk
flagfac 5,0,0,P,P,P,0,P,P,P,P,0,P  no limit   345 78910  12 for vis
flagfac 6,0,0,0,P,P,0,P,P,P,P,0,0  no limit    45 78910     for o3 op, nontoll
flagfac 7,0,P,P,P,P,0,P,P,P,0,0,0  no limit  2345 789       for o1 op, toll
flagfac 8,0,0,P,P,P,0,P,P,P,0,0,0  no limit  2345 789       for o2 op, toll
flagfac 9,0,0,0,P,P,0,P,P,P,0,0,0  no limit  2345 789       for o3+ op, toll
$
$ Turn penalties
penf data\tpamxxau.%alt%,form=f
$
$ SPED & CAPA definitions
*read ..\..\generic\hwy\luxxxxau.def
$
$ VDF definitions
*read ..\..\generic\hwy\vdxxxxau.con
$
$ Output controls
repo 1,2,4,6,14,20
$repo 8                 for detailed link calculations
*
```

Once the three assignments are run, the fourth program run (NETMRG) reads the three loaded highway networks, from each period, and produces a highway network with: (1) the volumes totaled; (2) the volumes, v/c ratios, and congested speeds for each of the three networks. This final network also contains the data common to each of the networks, such as the distance. A copy of this program's control file is as follows (ASTTXXAU.SET):

```
*pgm netmrg hlttxxxx.%alt%,hlamxxxx.%alt%,hlopxxxx.%alt%,hlpmxxxx.%alt%
$
comp totvam=totv(1)
comp totvop=totv(2)
comp totvpm=totv(3)
comp totv=totv(1)+totv(2)+totv(3)
$
comp volam=vol(1)
comp volop=vol(2)
comp volpm=vol(3)
comp vol=vol(1)+vol(2)+vol(3)
$
comp vcam=vc(1)
```

```
comp vcop=vc(2)
comp vcpm=vc(3)
comp vc=0.
$
comp cspdam=cspd(1)
comp cspdop=cspd(2)
comp cspdpm=cspd(3)
comp cspd=0.
*
```

1.3 Input Files

The "non-toll" assignment programs require a highway network and the vehicle trip tables from the time of day procedures[1]. The highway network file should always be the basic network generated in either the Highway Network Building procedure (see Section B.1) or developed exogenously. The file name for the highway network should always be HNTTXXX.zzz.

There will be nine trip tables input to each assignment program. These trip tables will be:

1. Vehicle trips for the one/car mode for period one (e.g. the morning peak period).
2. Vehicle trips for the one/car mode for period two (such as the shoulder period).
3. Vehicle trips for the two/car mode for period one.
4. Vehicle trips for the two/car mode for period two.
5. Vehicle trips from the air access model for the assignment period
6. Truck trips for the assignment period
7. Vehicle trips from the visitor model for the assignment period.
8. Vehicle trips for the three plus/car mode for period one
9. Vehicle trips for the three plus/car mode for period two.

Tables 1 and 2 will be in the TOD directory and will be on file VOTTXXO1.zzz. Table 3 and 4 will also be on the TOD directory on file VOTTXXO2.zzz. Table 5 will in the AIR directory on file VOTTAAXX.zzz. Table 6 will be in the TRK directory on file TOTTXXXX.zzz. Table 7 will be in the VIS directory on file VOTTVSXX.zzz. Tables 8 and 9 will be in the TOD directory and will be on file VOTTXXO3.zzz.

The "toll" assignment program has the 9 trip tables slightly reordered. They are:

1. Non-toll vehicle trips for the one/car mode for particular time period.
2. Non-toll vehicle trips for the two/car mode for particular time period.

[1] Some of the time of day procedures are embedded in the modeling procedure, such as the truck and visitor procedures, while the "standard" vehicle trip tables are produced by the Time of Day Procedures previously described.

3. Vehicle trips from the air access model for the assignment period (from AIR directory VOTTAAXX.zzz)

4. Truck trips for the assignment period (from TRK directory TOTTXXXX.zzz)

5. Vehicle trips from the visitor model for the assignment period (from VIS directory VOTTVSXX.zzz)

6. Non-toll vehicle trips for the three plus/car mode for particular time period.

7. Toll vehicle trips for the one/car mode for particular time period.

8. Toll vehicle trips for the two/car mode for particular time period.

9. Toll vehicle trips for the three plus/car mode for particular time period.

A matrix calculation is done prior to the highway assignment to combine the non-toll and toll vehicle trips into one file for each time period. The excerpt shown below shows the matrix calculation for the AM 4 hour time period. Tables 1, 2, 6, 7, 8, 9 are the six tables (in that order) combined in the file VOTTAMXX.zzz

```
*pgm matrix
*unit 11=..\tod\vottxxo1.%alt%   vt by tod for occ1, nontoll
*unit 12=..\tod\vottxxo2.%alt%   vt by tod for occ2, nontoll
*unit 13=..\tod\vottxxo3.%alt%   vt by tod for occ3+, nontoll
*unit 14=..\tod\vtttxxo1.%alt%   vt by tod for occ1, toll
*unit 15=..\tod\vtttxxo2.%alt%   vt by tod for occ2, toll
*unit 16=..\tod\vtttxxo3.%alt%   vt by tod for occ3+, toll
*unit 19=..\tod\vottamxx.%alt%   vt by occ/toll class for 4-hour am pk
$
comp 1=101+102
comp 2=201+202
comp 3=301+302
comp 4=401+402
comp 5=501+502
comp 6=601+602
$  save
out 1,901-906
```

1.4 Output Files

There are two output files from each assignment program run. The first file is produced by program NETMRG and is the highway network for the period with no volumes (for example, HNAMXXFS.zzz, for the am peak period). The second file is produced by program ASSIGN and is the highway network for the period with the volumes (for example, HLAMXXXX.zzz, for the am peak period). The fourth program run (a NETMRG) produces the highway network with the combined volumes and volumes for each time period (HLTTXXXX.zzz).

1.5 Procedure Controls

The setup batch files contains all the necessary controls. The user can invoke the procedure use the DOS batch file HWY\ASALL.BAT. This is a single command line argument with the

batch file name and the file extension denoting the alternative. For example: >asall zzz. The following is a copy of the batch file for doing a non-toll assignment.

```
@echo off
@echo Highway assignment
set alt=%1
call do asamxxau
call do aspmxxau
call do asopxxau
call do asttxxau
@echo.
```

The next box shows a copy of the batch file for doing a toll assignment.

```
@echo off
@echo Highway assignment
set alt=%1
rem
call do asamntau
call do aspmntau
call do asopntau
call do asttxxau
@echo.
```

1.6 Reports

The assign program produces the standard MINUTP reports. In the standard control file, the reports include: a listing of the SPED table; a listing of the CAPA table; Volume/Capacity report for each iteration; and link volumes for the last iteration.

2. Transit Assignment and Reporting

In the resident travel models, transit networks serve two functions: to provide service information to the mode choice model (program MC), and to provide a basis for assigning trips. This chapter describes the latter function, while Chapter B.3 describes the former.

2.1 Purpose

The Time-of-Day and Directional Factoring procedure generates person-trips on transit by time-of-day and detailed mode/path, ready to assign to transit networks. This requires a simple step of assigning trips to the paths built in the skimming step and saved on the network for this use.

The mode-choice model separately examines five transit paths, defined by combinations of access and line-haul modes. For walk access, three sets of best paths are considered: using only local bus, using some premium bus, and using some guideway service. For drive access, separate paths are built for parked vehicles and drop-offs, but are not differentiated by line-haul mode. These five path types are named and abbreviated: walk-to-local-bus (WL), walk-to-express-bus (WX), walk-to-guideway (WG), kiss-n-ride (KR), and park-n-ride (PR). Note that WG, and in general the guideway line-haul mode, is not available in the base year setting.

Separate MINUTP TRNPTH setups assign trips to each path-type. Two MINUTP NETMRG steps combine results from the "loaded" transit networks into one file for each time-period. Program BOARDS then reports peak and off-peak volumes on each bus line, both by line and by stop.

2.2 Control File

Batch file TRN\ASALL.BAT controls transit assignment and reporting for all five transit paths and two time-periods. It takes a single command-line argument, the file-extension denoting the year and scenario. For the base-year application, this extension is .C9X, so the transit skim-building process is invoked by navigating to the TRN directory and invoking "ASALL C9X" at the command prompt.

The main setup file TRN\ASTTXXTR.SET performs ten separate assignments of transit trips to their corresponding paths.

The following box shows this file in its entirety. The first call to MINUTP MATRIX simply adds the visitor trips on transit to the resident trips on transit as required for assignment.

```
$ Honolulu models
$ Transit assignment
$ cvf991019 five paths, two periods, no guideway
$
$ walk-local
*pgm matrix
*unit 11=..\tod\ppttxxwl.%alt%
*unit 12=..\vis\ppttvstr.c91
*unit 19=ppttxxwl.%alt%
comp 1=101+201+203
comp 2=102+202
```

```
out 1,901-902
$
*pgm trnpth ntamxxwl.%alt%
*par msglev=5
*unit 11=ppttxxwl.%alt%
apath=w
load 101
neto p=plpkxxwl.%alt%
$
*pgm trnpth ntmdxxwl.%alt%
*par msglev=5
*unit 11=ppttxxwl.%alt%
apath=w
load 102
neto p=plopxxwl.%alt%
$
$
$ walk-premium
*pgm matrix
*unit 11=..\tod\ppttxxwp.%alt%
*unit 12=..\vis\ppttvstr.%alt%
*unit 19=ppttxvwp.%alt%
comp 1=101+204+206
comp 2=102+205
out 1,901-902
$
*pgm trnpth ntamxxwp.%alt%
*par msglev=5
*unit 11=ppttxxwp.%alt%
apath=w
load 101
neto p=plpkxxwp.%alt%
$
*pgm trnpth ntmdxxwp.%alt%
*par msglev=5
*unit 11=ppttxxwp.%alt%
apath=w
load 102
neto p=plopxxwp.%alt%
$
$
$ park-n-ride
*pgm trnpth ntamxxpr.%alt%
*par msglev=5
*unit 11=..\tod\ppttxxpr.%alt%
apath=d
load ,101
neto p=plpkxxpr.%alt%
$
*pgm trnpth ntmdxxpr.%alt%
*par msglev=5
*unit 11=..\tod\ppttxxpr.%alt%
apath=d
load ,102
neto p=plopxxpr.%alt%
$
$
```

```
$ kiss-n-ride
*pgm trnpth ntamxxwp.%alt%
*par msglev=5
*unit 11=..\tod\ppttxxkr.%alt%
apath=w
load 101
neto p=plpkxxkr.%alt%
$
*pgm trnpth ntmdxxwp.%alt%
*par msglev=5
*unit 11=..\tod\ppttxxkr.%alt%
apath=w
load 102
neto p=plopxxkr.%alt%
$
$ export transit nets to ASCII
*pgm netmrg ,plpkxxwl.%alt%
*id pk loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plpkxxwl.asc
$ export transit nets to ASCII
*pgm netmrg ,plpkxxwp.%alt%
*id pk loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plpkxxwp.asc
$
$ export transit nets to ASCII
*pgm netmrg ,plpkxxpr.%alt%
*id pk loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
```

```
lsto 2,plpkxxpr.asc
$ export transit nets to ASCII
*pgm netmrg ,plpkxxkr.%alt%
*id pk loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plpkxxkr.asc
$
$ export transit nets to ASCII
*pgm netmrg ,plopxxwl.%alt%
*id op loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plopxxwl.asc
$ export transit nets to ASCII
*pgm netmrg ,plopxxwp.%alt%
*id op loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plopxxwp.asc
$
$ export transit nets to ASCII
*pgm netmrg ,plopxxpr.%alt%
*id op loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
```

```
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plopxxpr.asc
$
$ export transit nets to ASCII
*pgm netmrg ,plopxxkr.%alt%
*id op loaded nets
merge
key mode,line
comp volab=(vol(1))
comp volba=(volt(1))-volab
comp tbrda=(brda(1))
comp tbrdb=(brdb(1))
comp txita=(xita(1))
comp txitb=(xitb(1))
list mode=2-3,$line=5-10,a=11-16,b=17-21,dist=22-25,volab=26-31
list volba=32-37,tbrda=38-42,tbrdb=43-47,txita=48-52,txitb=53-57
lsto 2,plopxxkr.asc
```

The following command should be typed at the DOS prompt to combine the ASCII networks together, one each for peak and off peak. *Note that when doing a future year scenario, fixed guideway would be added to the following command.*

```
type plpkxxwl.asc plpkxxwp.asc plpkxxpr.asc plpkxxkr.asc > plpkxxtr.asc
type plopxxwl.asc plopxxwp.asc plopxxpr.asc plopxxkr.asc > plopxxtr.asc
```

Preparation for BOARDS reporting includes a run of NODES and two applications of BIGSORT. The NODES run should have already been accomplished in the transit skim-building procedures, and thus is not repeated. Program BIGSORT reorders the output from MINUTP NETMRG by transit line, as required by BOARDS. Two applications of BIGSORT accomplish this for peak and off-peak assignments. The Fortran control file for sorting peak records is shown (TSPKXXTR.CTL). The off-peak control file (TSOPXXTR.CTL) differs only in the input and output file names.

```
Honolulu models
cvf991019 sort trn net records

&files
  finame='plpkxxtr.asc'                In: NETMRG output link records
  foname='tspkxxtr.asc'                Out: sorted link records
  fpname='tspkxxtr.rpt'                Out: report
/
&params
  pbegcol= 5                    Primary   sort key - beginning column
  pnumcol= 6                    Primary   sort key - length
  sbegcol= 0                    Secondary sort key - beginning column
  snumcol= 0                    Secondary sort key - length
/
&options
  typsrt= 'L'                   Perform line (L) sort
/
```

Program BOARDS then reports boardings by line and stop for peak and off-peak. Both short- and long-format BOARDS reports are produced. The following box shows the control file for BOARDS (TBTTXXTR.CTL).

```
Honolulu models
cvf991019 transit BOARDS reports

&files
  fnodes= 'acc\tnttxxtr.c9x'          In: NODES output line file
  fnetpk= 'tspkxxtr.asc'         In: BIGSORT output    peak link file
  fnetop= 'tsopxxtr.asc'         In: BIGSORT output offpeak link file
  fnames= 'acc\nodename.c9x'          In: ACCLINK output intersection
names
  frpts = 'tbttxxtr.rps'         Out: short BOARDS report
  frptl = 'tbttxxtr.rpl'         Out: long BOARDS report
/
&options
  rptmode= 4, 5                       Produce long reports for these
modes
  scale  = 1.0                   Scale trips in report
/
```

2.3 Input Files

Transit assignment requires two main types of input files: trip-tables containing person trips on transit for each path-type, and "built" networks containing descriptions of the best transit paths of each type. Assignment uses person trip tables produced by the Time-of-Day and Directional Factoring procedures, with standard names ppttxxwl.zzz, ppttxxwp.zzz, ppttxxwg.zzz, ppttxxpr.zzz, and ppttxxkr.zzz for the five path-types, where "zzz" is the alternative name. The required transit networks are produced by the Transit Path- and Skim-Building Procedures. They have standard names ntamxxwl.zzz, ntamxxwp.zzz, ntamxxwg.zzz, and ntamxxpr.zzz (replace am with md for midday paths). Note that no set of kiss-n-ride paths exist, as the kiss-n-ride trips are assigned to the best walk-express or walk-guideway paths.

The NETMRG setup in TRN\ASTTXXTR.SET requires only the loaded transit networks output from each transit assignment step as input. Each application of BIGSORT requires as input only the output from NETMRG. Finally, BOARDS reads the NODES and BIGSORT outputs. BOARDS also reads a file of intersection names produced during an ACCLINK application in the skim-building step. The format of both the NODES output file and ACCLINK intersection file are described in the earlier chapter on skim-building.

2.4 Output Files

Each transit assignment setup produces a loaded transit networks, in MINUTP binary format, which is then output to ASCII-format. The TYPE command at the DOS prompt combines these to produce one per time period, and writes link records out to ASCII-format files with standard names plpkxxtr.asc and plopxxtr.asc. An excerpt from file plpkxxtr.asc, shown below, contains one record per loaded link with the following information: mode number (columns 2–3), line name (5–10), a-node (11–16), b-node (17–21),
distance (22–25), a>b volume (26–31), b>a volume (32–37), boards at a (38–42),
boards at b (43–47), exits at a (48–52), and exits at b (53–57).

```
11              1 1763  21      8     27     0     0     0     0
15              1 1763  21      0      0     0     0     0     0
11              1 1764  41      0      0     0     0     0     0
15              1 1764  41      0      1     0     0     0     0
15              2 1764  55      0      0     0     0     0     0
15              2 2466 110      0      4     0     0     0     0
 4 22AW      1001 1203  39     22      0     0     0     0     4
 4 22AE      1001 2893  35     26      0     0     0     0     0
 4 1DE       1002 2643  30     15      0     0     0     0     8
 4 22AE      1002 2643  30     42      0     0     0     0    15
 4 58AE      1002 2643  30     33      0     0     0     0    17
 5 82AE      1002 2643  30    269      0     0     0     0   140
 4 1DW       1002 2885   9     64      0     0     0     0    51
```

Program BIGSORT creates files formatted just as the inputs, but sorted by line name.

Program BOARDS produces only reports, detailed in section 2.6 and attachments.

2.5 Controls

The setup and control files have all necessary parameters specified, although the user can refer to section 2.2 above for documentation of each setting. Batch file TRN\ASALL.BAT controls assignment and reporting for all available transit paths and both time periods.

2.6 Reports

At the completion of each assignment run, the standard MINUTP report file is copied to the same name as the setup which created it, maintaining the default extension .prn. This file echoes all commands and reports any problems.

Programs BIGSORT and BOARDS each produce report files, named as specified in the corresponding control file. The report files from BIGSORT echo the input parameters and provide informational and summary messages. Program BOARDS provides both long and short BOARDS reports. These wide ASCII-format files must be printed in landscape mode. Excerpts from the short and long BOARDS reports are shown below.

2.7 Error Messages

Since transit assignment calls MINUTP modules, standard MINUTP error messages are produced. The end of each report file summarizes the maximum severity of all problems encountered, with severity 0 indicating no warnings, 4 warnings but no fatals, and 8 fatals. The user should investigate all messages and consult MINUTP documentation for details.

Applications BIGSORT and BOARDS produce error messages which detail any problems they encounter. The most typical BOARDS error message the user might encounter is described below. It indicates a mismatch between the transit network used for assignment and that shown in the NODES file. The usual solution is to produce a NODES output file using the updated transit network information (see User's Guide to Model Application, Section B.3).

```
boards 9006 (e)    peak link not found (name,anode,bnode): linename, anode, bnode
boards 9014 (e) offpeak link not found (name,anode,bnode): linename, anode, bnode
```

BOARDS short-report *boards\tbttxxtr.rps* (excerpt)

```
 program boards (version 3.2; July 9, 1996)
   date: 10/19/97
   time: 18: 9:13
```

							boardings							max load point vol				pass-miles			avg trip dist		
							a-b			b-a			total					both directions			both directions		
line	mo	h1	h2	h3	way	stops	dist	peak	offp	24hr	peak	offp	24hr	peak	offp	peak	offp	peak	offp	24hr	peak	offp	24hr
1AE	4	30.0	.0	37.5	1	131	20.0	5148	0	5148	0	0	0	5148	0	5148	2831	0	0	0	18865	0	18865	3.7	.0	3.7
1AW	4	30.0	.0	50.0	1	123	21.0	5090	0	5090	0	0	0	5090	0	5090	2717	0	0	0	15363	0	15363	3.0	.0	3.0
1BE	4	30.0	99.9	30.0	1	138	21.2	5343	1474	6817	0	0	0	5343	1474	6817	3030	735	0	0	19880	3014	22894	3.7	2.0	3.4
1FE	4	16.7	8.9	13.6	1	97	11.8	4499	6672	11171	0	0	0	4499	6672	11171	4528	4710	0	0	8656	17705	26361	1.9	2.7	2.4
76AW	4	75.0	40.0	37.5	1	13	8.4	473	304	777	0	0	0	473	304	777	312	225	0	0	825	423	1248	1.7	1.4	1.6
77AE	4	.0	60.0	75.0	1	40	12.7	510	510	1020	0	0	0	510	510	1020	240	379	0	0	1376	2038	3414	2.7	4.0	3.3
77AW	4	.0	60.0	99.9	1	30	10.7	175	84	259	0	0	0	175	84	259	150	50	0	0	922	313	1235	5.3	3.7	4.8
totals	4					12622	3332.1	314471147077461548	0	0	0	314471147077461548									1225018	4141741639192		3.9	2.8	3.6

							boardings							max load point vol				pass-miles			avg trip dist		
							a-b			b-a			total					both directions			both directions		
line	mo	h1	h2	h3	way	stops	dist	peak	offp	24hr	peak	offp	24hr	peak	offp	24hr	peak	offp	peak	offp	peak	offp	24hr	peak	offp	24hr
80AE	5	.0	10.0	.0	1	91	17.8	0	1109	1109	0	0	0	0	1109	1109	0	622	0	0	0	4774	4774	.0	4.3	4.3
80AW	5	21.4	.0	.0	1	98	17.7	359	0	359	0	0	0	359	0	359	298	0	0	0	3755	0	3755	10.5	.0	10.5
202BW	5	.0	10.0	.0	1	99	23.9	0	1979	1979	0	0	0	0	1979	1979	0	1347	0	0	0	4037	4037	.0	2.0	2.0
203AE	5	75.0	.0	.0	1	63	8.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0	.0	.0
203AW	5	.0	10.0	.0	1	71	9.8	0	4306	4306	0	0	0	0	4306	4306	0	2102	0	0	0	12080	12080	.0	2.8	2.8
totals	5					8042	2122.0	26695	52728	79423	0	0	0	26695	52728	79423					315209	315590	630799	11.8	6.0	7.9

BOARDS long-report *boards\tbttxxtr.rpl* (excerpt)

```
 program boards (version 3.2; July 9, 1996)
   date: 10/19/97
   time: 18: 9:13
```

line: 1AE mode: 4	headway 1: 30.0 headway 2: .0 headway 3: 37.5 direction: 1	no. of stops : 131 tot dist (mi): 20.0		peak	off-peak	daily
			max load point a-b	2831	0	2831
			max load point b-a	0	0	0
			passenger-miles	18865	0	18865
			avg trip dist (mi)	3.7	.0	3.7

			a-to-b direction						b-to-a direction						total		
			--- peak ---			--- off-peak ---			--- daily ---			--- peak ---			--- off-peak ---			--- daily ---			--- daily ---		
anode	bnode	a-name	on @ anode	vol a-b	off @ bnode	on @ anode	vol a-b	off @ bnode	on @ anode	vol a-b	off @ bnode	on @ bnode	vol b-a	off @ anode	on @ bnode	vol b-a	off @ anode	on @ bnode	vol b-a	off @ anode	on @ anode	vol tot	off @ anode
1664	1665	MIDDLE +	8	8	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	8	8	0
1665	1659	MIDDLE +KING	92	101	2	0	0	0	92	101	2	0	0	0	0	0	0	0	0	0	92	101	0
3030	3019	MANINIHO+LUNALILO	0	215	215	0	0	0	0	215	215	0	0	0	0	0	0	0	0	0	0	215	58
3019		LUNALILO+																			0		215
totals			5148		5148	0		0	5148		5148	0		0	0		0	0		0	5148		5148

F. Utility Programs

1. ZONAL DISTRIBUTION PROGRAM (ZDISTRIB.EXE)

1.1 Purpose

This program is designed to distribute any zonal attribute into separate categories. For example, the program can take a forecast of zonal households and distribute them (based on an input base household distribution) into appropriate household size, worker, and income strata. Similarly, the program could take forecasts of zonal employment (i.e. jobs at the workplace) and distribute them into zonal jobs by type (assuming a base input distribution was provided).

The program was specifically written for distributing zonal households into size, worker, and income strata. For the OMPO travel demand models, this distribution will normally be generated from the Land Use models. However, initially this program was not available for the travel demand modelers. Therefore, the base distribution of households was determined from the expanded Household Interview Survey (HIS) data. The zonal distribution program was then used to distribute the census total households into size, worker, and income strata for each zone.

This document describes the Zonal Distribution Program, including its inputs, outputs, and program execution. All example files are from the OMPO household distribution run, which was used to distribute zonal households into size, worker, and income strata.

1.2 Input Files

The Zonal Distribution Program requires 2 input files: 1) Zone attribute file (e.g. total households by zone), and 2) Base distribution file (e.g. base zonal households by size, workers, and income).

1. Zone attribute file: This file contains the zonal data which is to be distributed into categories by the program. The file format is flexible. The program expects to read 2 integer variables: ZONE_ID and ATTR, the attribute which is to be distributed. The format is specified in the control file, but the program must have the variables in that order (i.e. zone first).

2. Base distribution file: This file contains the base distribution of zonal attributes, which serves as the seed for the distribution of input zonal attributes. For example, the file could contain the input household distribution by household size, household income, and number of workers. Again, the file format is flexible. The program expects to read a ZONE_ID, ATTR_GROUP1, ATTR_GROUP2, ATTR_GROUP3, etc., where ATTR_GROUPx represents the number of zonal attributes in group (or strata) x. The user can specify how many groups are available, and then specify the corresponding format in the control file. The program is expecting all INTEGER values, and the ZONE_ID must be the first variable in the file.

Example Inputs:

1. Zone attribute file = zdxxxxxx.c9x

The file zdxxxxxx.c9x contains data on households and attractors. It contains one row per zone. All fields in this file are 8 columns wide. The key to the zdxxxxxx.c9x file is shown below.

Field	Columns	Field Contents
1	1-8	Zone
2	9-16	Population
3	17-24	total employment (sum of cols 11-20)
4	25-32	housing units
5	33-40	hotel rooms
6	41-48	residential units
7	49-56	group quarters residents
8	57-64	total households (census)
9	65-72	mean persons per household
10	73-80	mean household income ($)
11	81-88	district (1-23)
12	89-96	puma (1-7)
13	97-104	military employment
14	105-112	government employment
15	113-120	hotel employment
16	121-128	agricultural employment
17	129-136	transportation employment
18	137-144	industrial employment
19	145-152	fiscal employment
20	153-160	service employment
21	161-168	retail employment
22	169-176	construction employment
23	177-184	private college students
24	185-192	public college students
25	193-200	private k-12 students
26	201-208	public k-12 students
27	209-216	number of schools
28	217-224	workers residing in group quarters (census)
29	225-232	retail employment: resident-oriented
30	233-240	retail employment: visitor-oriented
31	241-248	total employment by workers residing in households
32	249-256	area type (1-9)
33	257-264	retail employment: resident-oriented
34	265-272	area of zone (in square miles)

2. Base distribution file = zdxxxxh3.c95

The file zdxxxxh3.C95 contains the input household distribution by household size, household income, and number of workers. The household distribution is a three dimensional joint distribution of households. The file is a standard ASCII format file. Each field is 5 columns wide. The first column is the zone number and subsequent columns contain households in each class within the size, income, and number of workers distribution. An excerpt from zdxxxxh3.c95 follows:

```
1     0   100         29    63    29    39     5    65    20    17    27    99    49     0    22   …
2    64    63         77    94    90    81    82    68     9    73    79    28    75    43     8   …
3     5    71         58    42    84    75    77    63    32    49    22    76    90    57         …
4    38    79         97    23    96    30    35    81    51    89    40    33    59    84    40   …
5    90     8         40    72    77    61     0    79    98    12    23     3    26    52    56   …
6    52    82         25    84    88    62    92    18     2    87    89     1    32    53    48   …
.     .     .    .     .     .     .     .     .     .     .     .     .     .     .     .     .    …
.     .     .    .     .     .     .     .     .     .     .     .     .     .     .     .     .    …
```

The key to the ZDXXXXH3.C95 file is as follows:

Field			Format	Columns
Zone			i5	1-5
income 0-20k	1 person	0 worker	i5	6-10
income 0-20k	1 person	1 worker	i5	11-15
income 0-20k	1 person	2+ worker	i5	16-20
income 0-20k	2 person	0 worker	i5	21-25
income 0-20k	2 person	1 worker	i5	26-30
income 0-20k	2 person	2+ worker	i5	31-35
income 0-20k	3 person	0 worker	i5	36-40
income 0-20k	3 person	1 worker	i5	41-45
income 0-20k	3 person	2+ worker	i5	46-50
income 0-20k	4 person	0 worker	i5	51-55
income 0-20k	4 person	1 worker	i5	56-60
income 0-20k	4 person	2+ worker	i5	61-65
income 0-20k	5+ person	0 worker	i5	66-70
income 0-20k	5+ person	1 worker	i5	71-75
income 0-20k	5+ person	2+ worker	i5	76-80
income 20-40k	1 person	0 worker	i5	81-85
income 20-40k	1 person	1 worker	i5	86-90
income 20-40k	1 person	2+ worker	i5	91-95
income 20-40k	2 person	0 worker	i5	96-100
income 20-40k	2 person	1 worker	i5	101-105
income 20-40k	2 person	2+ worker	i5	106-110
income 20-40k	3 person	0 worker	i5	111-115
income 20-40k	3 person	1 worker	i5	116-120
income 20-40k	3 person	2+ worker	i5	121-125
income 20-40k	4 person	0 worker	i5	126-130
income 20-40k	4 person	1 worker	i5	131-135
income 20-40k	4 person	2+ worker	i5	136-140
income 20-40k	5+ person	0 worker	i5	141-145
income 20-40k	5+ person	1 worker	i5	146-150
income 20-40k	5+ person	2+ worker	i5	151-155
income 40-75k	1 person	0 worker	i5	156-160
income 40-75k	1 person	1 worker	i5	161-165
income 40-75k	1 person	2+ worker	i5	166-170

income 40-75k	2 person	0 worker	i5	171-175
income 40-75k	2 person	1 worker	i5	176-180
income 40-75k	2 person	2+ worker	i5	181-185
income 40-75k	3 person	0 worker	i5	186-190
income 40-75k	3 person	1 worker	i5	191-195
income 40-75k	3 person	2+ worker	i5	196-200
income 40-75k	4 person	0 worker	i5	201-205
income 40-75k	4 person	1 worker	i5	206-210
income 40-75k	4 person	2+ worker	i5	211-215
income 40-75k	5+ person	0 worker	i5	216-220
income 40-75k	5+ person	1 worker	i5	221-225
income 40-75k	5+ person	2+ worker	i5	226-230
income 75k+	1 person	0 worker	i5	231-235
income 75k+	1 person	1 worker	i5	236-240
income 75k+	1 person	2+ worker	i5	241-245
income 75k+	2 person	0 worker	i5	246-250
income 75k+	2 person	1 worker	i5	251-255
income 75k+	2 person	2+ worker	i5	256-260
income 75k+	3 person	0 worker	i5	261-265
income 75k+	3 person	1 worker	i5	266-270
income 75k+	3 person	2+ worker	i5	271-275
income 75k+	4 person	0 worker	i5	276-280
income 75k+	4 person	1 worker	i5	281-285
income 75k+	4 person	2+ worker	i5	286-290
income 75k+	5+ person	0 worker	i5	291-295
income 75k+	5+ person	1 worker	i5	296-300
income 75k+	5+ person	2+ worker	i5	301-305

1.3 Output Files

There are two output files from the Zonal Distribution Program, a report file and a distributed zonal attribute file.

1. Report file: The report file simply contains the date and time various portions of the program were executed. Additionally, it is used to identify any program errors during execution (e.g. an input file wasn't found).

2. Distributed zonal attribute file: This file contains the output distribution of zonal households by required strata. The file has the same format as the input distribution file; however, the output distributed attributes sum to the input total zonal attributes.

Example Outputs:

1. Report file = hh_group.rpt

```
03/30/00  09:00:51  Reading zonal units

03/30/00  09:00:51  Getting region units

03/30/00  09:00:51  Processing groups

03/30/00  09:00:51  Program Complete
```

2. Distributed zonal attribute file = zdxxxxh3.c9x

Format is identical to zdxxxxh3.c95 input file.

1.4 Procedure Controls

The Zonal Distribution Program (ZDISTRIB.EXE) operates in "batch" mode only. That is, the user must use a text editor to create a setup file (also called a control file or driver file). This setup file provides the program with the names of the input and output files, as well as parameters that the user may want to change. The program is executed by typing the following command at a DOS prompt:

ZDISTRIB <SETUP FILE>

Where <SETUP FILE> is the name of the setup file (can be any legitimate DOS filename, which may include drive and path information). This setup file is a generally free-form ASCII file with three control "cards". The control cards are written using the NAMELIST convention; this means that the name of the control card, preceded by an ampersand (&), is the first variable on the record, and the control card ends with a &END statement. The three control cards are the &INFILES, &OUTFILES, &PARAMS, and &FORMATS. The &INFILES card allows the user to specify the input file names; the &OUTFILES card allows the user to specify the output file names; the &PARAMS card allows the user to specify various parameters required in the program; and the &FORMATS card allows the user to specify the formats for reading the input files. NOTE: Each of the file names must be legitimate DOS file names in single quotes, and they may contain drive and path information up to 60 characters.

The &INFILES are specified using the following keywords:

ZONE_ATTR	Zonal attribute file which is to be expanded
ATTR_DIST	Base attribute distribution file which is used as the seed

The &OUTFILES are specified using the following keywords:

REPORT	Output report file
ZONE_DIST	Output zonal attribute distribution file

The &PARAMS are specified using the following keywords:

NZONES	Number of zones to be processed (in the input files)
NGRPS	Number of groups to be used for the distribution

The &FORMATS are specified using the following keywords:

FMT_ZONE	Format for reading the zone attribute file records. Program expects integer values of ZONE_ID and ATTRIBUTE, in that order. Width and spacing may vary, but the format cannot be more than 60 characters.
FMT_DIST	Format for the zone distribution data files. Program expects to read integers, with ZONEID first. Width and spacing may vary, but the format cannot be more than 60 characters.

An example setup file (HH_GROUP.CTL) appears below. The file must be edited to specify the correct input files, output files, and parameters.

```
OMPO HH_GROUP Control file
Takes zonal landuse data (HH's) and base year distribution of hhs by
group
and distributes LU hhs into cross-class categories.

&infiles
  zone_attr = 'zdxxxxxx.c9x'
  attr_dist = 'zdxxxxh3.c95'
&end
&outfiles
  report    ='hh_group.rpt'
  zone_dist ='zdxxxxh3.c9x'
&end
&params
  nzones = 762
  ngrps  = 60
&end
&formats
  fmt_zone = '(i8,49x,i8)'
  fmt_dist = '(i5,60i5)'
&end

NOTE: The zone_attr file is supposed to have the ZONE & hhs;
          fmt_zone tells the format for how to read zone then hhs
      The attr_dist file is supposed to have the zone & hhs by group;
          fmt_dist tells the format for reading zone, then hhs in
multiple
          groups.
      In this run, we're using CENSUS HHS from the zone file.
```

2. Program REPORT

The reporting of information from the travel forecasting procedures is a crucial component of any forecasting task. Without powerful and flexible methods to examine the inputs, intermediate information, and forecasts, even the best forecasting procedures are ineffective as tools that produce information for decisionmaking.

Program REPORT is a dedicated reporting tool that integrates three primary functions into a single, consistent user-interface. First, it can summarize and compare trip tables, aggregating them from the zone level to the district level and preparing district-to-district reports. Second, it can summarize and compare zone attributes, aggregating them to the district level and preparing district summaries. Third, it can perform several analyses that examine and compare network-derived impedance information. The "quality-of-service" analyses include preparation of impedance information for output to thematic mapping (usually GIS) software, development of trip length frequency distributions (TLFDs), and classification of a trip table in to a set of tables that stratify trips by value ranges in a specified impedance table.

The program provides a calculator function that supports the calculation and reporting of working tables and vectors (totals, subtotals, differences, and ratios) that would not otherwise be prepared by the forecasting procedures. The program provides sufficient control on the content and format of its output reports so that the user can print or capture the report file for direct use in documentation of a set of forecasts. Applications of the program can be included within the stream of software steps that are used to apply travel forecasting procedures, thereby producing summaries "on the fly" as intermediate information (impedances, person-trip tables, mode shares) are produced. The ability to generate useful, well-formatted, and timely reports means that there are no excuses for the failure to summarize, review, and distribute the full range of information typically available within a forecast.

2.1. INPUTS

Program REPORT reads files of trip tables, impedance tables, and area (zone) attributes. The file format for area attributes is fixed, using a format that is compatible with most software (database, spreadsheet, and flat ASCII) used to maintain attribute data. File formats for trip tables and impedance tables depend entirely on the transportation software used to produce those files.

The program is intended to work with a broad range of software – both transportation software and geographic information system (GIS) mapping functions. Typically, travel forecasting procedures employ a format for trip tables and impedance tables that is used by a proprietary software package. Similarly, most travel forecasting agencies have access to the mapping functions in a GIS program that expects area attributes in a specific import format. Program REPORT currently works with the MINUTP transportation software package and any GIS software that can import attributes files in comma-separated-value (CSV) format. Updates of the program will add other formats.

2.2. OUTPUTS

Most output from Program REPORT is written to a report file, formatted for printing and presentation. Depending on the specific application, the report file includes:

- Playback of all control settings, both those specified by the user in the control file and those with non-blank default values that assume those default values;
- If the quality-of-service analysis is invoked and a trip table is provided, trip length frequency distributions (TLFDs) that describe the distribution of the trips in the trip table with respect to each of the user-specified impedance tables; and
- If summaries of trip tables are specified, reports summarizing district-to-district movements.
- If stratified trip tables are specified, reports summarizing district-to-district movements stratified by the program using user-specified impedance breakpoints and the first specified impedance table.

Four other output files are also available, generally to provide simply formatted versions of the information included in the report file. These files are useful for importing this information into other software for additional analysis. The four optional output files are:

- A plain text file with the contents of the district-level and/or district-to-district-level reports, useful for importing into a spreadsheet program for additional analysis and formatting;
- A plain text file with the contents of the TLFDs, useful for importing into a spreadsheet program for additional formatting;
- A plain text file with values from specified impedance tables for travel between all zones and a set of zones of interest; and
- A trip-table file containing a set of zone-to-zone trip tables stratified by ranges of values in the user-specified impedance table, written in the format used by the transportation software identified by the user, useful for network assignments.

To generate any of these files, the user simply supplies a filename. Program REPORT automatically invokes processing of the corresponding output information and writes the file.

2.3. CONTROLS

The user controls a specific application of the program through information supplied in a control file. The file is included in the command line when program REPORT is initiated:

```
C:\>report myfile.ctl
```

Any valid filename can be used in place of "myfile.ctl" in the example. The control file specifies information for the program in several NAMELIST blocks:

- &FNAMES identifies all input and output files needed for this application; this block must be provided in all applications.
- &PARAMS sets various parameters for this application; this block must be provided in all applications.
- &TABLES specifies the calculation of internal working tables using any of the tables in the input files; either &TABLES or &VECTORS or both must be provided in all applications.

- &VECTORS specifies the calculation of internal working vectors using any of the data vectors in the input files; either &TABLES or &VECTORS or both must be provided in all applications.

- &DDRPT specifies the titles and formatting for a single district-to-district report for one of the working tables (a DDRPT report cannot make direct use of an input table, but rather must refer to a working table); up to 30 &DDRPT blocks may appear in any application of the program.

- &DRPT specifies the titles and formatting for a single district report that includes up to 20 working vectors (a DRPT report cannot make direct use of vectors from an input file, but rather must refer to working vectors); up to 30 &DRPT blocks may appear in any application.

- &QOS identifies the working impedance table(s), working trip table, and other parameters necessary to control the various quality-of-service analyses; this block is optional in any application of the program.

- &PAGES groups the reports generated by &DDRPT and &DRPT onto pages in preparation for printing; this block is optional because the pagination of reports defaults to one report per page.

Table 2.3-1 documents the controls available within each of these blocks, including their functions, formats, ranges, and default values.

2.4. SYNTAX FOR &TABLES AND &VECTORS

The specifications for internal working tables and internal working vectors share the same syntax. This syntax permits the user to control the computation of working tables and vectors using information from the input files. The computations are separate: mixing of tables and vectors is not permitted.

Up to 99 working tables (t1 through t99) and 99 working vectors (v1 through v99) are available. The specification for each can refer to input tables and vectors using references in the forms:

Tftt or Vfvv

where T indicates a table reference;

V indicates a vector reference;

f identifies the FTABLEf or FVECTORf file in which the information is located;

tt identifies the table number in FTABLEf that is to be used; and

vv identifies the vector number in FVECTORf that is to be used.

Analogously, specifications can refer to working tables and working vectors by omitting the file number from the reference. The working table or working vector must be defined earlier in the

Table 2.3-1(a)
Controls for Program REPORT
Files, Parameters, and Internal Calculations

Keyword	Type	Default	Definition
&FNAMES			**Filenames for:**
FEQUIV	A64	<blank>	File of zone-district equivalences
FREPORT	A64	<blank>	Output file for reports
FTABLEn	A64(10)	10 * <blank>	Input files of trip tables and/or impedance tables for n = 1 up to 10
FTABLES	A64	<blank>	Output file for stratified trip tables
FTABTXT	A64	<blank>	Output file for fixed-formatted version of district reports
FTABQOS	A64	<blank>	Output file for quality-of-service reports
FTHEMEO	A64	<blank>	Output file for thematic mapping information
FVECTORn	A64(4)	4 * <blank>	Input files of area attributes for n = 1 up to 4
&PARAMS			**Parameter settings for:**
COLTEXT	I	6	Number of columns for each column in output file FTABTXT
NDISTS	I	0	Number of districts
NZONES	I	0	Number of zones
PAGEH	I	56	Page-height in lines
PAGEW	I	132	Page-width in columns
PRTEQV	L	False	Print summary of zone-district equivalences
SOFTMAP	A10	<blank>	Software format for output file FTHEMEO
SOFTTRAN	A10	<blank>	Software format for FTABLEn and FTABLES
&TABLES			Parameter settings for:
Tn	A64(99)	99 * <blank>	Specifications for internal working tables 1 up to 99
TAn	I(99)	99 * 0	Reference to input or working table that sets availability (available if value <> 0)
&VECTORS			**Parameter settings for:**
Vn	A64(99)	99 * <blank>	Specifications for internal working vectors 1 up to 99
VNn	A10(99)	99 * <blank>	Vector name for internal working vectors 1 up to 99

Table 2.3-1(b)
Controls for Program REPORT
Reporting and Formatting

Keyword	Type	Default	Definition
&DDRPT			**Settings for district-to-district reports:**
COLPCT	L	False	Report as column-percentages
DPLACES	I	0	Number of decimal places in each column
MASKUB	R	-999999.0	Upper bound of range for which cell values are masked out of the report
MASKLB	R	999999.0	Lower bound of range for which cell values are masked out of the report
NOTEn	A64(5)	5 * <blank>	Text lines for footnotes
PAFMT	L	False	Label districts "production" and "attraction" rather than "origin" and "destination"
PLACES	I	6	Number of places in each column
ROWPCT	L	False	Report as row-percentages
SCALE	R	1.0	Multiplicative scale to apply to all cell values
SOURCE	A64	<blank>	Text line for source footnote
T	I	0	Table number of internal working table for use in this report
TLINEn	A64(5)	5 * <blank>	Text for title lines
&DRPT			**Settings for up to 30 district reports:**
COLPCT	L	False	Report as column-percentages
DPLACES	I(20)	20 * 0	Number of decimal places in each column
NOTEn	A64(5)	5 * <blank>	Text lines for footnotes
PLACES	I(20)	6	Number of places in each column
SCALE	R(20)	20 * 1.0	Multiplicative scale to apply to all vectors
SOURCE	A64	<blank>	Text line for source footnote
TLINEn	A64(5)	5 * <blank>	Text for title lines
V	I(20)	20 * 0	Vector numbers of internal working vectors for use in this report
&QOS			**Settings for quality-of-service analysis:**
BPOINTS	I(8)	8 * 0	Breakpoints in impedance values for use in stratifying trip table TTRIP
IZ	I(20)	20 * 0	I-zones of interest for which impedance vectors will be written in FTHEMEO
JZ	I(20)	20 * 0	J-zones of interest for which impedance vectors will be written in FTHEMEO
TIMPS	I(20)	20 * 0	Table numbers of impedance tables for FTHEMEO, FTABLES, and TLFDs
TLFINTVL	R	1.0	TLFD interval used as divisor into impedance values in developing TLFDs
TLINEn	A64(5)	5 * <blank>	Text for title lines
TTRIP	I	0	Table number of trip table for stratification into FTABLES and TLFD development
&PAGES			**Settings for pagination in FREPORT:**
DDPAGEm	I(30)	M, 29 * 0	DDRPTs to be printed on page m
DPAGEn	I(30)	n, 29 * 0	DRPTs to be printed on page n

list of specifications. Consequently, a specification for working table t6 cannot refer to t8 because t8 will be evaluated after t6. Generally, then, working tables and vectors that are used in a specification must have numbers that are less than the number of the specification in which they appear.

The specifications may use any of the four arithmetic operators but may not use parentheses to set the order of calculations. To avoid ambiguity in calculation order, each specification is defined as a set of from one to 20 terms, where each term includes up to three elements combined multiplicatively (either through multiplication or division). A specification that is strictly additive in its table- or vector-references may use as many of the 20 permitted terms as needed. However, a specification that is multiplicative in its references may include only one term.

Some examples illustrate the various computations that can be specified for the working tables and working vectors.

t4 = 't101 + t201'

This specification is correct. It has two terms that are added together. Working table 4 is the sum of the first table in FTABLE1 and the first table in FTABLE2.

*t2 = '0.02 * t402 + 0.01 * t307'*

This specification is correct. It has two terms, each with one scalar and one table-reference, that are added together after the scalars are multiplied by the tables. Working table 4 is the sum of 0.02 times the second table in FTABLE4 plus 0.01 times the seventh table in FTABLE3.

v13 = 'v102 + v103 +v104 + v105/2'
v14 = 'v13 / v201'

These specifications are correct. The specification for v13 has four terms, three with single vector-references and a fourth with one scalar and one vector-reference. The specification for v14 has one term that includes two vector-references, one to a working vector and one to an input vector.

t1 = 't201 + t202 + t203 + t204'
t2 = 't401 + t402 + t403 + t404'
t3 = 't2 – t1'
*t4 = '100 * t3 / t1'*

These specifications are correct. Working table 1 has four terms and is the sum of four input tables. Working table 2 also has four terms and is the sum of four input tables. Working table 3 has two terms and is the difference between two working tables previously specified. Working table 4 has one term (the maximum permitted with division) and is 100 times the ratio of two working tables previously defined.

*v23 = 'v102 * v103 + v104'*

This specification is incorrect and will be rejected by the error scan. It has two terms. Because the first is multiplicative in the vector-references, it must be the only term in the specification. A correct approach to these computations is:

*v23 = 'v102 * v103'*
v24 = 'v23 + v104'

The corrected specification for v23 has one term that includes two vector-references, the maximum permitted because it is multiplicative in its vector-references. The new specification for v24 has two terms and is additive.

2.5. FILE FORMATS

In addition to the input control file, Program REPORT deals with two kinds of input files: (1) vector files that typically contain attributes of zones or districts; and (2) table files that typically contain trips or network impedances for travel between zones or districts. The formats of these files are:

Input vector files — Each record in a vector file refers to a single zone or district with the (integer) number of the zone or district in the first field and its (real number) attributes appearing in up to 100 additional fields. Gaps are permitted in the numbering of zones or districts but the records must be sorted in ascending order by zone-number or district-number. The first record in the file provides data labels. In its first field, the labels-record includes either the number of zones or the number of districts to identify whether the file provides zone-level or district-level information. In the remaining fields up to 100 fields, the labels-record provides a label for each data vector (column). All 101 fields are 10 spaces wide for both the labels-record and the data records.

Input table files — The format of table files is determined entirely by the software package used to create the files and specified in &PARAMS SOFTTRAN.

In addition to the output report file, Program REPORT writes up to four other output files, depending on controls set by the user. The first file is a "plain" version of the table reports and vector reports that are written to the report file. The second is a "plain" version of the trip-length-frequency distributions (TLFDs) also written to the report file. The third is a data file for import to a thematic mapping program. The last output file comprises a set of stratified trip tables. The formats of these files are:

Output table-text file — If the user provides a filename, a table-text file is created to record plain versions of all district-to-district reports and district reports. These plain versions include only the interior cell values of the reports. They do not include titles, labels, row-sums, column-sums, or other formatting provided in the report file. All columns are 10 spaces wide. Program REPORT writes the contents of this file in parallel to its writing of the output report file so that the order of its contents matches that of the report file.

Output TLFD file — If the user provides a filename, Program REPORT creates a TLFD file to record plain versions of the TLFD reports. These plain versions include only the interval values and the cell values of the TLFDs. They do not include titles, labels, or other formatting provided in the report file. All columns are 10 spaces wide. Program REPORT writes the contents of this file in parallel to its writing of the TLFDs in the report file so that the order of the TLFDs is the same.

Output theme file — If the user provides a filename, Program REPORT creates a file that provides information for importing to a thematic mapping program. The file contains an initial record that provides a label for each vector (column) followed by one record for each zone in ascending order. The first field on each record is the zone number. The remaining vectors are sorted (1) all IZ and then all JZ, and (2) TIMPS impedance tables. For example, if TIMPS = 1, 2, 3 and IZ = 100, 200 and JZ = 150, 250, 350 then the first three data fields on the first data record would be travel impedance from working tables 1, 2, and 3 from IZ 100 to zone 1. The next three fields would be the travel impedances from the same three working tables from IZ 200 to zone 1. The next three fields would be the travel impedances from the same three working tables to JZ 150 from zone 1. Two additional sets of three fields would provide the analogous information for travel to JZ 250 and JZ 350.

Output trips file — If the user provides a filename, Program REPORT creates a file to record the zone-to-zone stratified trip tables that result from the classification of trips in the TTRIPS trip table according to ranges set by BPOINTs in the first impedance table identified in TIMPS. The format of the output table file is compatible with the software package specified in &PARAMS SOFTTRAN.

2.6. OPERATIONS

Operation of Program REPORT includes up to ?? steps, depending on the control setting provided by the user.

1. Read controls — The program reads the control file, interprets all values, and set the controls for this application using the user-supplied values and, where appropriate, the default values.

2. Scan files — The program opens and scans all input files to determine the level of aggregation (zones or districts) and the number of tables or vectors provided for each file.

3. Read equivs — If equivalences are needed, the program reads, checks, and stores to memory the zone-district equivalences

4. Scan for errors — The program checks the internal consistence among user-provided control settings and the consistence between these settings and the properties of user-identified files.

5. Do zone specs — The program applies the specifications (excluding division operations) for working tables and/or working vectors to the input zone-level files and aggregates the results to working tables and/or vectors at the district level. During this step, the program also accumulates information into TLFDs, stores information for the thematic mapping file, and writes the stratified trip-table output file if the user requests these analyses.

6. Do district specs — The program applies the specifications for working tables and/or working vectors to the input district-level files and the aggregated working tables and/or vectors.

7. Prepare reports — The program formats the district-level reports of the selected working tables and/or working vectors as well as the TLFDs and writes these reports to a temporary file. During this step, the program also writes the table-text file, the TLFD file, and the thematic mapping file if the user requests these files.

8. Paginate — The program reads the temporary file and writes the final report file using the pagination specified by the user in &PAGES.

2.7. ERROR MESSAGES

Program REPORT applies a number of consistency checks to the control settings before initiating an application. Each message has one of three possible levels of severity. Warnings (w) identify conditions that may be incorrect but do not, by themselves, affect completion of the application. Errors (e) identify conditions that are incorrect, permit continuation of the error scan, but lead to termination of the application after the error scan is completed. Fatal (f) messages identify conditions that are incorrect and that prevent any further processing.

2.7.1 CHKFILES

Messages generated by CHKFILES deal with problems in the availability or properties of files needed for the operation of Program REPORT.

chkfiles 6601 (e) file not found: <filename>

An input file is not in the location specified. Check the spelling of the filename and the path identified for the file.

chkfiles 6602 (e) f<type><n> used in &<type> but no filename given

F<type> is either Ftables or Fvectors and &<type> is either &tables or &vectors. A specification makes reference to a table or vector in file <n>, but the corresponding ftablen or fvectorn is not provided in the control file. Correct the file reference in the specification or add the appropriate filename.

2.7.2 CHKLOGIC

Messages from CHKLOGIC identify problems in the internal consistency of settings in the control file.

chklogic 6601 (e) spec for <type><n> uses undefined internal <type><n>

<Type> is either t or v. A specification for either a table or a vector makes reference to an internal table or vector that is not defined. Check that the specification refers to tables or vectors that are defined earlier in the list of specifications.

chklogic 6602 (e) spec for <type>rpt<n> uses undefined internal <type><n>

Either &DDRPT or &DRPT makes reference to an internal table number that is not defined in &TABLES or &VECTORS. Check the reference number or provide the specification.

chklogic 6603 (e) <zz> not in ascending order')

In &QOS, either the IZ list or the JZ list is not in ascending order. Revise the order.

chklogic 6604 (e) ttrip <n> invalid for qos tasks'

In &QOS, the ttrip entry does not refer to a defined internal table number.

2.7.3 INFIELD

Messages generated by INFIELD deal with problems in the syntax of specifications for &TABLES, &VECTORS, and zone-district equivalences. Field numbers are counted from left to right and are delineated by commas and the four math operators.

infield 6601 (e) illegal field # <n>

The field is blank and must not be. Check the syntax and placement of operators.

infield 6602 (e) uninterpretable field # <n>

The field is inconsistent with the required syntax and cannot be interpreted.

2.7.4 OPENFILES

Messages from OPENFILES deal with inconsistencies in the properties of input files.

openfile 6601 (e) data-labels missing in <filename>

The first record of a vector file is not a data-labels record. Add the record, with the level of aggregation (number of zones or districts) in the first column and a data-label of up to 10 characters in each of the data columns.

openfile 6602 (e) #areas <n> invalid in <filename>

The highest zone number found on a record in the file exceeds the number of zones specified in the control file. Check the NZONES setting and the zone-numbers in the data file.

openfile 6603 (e) #items<m> < max item# <n> needed in <filename>

A specification in &TABLES or &VECTORS refers to a table or data-vector in this file that exceeds the number of tables or vectors found in the file.

2.7.5 RDCTL

Messages from RDCTL identify errors that prevent continuation of the error scan and therefore cause immediate termination of the application.

rdctl 6601 (f) error opening control file <errnum>

The program could not find the control file. Check the spelling and path of the control file named when REPORT is invoked at the prompt.

rdctl 6602 (f) nzones and ndists cannot both be zero

In the control file, both the number of zones and the number of districts are specified as zero or are unspecified. One or the other, or both, must be greater than zero.

rdctl 6603 (f) report file not provided

In the control file, no filename is provided for FREPORT. Provide a name for the output file that will include all messages and reports written by the program.

2.7.6 RDEQUIV

Messages from RDEQUIV identify problems in the interpretation of the zone-district equivalences.

rdequiv 6601 (w) rec# <n> in fequiv is blank

A record in the equivalence file is entirely blank. Make sure that this record is not an error.

rdequiv 6602 (e) rec# <n> in fequiv is not an equivalence

The program could not find the keyword 'dist' (or 'DIST') in the first four spaces on the record. Make sure that the keyword appears in the first four spaces of every record in the equivalence file (except for records with a dollar sign in the first space to denote a comment record).

rdequiv 6603 (e) rec# <n> in fequiv has no district #

On the identified record, the program could not find an equal sign following the keyword 'dist' and separated from the keyword by at least one blank space. Make sure that an equal sign is included.

rdequiv 6604 (e) rec# <n> in fequiv has invalid district # <d>

On the identified record, the field immediately following the equal sign contains an entry that is either unreadable as an integer number, an integer number that is less than one, or an integer number greater than the value of NDISTS in &PARAMS. Correct the district number provided on the identified record in the equivalence file.

rdequiv 6605 (e) rec# <n> in fequiv has unreadable zone # <z>

The record has a field that should be a zone number that cannot be read as an integer. Correct the syntax.

rdequiv 6607 (e) rec# <n> reuses zone # <z>

The identified record assigns a zone to this district that has already been assigned to a previous district. Resolve the redundant assignment.

rdequiv 6606 (e) rec# <n> in fequiv has invalid zone # <z>

The identified record has a zone number that is either zero or greater than the value of NZONES in &PARAMS. Correct the zone number.

rdequiv 6608 (w) <n> zone(s) not used in equivs: <z1, z2, ...>

At least one zone number less than or equal to NZONES has not been assigned to a district. Make sure that any omissions are intended.

rdequiv 6609 (w) <n> districts not used in equivs: <d1, d2, ...>

At least one district number less than or equal to NDISTS has not been defined as a set of zones. Make sure that any omissions are intended.

rdequiv 6612 (f) stopping with <n> fequiv errors

Program REPORT is terminating this application because of errors found in the equivalence file. Correct these errors (and any other errors detected during the error scan) and rerun the application.

2.7.7 RDSPEC

Messages from RDSPEC deal with problems in the interpretation of the specifications provided in &TABLES for individual tables and &VECTORS for individual vectors.

rdspec 6601 (e) spec has illegal operator <a> following field <n>

The operator following the identified field is not in the dictionary of operators within REPORT. Make sure that all operators are one of: plus sign, minus sign, asterisk (for multiplication), slash (for division), and comma.

rdspec 6602 (e) spec is multiplicative but has more than one term

The specification is multiplicative (using either multiplication or division of two tables or vectors) and has more than one term. Where multiplication or division of two tables or vectors is needed, specify a working table or vector to include only one term, where a term has two references to tables or vectors and may include a scalar. A specification 't2 = 0.1 * t101 / t105' is acceptable. However, a specification 't3 = 0.1 * t101 / t105 + 0.1 * t201' is not because it contains two terms.

rdspec 6603 (e) term in field #s <m> to <n> has more than one numeric factor

The identified term has more than one scalar. Make sure that each term includes no more than one scalar and no more than two references to tables or vectors.

rdspec 6604 (e) element in field # <n> has an invalid alpha character <a>

The specification includes an alphabetic character that is not 't' or 'v' in either lower or upper case. Make sure that the specification contains only number, decimal places, operators, and the characters 't' or 'v' (either lower case or upper case).

rdspec 6605 (e) division cannot make direct use of input item <innn>

At least one of the tables or vectors used in a division is an input item. Revise the specifications to first capture the input items as working tables or vectors and then refer to these working items in the division.

rdspec 6606 (e) spec undefined: <inn>

A reference is made to the identified working table or vector, but that working table or vector has not previously been defined.

rdspec 6607 (e) uses divide result: <inn>

The identified reference is a working table or vector that divides one table or vector by another. A specification that divides tables or vectors cannot be used in later specifications.

rdspec 6608 (e) uses district info: <inn>

The identified reference is an internal working table or vector that applies at the district level; it cannot be used in a later specification. Specifications that make district-level calculations must be the final calculations in the sequence of working tables or vectors.

rdspec 6609 (e) term in field #s <m> to <n> has more than two references

The term defined in the identified fields has more than two references to tables or vectors. Revised the specification to comply with the syntax that permits each term to have up to one scalar and up to two references to tables or vectors.

rdspec 6610 (e) element in field # <n> is not interpretable

Program REPORT can not interpret the entry in the identified field. Correct the syntax.

2.7.8 SOFTWARE

The message from SOFTWARE indicates that the program is not able to interpret one or both of the software packages identified.

software 6603 (f) software not recognized: <software name>

Program REPORT does not recognize the value provided for SOFTTRAN or SOFTMAP in &PARAMS. Check the spelling and ensure that the current version of REPORT is compatible with the specified software.

2.7.9 WRTCTL

Messages from WRTCTL identify problems with the ability of Program REPORT to read successfully the settings for &FNAMES, &PARAMS, &TABLES, &VECTORS, &DDPRT, and &DRPT.

wrtctl 6601 (e) &<namelist> has error <errnum>

A basic syntax error has occurred in the identified namelist block. Check for misspelling of one or more of the variables, for character variables that are assigned integer or real values, for logical (true/false) variables that are assigned integer or real values, and for missing close-quotes on character strings.

wrtctl 6602 (e) spec for &ddrpt <n> has error <errnum>

A basic syntax error has occurred in the identified &DDPRT block. Check for misspelling of one or more of the variables, for character variables that are assigned integer or real values, for

logical (true/false) variables that are assigned integer or real values, and for missing close-quotes on character strings.

wrtctl 6603 (e) spec for &drpt <n> has error <errnum>

A basic syntax error has occurred in the identified &DPRT block. Check for misspelling of one or more of the variables, for character variables that are assigned integer or real values, for logical (true/false) variables that are assigned integer or real values, and for missing close-quotes on character strings.

wrtctl 6699 (f) stopping with error(s):

in &fnames,&params,&tables,&vectors,&qos:	*<n>*
in &ddrpt:	*<n>*
in &drpt:	*<n>*
in table specifications:	*<n>*
in vector specifications:	*<n>*
in control settings:	*<n>*
in file properties:	*<n>*
	------
total:	*<n>*

The error scan has detected at least one error in the identified part of the control settings, as identified in an earlier detailed message. Application of Program REPORT terminates immediately after this message is written.

G. Examples of Uses of the Models

1. Application Examples

1.1 Introduction

This chapter describes a few examples of applications of the model to address specific questions or support various analyses. These applications are among those presented in the training session presented to OMPO and State planning staff on December 4 and 5, 2003 in PB Honolulu offices.

The examples presented here include

Section 1.2: Selected Link Analysis

Section 1.3: Difference Plots

Section 1.4: Air Quality Analysis

Section 1.5: Time Contours

1.2 Selected link Analysis

It is often useful to identify trips that traverse a link or set of links in order to determine their influence on other parts of the network, and their relative magnitude in relation to other trips. For example, selecting a link on a proposed new roadway will tell the analyst something about the geographic market for this facility. A selected link analysis is used to identify such trips. The user must identify the link or links for which traffic will be tracked. During the assignment phase, the program can then keep track of all trips that traverse these links, including their origin and destination and, to some degree, their paths.

To implement a selected link assignment, the user must have the following:

- An unassigned network
- The trip table(s) providing the demand for the scenario and time period being tested
- A list of the desired selected links in terms of anode and bnode

A normal assignment is then run, using the standard MINUTP setup, with the addition of keywords and parameters that tell the program to track trips that traverse the selected links, and the specification of the selected link set itself. An example of a selected link script is shown below:

```
$ OMPO Model Development
$ PM PEAK-Period (4 hr) Capacity Restrained ASSIGNMENT
$ cvf990504 adapted from asamxxau.set
$
*pgm netmrg hnpmxxfs.%alt%,hnttxxxx.%alt%
comp lane=lanep
@ lane=0 lane=1
$
*pgm assign hnpmxxfs.%alt%,,1,1000
*unit 11=..\tod\vottxxo1.%alt%          vt by tod for occ1
*unit 12=..\tod\vottxxo2.%alt%          vt by tod for occ2+
*unit 13=..\air\vottaaxx.%alt%          vt by tod for air acc
*unit 14=..\trk\tottxxxx.%alt%          vt by tod by trucks
*unit 15=..\vis\vottvsxx.%alt%          vt by tod by visitors
*unit 16=..\tod\vottxxo3.%alt%          vt by tod for occ3+
*unit 21=hlpmxxxx.%alt%                 loaded network
*id AM Peak Per Asnmt (4 hr)
$
$ Parameters
par pctadt=30               pct of trips that occur in capacity pd.
par slnk=1                  assign all trips
par speed=0                 use SPED values according to SPDC
equi tol=0.001              equilibrium assignment w/ tolerance factor
thet 30*0                   number of iterations
$
$ Trip tables and restrictions for assignment
mati 104,105,204,205,303,403,503,604,605     trip tables to assign
par flagvar=limitp          specifies multi-user asnmt variable
flagfac 1,0,P,P,P,P,0,P,P,P  no limit  2345 789 for o1
flagfac 2,0,P,P,P,P,0,P,P,P  no limit  2345 789 for o1
flagfac 3,0,0,P,P,P,0,P,P,P  no limit   345 789 for o2
flagfac 4,0,0,P,P,P,0,P,P,P  no limit   345 789 for o2
flagfac 5,0,0,P,P,P,0,P,P,P  no limit   345 789 for air
flagfac 6,0,P,P,P,P,P,P,P,P  no limit  23456789 for trk
flagfac 7,0,0,P,P,P,0,P,P,P  no limit   345 789 for vis
flagfac 8,0,0,0,P,P,0,P,P,P  no limit    45 789 for o3
flagfac 9,0,0,0,P,P,0,P,P,P  no limit    45 789 for o3
$
$ Turn penalties
penf data\tppmxxau.%alt%,form=f
$
$ SPED & CAPA definitions
*read ..\..\generic\hwy\luxxxxau.def
$
$       VDF definitions
*read ..\..\generic\hwy\vdxxxxau.def
$
$ Select link analysis
par subscale=100
par slnk=2
slnk slpmnu1
alnk 1,n=1,1705-1706
$
$ Output controls
varo vol,vc,cspd            variables to be included in output net
repo 1,2,4,6,20
*
```

Note the four statements near the end of the script:

par subscale=100
par slnk=2
slnk slpmnu1
alnk 1,n=1,1705-1706

The first statement identifies a multiplier which is applied to trips stored in the selected link trip table. Since fractions of trips are often involved, and MINUTP stores selected link trips as integers, this is helpful to maintain accuracy and prevent loss of trips in the resulting trip table.

The second statement tells the program that a selected link assignment is requested. A value of 0 may be used in all-or-nothing assignment to generate a network with selected link loadings assigned. Otherwise, a value of 2 must be used with multiple iterations to generate only a selected link trip table.

The third statement identifies the name of the selected link trip table, with an extension "Mii" where ii is the associated assignment iteration.

Finally, the alnk command is shown. This command specifies the selected link set. The 1 is the set identifier and should increase by one for each set of selected links. The n=1 parameter indicates that table 1 will be used in this case on the selected matrix output file. Finally the last set of numbers indicate the anode and bnode of the selected link. More than one link may be specified. The alnk keyword indicates that a trip must pass through all links identified to be selected. An alternative keyword, olnk, may be used to select a trip that passes through any of the links listed.

Though MINUTP does not allow direct link report of multiple-iteration selected link assignments, an approximation may be obtained through one of several techniques:

1. Assigning the trip table in an all-or nothing manner to a network with loaded speeds from an earlier, standard assignment with par slnk=0

2. Assigning just the selected link trip table to a network with loaded speeds in an all-or-nothing manner using a standard assignment. Further refinement may be made by selectively increasing impedance on links adjacent to the selected link to force trips through the selected link or set of links.

3. Simulate the equilibrium assignment with a series of all-or-nothing assignments that build upon each other. In each all-or-nothing assignment, run a selected link run with par slnk=0, and sum up the weighted assigned networks when complete.

1.3 Difference Plots

Difference plots are very useful in comparing the effects added capacity, new connections or other localized network improvements or localized developments. It is not well suited to evaluate system-wide changes, such as transit fare changes or parking cost increases. The analysis simply subtracts the loaded volumes of one network from another. The resulting network shows where volume changes occur and their magnitude, since the resulting volumes are simply the difference (if any) between the two initial loadings. Typically, this is used to compare build and no-build conditions.

To generate a difference plot, the analyst will need to loaded networks. Make sure that the difference between these networks is well defined and not to extensive. These networks may be the result of two complete model runs, or simply the result of assigning the same demand to a base and slightly modified network. The latter will typically give "cleaner" results, since even with very similar networks, full model runs will generate some meaningless differences that are well removed from the associated network change.

A MINUTP script is shown below that will generate a difference plot from two loaded networks.

```
$ OMPO Model Development
$  SAMPLE MINUTP SETUP -DIFFERENCE IN VOLUME
$ AM Peak Period (2-hour) Volume difference
$
*PGM NETMRG HL1ADIFF.A00,HLA2XXXX.A00,HLA2XXXX.D00
$
titl 2
 OMPO Regional Model
 Year 2000 Alt A - 2000 Base
$
comp altav=vol(1)
comp basev=vol(2)
comp vdiff=vol(1)-vol(2)
if vdiff=0-1000000
 comp vpdiff=vol(1)-vol(2)
else
 comp vndiff=vol(2)-vol(1)
endif
*
```

Note that positive and negative differences are stored in separate link attributes. This allows both to be represented as positive values, and allows more reasonable display of bandwidths through VIPER. Both bandwidths may be displayed simultaneously, since either vpdiff or vndiff will always be 0.

An example of difference plots may be seen in Chapter F, Sensitivity Testing of the Travel Models, in the Guide to Model Form.

1.4 Air Quality Analysis

Regional air quality analyses are often required as a part of regional transportation plans and to demonstrate compliance with Federal and State environmental standards. Since vehicle volume and speed data are required to compute emissions loadings, travel demand models typically called upon to provide input to these analyses.

The basic inputs required by the MOBILE model are Vehicle-Miles of Travel (VMT) by type of vehicle and speed range. The OMPO model can be easily used to generate this data by summing up volume and speeds by link, and making assumptions regarding the vehicle mix by facility type. The only input necessary is an assigned network.

The MINUTP script below illustrates how the VMT may be summarized.

```
$ Honolulu Travel Demand Model Development
$ Air Quality VMT
$
*pgm netmrg test.tmp,hlttxxxx.%alt%
*id vmt by speed
comp vmtam=dist*volam/100.0
comp vmtop=dist*volop/100.0
comp vmtpm=dist*volpm/100.0
comp AM_SPEED=cspdam/10.0
comp OP_SPEED=cspdop/10.0
comp PM_SPEED=cspdpm/10.0
tab vmtam=02,AM_SPEED=0-80-5
tab vmtop=02,OP_SPEED=0-80-5
tab vmtpm=02,PM_SPEED=0-80-5
*
```

In the example shown above, the vmt is summarized by speed range in 5 mph increments. Optionally, a second stratification may be added to the "tab" statements that would include facility type, (FACTYPE attribute of the link). A portion of the output report is shown below:

The VMT by vehicle type may be generated by using pre-determined factors of auto and truck VMT by facility type, or by using only auto or truck assignments initially. Note that the speeds used in this analysis are based on the volume-delay functions of the model. More precise speed estimates are sometimes obtained by post-processing the assigned volumes and capacities to more accurately reflect queuing and other delays experienced at high congestion levels.

NETMRG 07-15-03 15:05 VMT BY SPEED Page 460

Tab

AM_SPEED	VMTAM
0-4	11,949
5-9	28,801
10-14	95,606
15-19	118,940
20-24	122,865
25-29	213,226
30-34	416,711
35-39	438,027
40-44	166,341
45-49	214,197
50-54	66,358
55-59	57,003
60-64	421,732
65-69	849,581
	3,221,337

Tab

OP_SPEED	VMTOP
0-4	2,867
5-9	10,177
10-14	12,781
15-19	120,769
20-24	121,355
25-29	271,479
30-34	529,397
35-39	545,103
40-44	186,655
45-49	210,283
50-54	91,757
55-59	31,702
60-64	800,578
65-69	1,507,791
	4,442,694

Tab

PM_SPEED	VMTPM
0-4	10,748
5-9	50,715
10-14	36,442
15-19	134,530
20-24	127,624
25-29	261,425
30-34	469,097
35-39	442,398
40-44	160,357
45-49	179,123
50-54	59,725
55-59	38,846
60-64	533,707
65-69	1,005,187
	3,509,924

1.5 Travel Sheds

Travel sheds are depictions of accessibility from or to specific locations. They help display how accessible major attractors or producers may be, and can also be used to show how new transportation capacity might affect the accessibility of certain locations in the network. Travel contours show areas that are accessible within "bands" of travel time increments, such as 0-10 minutes, 10-20 minutes, 20-30 minutes, etc.

To generate travel time contours, load an assigned network into VIPER. The follow these steps:

1. Select "Path" from the top row menu
2. Select the "Build" option
3. Type in the desired impedance, using a link attribute name. For example, "ctim" is the loaded impedance, in hundredths of minutes. Optionally, you may also use a second attribute as an additional trace value that will be summed along with the primary impedance. Note that paths will be built only based on the primary impedance.
4. Press the "Done" button
5. In the Origin box, type a zone number of node number you wish to use as the accessible point from which the time contours will be built. You may also use the mouse to select this point from the network graphically.
6. In the destination box, type a range of zones and/or nodes that you wish to be included in the time contours. A good set is 1-762, which will include all network zones.
7. Check the "Isochrome" box to the left of the menu bar.
8. Fill in the "Increment" field (just below the Isochrome box) with the impedance increment you wish to use to display the time contours. Remember that this must be in the same units as your impedance, so if you used ctim, the congested time in hundredths, a value of 500 in this box would result in a map with 5 minute increments.
9. Press the "Display" button

The screen will then display the selected time contours (or isochromes) by coloring each link that is on a shortest path to the destination zone with a color depending upon the time band within which it is contained. Figure 1 below shows an example from zone 76 (identified by a triangle) to all zones with 5 minute increments.

Figure 1: Time Contour Example