UTPS/ SLIM

Simplified Limited Instructional Manual

PROGRAM DOCUMENTATION

Submitted to:

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Washington, D.C. 20596

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October 1, 1985

PREFACE

Over the last 25 years, the Urban Mass Transportation Administration (UMTA) has developed a comprehensive series of urban transportation planning computer programs. Known as the Urban Transportation Planning System (UTPS), these programs require extensive and detailed documentation best suited for large regional planning agencies. In order to facilitate urban travel forecasting by smaller agencies and educational institutions, this manual, the Urban Transportation Planning System / Simplified Limited Instruction Manual (UTPS/SLIM) was developed. UTPS/SLIM simplifies and repackages, without changing the software, the existing UTPS documentation. The UTPS/SLIM user is presented with only the most relevant and necessary program functions.

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UTPS/SLIM

U T P S / S L I M : USER NOTES

NOTES

(A) THE FOLLOWING ARE TERMS COMMONLY USED IN UTPS/SLIM:

KEYWORD: PROGRAM CONTROL STATEMENT.

ATTRIBUTE RECORD: LIST OF ATTRIBUTES (E.G. POPULATION) INDEXED BY ZONES.

ATTRIBUTE FILE: A SET OF ATTRIBUTE RECORDS.

LAV: LIST OF ATTRIBUTE VALUES, IS UTPS TERMINOLOGY FOR AN ATTRIBUTE RECORD.

Z-FILE: A UTPS CREATED FILE CONTAINING ONE OR MORE TABLES WHICH ARE EITHER PROGRAM INPUT OR OUTPUT.

J-FILE: A UTPS CREATED MATRIX FILE CONTAINING ONE OR MORE MATRICES WHICH ARE EITHER PROGRAM INPUT OR OUTPUT.

(B) KEYWORDS ARE PRECEDED BY "&" AND, WITH THE EXCEPTION OF &END, START IN COLUMN 2. THE &END STATEMENT CONCLUDES MOST KEYWORDS AND MAY BE PLACED IN ANY COLUMN. &DATA IS A EXCEPTION AND DOES NOT NEED &END AS A CONCLUDING KEYWORD.

(C) A RANGE OF VALUES (E.G. ZONES) ARE SPECIFIED BY A DASH AND A COMMA. FOR EXAMPLE, 62,-70 SPECIFIES 62 THROUGH 70.

(D) TYPICALLY THE UTPS/SLIM KEYWORDS ARE ARRANGED AS FOLLOWS:

```
&PARAM  ......  &END
&OPTION ......  &END
&SELECT ......  &END
&DATA   ......
```

NOTE THAT NOT ALL KEYWORDS ARE NOT NEEDED IN EVERY PROGRAM.

(E) TABLE AND MATRIX REFERENCES ARE A ONE DIGIT FILE NUMBER FOLLOWED BY A THREE DIGIT TABLE OR MATRIX NUMBER. FOR EXAMPLE, Z9002, IS Z-FILE NINE-TABLE TWO.

(F) THE FULL UTPS DOCUMENTATION SHOULD BE CONSULTED FOR OPTIONS AND INSTRUCTIONS BEYOND THE SCOPE OF THIS MANUAL.

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UMODEL/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

U M O D E L / S L I M : TRANSPORTATION DATA FORMATING PROGRAM

SUMMARY

UMODEL/SLIM IS ONLY USED TO CREATE ZONAL ATTRIBUTE FILES FOR INPUT TO UMATRIX/SLIM.

ATTRIBUTE RECORDS

A ZONAL ATTRIBUTE RECORD IS A LIST OF ATTRIBUTES IMPLICITLY INDEXED BY ZONES. A ZONAL ATTRIBUTE RECORD DESCRIBES AN ATTRIBUTE (E.G. POPULATION) OF ALL ZONES. EACH ELEMENT IN THE RECORD GIVES THE VALUE FOR ONE ZONE. THE ITH ELEMENT IN THE THE LIST STORES THE ATTRIBUTE VALUE FOR THE ITH ZONE. FOR EXAMPLE, IF THE POPULATION OF ZONE 10 IN THE STUDY AREA IS 3200, THEN THE TENTH ELEMENT OF THE POPULATION RECORD WOULD CONTAIN THE VALUE 3200. IDENTIFYING INFORMATION, SUCH AS THE ATTRIBUTE NAME AND THE UNITS IN WHICH IT IS MEASURED, ARE ALSO STORED FOR EACH ATTRIBUTE RECORD.

ATTRIBUTE FILE

AN ATTRIBUTE FILE IS A SET OF ATTRIBUTE RECORDS WITH EQUAL LENGTH (I.E. THE SAME NUMBER OF ZONES). SUCH ATTRIBUTES AS POPULATION, EMPLOYMENT, HBW PRODUCTIONS AND ATTRACTIONS AVERAGE ZONAL INCOME, HOUSEHOLDS, AUTO OWNERSHIP, AND OTHERS MAY COMPRISE AN ATTRIBUTE FILE. IN ADDITION TO THE ZONES VALUE, IDENTIFYING INFORMATION ABOUT THE FILE AND A DIRECTORY OF THE ATTRIBUTES IN THE FILE ARE STORED AT THIS LEVEL.

UMODEL/SLIM READS TWO TYPES OF INPUT DATA:

1. ZONAL DATA, DESCRIBING VARIOUS SOCIO-ECONOMIC CHARACTERISTICS OF THE GEOGRAPHIC ZONES IN THE STUDY AREA, ESPECIALLY PRODUCTIONS AND ATTRACTIONS.
2. IDENTIFICATION DATA, WHICH NAME AND LOCATE THE INFORMATION ON THE ZONAL DATA CARDS ABOVE.

FILE TABLE

	FILE NAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS, AND DATA IDENTIFICATION CARDS
	A1	A1	INPUT ZONAL P & A DATA
OUTPUT	---	FT06F001	PROGRAM REPORTS AND MESSAGES
	Z1	Z1	ZONAL ATTRIBUTE FILE OUTPUT

KEYWORD TABLE

	KEYWORD	TYPE	DEFAULT	VALUE OR PURPOSE
&PARAM	ZONES	I	0	HIGHEST ZONE NUMBER
&SELECT	REPORT	R (20)	0	LIST OF REPORT NUMBERS TO BE PRINTED

DATA RECORD FORMATS

THE PROGRAM READS THE FOLLOWING 2 TYPES OF DATA CARDS:

1. DATA IDENTIFICATION CARDS
2. ZONAL DATA CARDS

DATA IDENTIFICATION CARDS

DATA IDENTIFICATION CARDS GIVE UMODEL/SLIM THE NAME, NUMBER, TYPE, AND LOCATION OF ALL INPUT AND OUTPUT DATA ITEMS.

DATA IDENTIFICATION CARD	
COLUMN	CONTENTS
2 - 3	DATA ITEM NUMBER
5	DATA TYPE
9 - 12	BEGIN COLUMN OF INPUT DATA
14 - 17	ENDING COLUMN OF INPUT DATA
19 - 20	POSITION IN Z ARRAY (USUALLY SEQUENTIAL)
22	FILE NUMBER (USUALLY = 1 IN IN UTPS/SLIM)
24	Z-FILE NUMBER (= 1 IN UTPS/ SLIM)
25 - 23	ATTRIBUTE RECORD NAME
37 - 60	32 CHARACTOR IDENTIFIER OF USERS CHOICE

(A) DATA ITEM NUMBER IS A SEQUENTIAL IDENTIFIER BEGINNING WITH 1. TYPICALLY, 7 DATA ITEMS WOULD BE NEEDED FOR UMODEL/SLIM.

(B) DATA TYPE IS THE CHARACTER "P" FOR "PRODUCTION" OR "A" FOR "ATTRACTION" DATA.

(C) INPUT DATA COLUMNS GIVE THE LOCATIONS IN WHICH THE ZONAL DATA ITEMS ARE FOUND ON THE ZONAL DATA CARDS. POPULATION AND EMPLOYMENT DATA MUST ALWAYS BE ON INPUT FILE A1.

(D) Z-ARRAY POSITION IS THE SEQUENCE IN WHICH THE DATA ITEM WILL BE PLACED IN THE OUTPUT Z-FILE.

(E) FILE NUMBER IS THE NUMBER OF THE INPUT FILE. IT SHOULD = 1 IN UMODEL/SLIM.

(F) Z-FILE NUMBER IS THE NUMBER OF THE OUTPUT Z-FILE AND USUALLY WILL = 1 IN UMODEL/SLIM.

(G) THE ATTRIBUTE RECORD NAMES TELL UMODEL/SLIM THE NAME BY BY WHICH THE USER WILL REFER TO THAT DATA IN THE FUTURE.

FOR UMODEL/SLIM, A SINGLE ATTRIBUTE FILE WILL BE CREATED, CONTAINING THE POPULATION AND EMPLOYMENT DATA NECESSARY FOR TRIP GENERATION IN UMATRIX/SLIM. THE DATA WILL BE EXACTLY THE SAME AS THE DATA ON THE USER'S INPUT CARD IMAGES, BUT WILL BE STORED IN THE UTPS ATTRIBUTE FILE OR "Z-FILE" FORMAT. ON THE Z-FILE, EACH COLUMN OF VARIABLES VALUES (E.G., NUMBER OF HOUSEHOLDS, RETAIL EMPLOYMENT, ETC.) IS STORED IN ITS OWN ATTRIBUTE RECORD

FOLLOWING ARE SOME SAMPLE DATA IDENTIFICATION CARDS FOR THE DEFAULT UMODEL/SLIM APPLICATION. THE NUMBER LINE GIVES COLUMN NUMBERS FOR THE IDENTIFICATION DATA WHICH FOLLOWS.

```
1---5---10----5---20----5---30----5---40----5---50----5---60----5---70
  1 P      1    5   1 1 1ZONE         ZONE NUMBER
  2 P      6   10   2 1 1HHINC1       HOUSEHOLDS - INC 1
  3 P     11   15   3 1 1HHINC2       HOUSEHOLDS - INC 2
  4 P     16   20   4 1 1HHINC3       HOUSEHOLDS - INC 3
  5 P     21   30   5 1 1POP          TOTAL POPULATION
  6 A     31   40   6 1 1EMPLOY       TOTAL EMPLOYMENT
  7 A     41   50   7 1 1RETAIL       RETAIL EMPLOYMENT
```

SAMPLE PRODUCTION RUN.

```
//UMODEL EXEC UMODEL,CORE=300K,TIME=1,
//         A1='DSN=HHEMP.DATA,VOL=SER=UMTA1',UNITA1=3330,
//         Z1='DSN=HHEMP.ZFILE,VOL=SER=UMTA1',UNITZ1=3330
//UMODEL.SYSIN DD *
     TRANSFER HH & EMPLOYMENT DATA TO Z-FILE
 &PARAM ZONES=180                &END
 &SELECT REPORT=1                &END
 &DATA
  1 P       1    6 1 1  1ZONE          ZONE NUMBER
  2 P       7   12 2 1  1HHINC1        HOUSEHOLDS - INC 1
  3 P      13   18 3 1  1HHINC2        HOUSEHOLDS - INC 2
  4 P      19   24 4 1  1HHINC3        HOUSEHOLDS - INC 3
  5 P      25   30 5 1  1POP           TOTAL POPULATION
  6 A      31   36 6 1  1EMPLOY        TOTAL EMPLOYMENT
  7 A      37   42 7 1  1RETAIL        RETAIL EMPLOYMENT
```

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UMATRIX/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

U M A T R I X / S L I M : TRANSPORTATION DATA MANIPULATION PROGRAM

SUMMARY

UMATRIX/SLIM PERFORMS TWO BASIC FUNCTIONS:

1. THE MANIPULATION OF ZONAL ATTRIBUTE DATA.
2. THE MANIPULATION OF UTPS MATRIX DATA.

ZONAL ATTRIBUTE DATA IS OUTPUT BY UMODEL AND OTHER UTPS PROGRAMS, AND INCLUDES ZONAL ATTRIBUTES SUCH AS POPULATION, EMPLOYMENT, OR TRIP PRODUCTIONS. UTPS MATRIX OR INTERCHANGE DATA MAY CONTAIN INFORMATION SUCH AS TRIP TABLES FROM AGM, HIGHWAY TRAVEL TIME SKIMS FROM UROAD, OR OTHER MATRIX DATA AS OUTPUT FROM PREVIOUS UMATRIX/SLIM RUNS.

UMATRIX/SLIM CAN UPDATE ZONAL AND MATRIX DATA AND CREATE NEW DATA WHICH ARE SIMPLE TRANSFORMATIONS OF EXISTING (INPUT) DATA. THESE DATA TRANSFORMATIONS ARE SPECIFIED USING ALGEBRAIC EXPRESSIONS WITH THE LEFT-HAND SIDE OF THE EXPRESSION NAMING THE NEW DATA TO BE CREATED BY THE OPERATIONS APPEARING ON THE RIGHT-HAND SIDE.

THE FLEXIBILITY OF UMATRIX/SLIM OFFERS CAPABILITIES ACROSS A BROAD RANGE OF TRANSPORTATION PLANNING APPLICATIONS, INCLUDING:

(1) COMBINING TRIP TABLES OR IMPEDANCE MATRICES,

(2) TRIP SPLITTING (CONVERTING P&A TABLES TO O&D),

(3) APPLICATION OF DEMAND MODELS (E.G., TRIP GENERATION).

FURTHER DETAIL ON ALLOWABLE OPERATIONS AND EXAMPLES OF THESE APPLICATIONS APPEAR BELOW. THE USER OF UMATRIX/SLIM SHOULD STUDY THE EXAMPLES IN THE "SAMPLE PRODUCTION RUN SETUPS" TO OBTAIN AN IDEA OF THE PROGRAM'S CAPABILITIES. TO UNDERSTAND THE FULL FLEXIBILITIES AND CAPABILITIES, THE USER SHOULD CONSULT THE COMPLETE UMATRIX DOCUMENTATION.

METHODOLOGY

1. CONTENT OF J-FILES AND Z-FILES

TO FACILITATE DATA STORAGE, CREATION, AND MANIPULATION, UTPS USES CERTAIN NAMING AND STORAGE CONVENTIONS FOR ZONAL AND MATRIX DATA. ZONAL DATA ARE STORED IN ATTRIBUTE FILES. EACH RECORD IN AN ATTRIBUTE FILE CONTAINS AN ATTRIBUTE VALUE (E.G., POPULATION TRIP PRODUCTIONS, ETC.) FOR EACH ZONE.

MATRIX DATA ARE STORED ON J-FILES. EACH MATRIX IN A J-FILE IS GIVEN A TABLE NUMBER BY WHICH IT IS IDENTIFIED.

UMATRIX/SLIM TAKES ADVANTAGE OF THESE NAMING CONVENTIONS IN ITS USER-SPECIFIED OPERATION EXPRESSIONS. THE FORM AND CONTENT OF THESE TYPES OF FILES ARE DISCUSSED IN MORE DETAIL IN THE FULL UTPS UMATRIX DOCUMENTATION.

2. DATA MANIPULATION

UMATRIX/SLIM HAS THE CAPABILITY OF SIMULTANEOUSLY READING BOTH ZONAL ATTRIBUTE DATA AND MATRICES, PERFORMING NUMEROUS USER-SPECIFIED COMPUTATIONS ON THEM, AND OUTPUTTING MANY ZONAL DATA RECORDS OR MATRICES DURING ONE PROGRAM RUN. UMATRIX/SLIM CAN ALSO UPDATE INDIVIDUAL ELEMENTS OF ZONAL RECORDS OR MATRICES AND CREATE NEW ZONAL RECORDS OR MATRICES WHICH ARE SIMPLE TRANSFORMATIONS OF EXISTING ZONAL RECORDS OR MATRICES.

THUS, WHILE OUTPUT IS RESTRICTED TO EITHER ZONAL RECORDS OR MATRICES, INPUT CAN BE EITHER ZONAL RECORDS OR BOTH. THE USER MAY NOT MIX ZONAL AND MATRIX OUTPUT IN THE SAME UMATRIX/SLIM CONTROL CARD BLOCK.

THE SAMPLE PRODUCTION RUN SETUPS BELOW ILLUSTRATE UMATRIX/SLIM USES IN THE UTPS/SLIM PROCESS. USERS SHOULD BECOME FAMILIAR WITH THE SAMPLE PRODUCTION RUNS PRIOR TO RUNNING THE PROGRAM.

REPORTS

TO DISPLAY DATA CREATED IN UMATRIX/SLIM, THE USER MAY REQUEST SEVERAL REPORTS. MATRICES AND ZONAL RECORDS MAY BE DISPLAYED USING THE APPROPRIATE "REPORT<N>" AND "PRINT<N>" KEYWORDS ON THE &SELECT CARD.

REPORT 2. MATRIX DATA PRINTING

THE &SELECT KEYWORD "REPORT2" CAUSES PRINTING OF THE SELECTED INPUT AND OUTPUT MATRICES. THOSE MATRICES MAY BE TRIP TABLES O-D TRAVEL TIMES, O-D DISTANCES, ETC. SELECTED ROWS OF THOSE MATRICES ARE REQUESTED THROUGH THE KEYWORD "PRINT2". FOR EXAMPLE, CODING

```
REPORT2=9001,PRINT2=20
```

RESULTS IN THE PRINTING OF ROW 20 ON TABLE 1 OF MATRIX FILE 9 AS FOLLOWS:

UMATRIX REPORT 2

INTERCHANGE VALUES FROM ROW 20 DATASET J9 TABLE NUMBER

UNITS	0	1	2	3	4	5	6	7	89
TENS		0	0	0	0	0	0	0	00
1	0	0	0	0	0	0	0	0	2210
2	112	22	1	1	1	19	3	2	2114
3	0	6	14	6	7	7	7	7	721
4	0	8	7	4	3	4	3	4	40

TOTAL = 310 MEAN = 6.3

THE TABLE NUMBER SPECIFIED BY THE REPORT2 KEYWORD CONSIST OF THE NUMBER OF THE J-FILE ON WHICH THE TABLE RESIDES (9 IN THE EXAMPLE ABOVE) FOLLOWED BY A 3-DIGIT TABLE NUMBER.

REPORT 4. ZONAL ATTRIBUTE DATA PRINTING

THE &SELECT KEYWORD "REPORT4" CAUSES PRINTOUT OF A SELECTED SERIES OF ZONAL ATTRIBUTES IN A COLUMN FORMAT. SPECFIC ZONES MAY BE SELECTED FOR PRINTING THROUGH USE OF THE "PRINT4" KEYWORD. FOR EXAMPLE, CODING

```
PRINT4=1,-5,
REPORT4='Z1PARKCOST','Z1EMPLOY',
        'Z1DUINC1','Z1DUINC2','Z1DUINC3'
```

RESULTS IN THE PRINTING OF THE SPECIFIC ATTRIBUTES FOR ZONES 1 THROUGH 5 FROM THE ATTRIBUTE FILE Z1, AS FOLLOWS:

UMATRIX REPORT 4

LISTS OF ATTRIBUTE VALUES

CELL	Z1PARKCOST	Z1EMPLOY	Z1DUINC1	Z1DUINC2	Z1DUINC3
1	65.000	39990.000	2170.000	2280.000	517.000
2	51.000	10635.000	7280.000	7620.000	1733.000
3	47.000	15815.000	2410.000	8745.000	5125.000
4	45.000	4995.000	1190.000	4305.000	2525.000
5	.000	5400.000	720.000	7200.000	8550.000
ALL LAV VALUES					
SUM	208.000	76835.000	13770.000	30150.000	18450.000
MEAN	41.600	15367.000	2754.000	6030.000	3690.000
STDEV	21.942	12929.070	2346.372	2379.343	2861.252

AS SHOWN ABOVE, THE CELL COLUMN CONTAINS THE ZONE NUMBER. IF ALL ZONAL VALUES FOR A PARTICULAR ZONE ARE MISSING, (E.G., IF A ZONE NUMBER WAS SKIPPED SO THE ZONE DOESN'T EXIST) THEN THAT ZONE IS NOT PRINTED. FOR ZONAL ATTRIBUTE DISPLAYS, THE PRINT4 KEYWORD REFERS TO ZONE NUMBERS. THE TERM "LAV" STANDS FOR "LIST OF ATTRIBUTE VALUES" AND IS UTPS JARGON FOR ZONAL ATTRIBUTE RECORD. THE ATTRIBUTE NAMES SPECIFIED BY THE REPORT4 KEYWORD MUST BE IN SINGLE QUOTES PRECEDED BY Z <N> WHERE <N> IS THE NUMBER OF THE Z-FILE ON WHICH THE ATTRIBUTE IS STORED.

REPORT 5. ATTRIBUTE FILE CONTENTS

A REPORT ON THE CONTENTS OF ANY ATTRIBUTE (OR "Z") FILE IS CONTROLLED BY THE "REPORT5" KEYWORD ON THE &SELECT CARD. REPORT 5 DISPLAYS THE ATTRIBUTE NAMES OF ALL Z-FILES REFERENCED. IT PROVIDES INFORMATION ON THE Z-FILE CREATION DATE, DISK SPACE CURRENTLY AVAILABLE AND THE LAVS (OR ATTRIBUTE RECORDS) WHICH RESIDE ON EACH Z-FILE. FOR EXAMPLE, CODING

```
REPORT5=1
```

RESULTS IN THE FOLLOWING REPORT:

UMATRIX REPORT 5

C O N T E N T S O F Z - F I L E Z 1

ZONES= 2746 CREATION: DATE= 3JUN82 TIME=17.19.45 PROG=UMODEL
CREATED FROM DSN=UMTA.POPEMP.DATA

SPACE (WORDS):	TOTAL DATA=270000	USED= 91550	UNUSED AVAILABLE=178450	EMBEDDED FREE SPACE= 0

ATTRIBUTE ENTRIES: LAVS PRESENT= 6 MAX LAVS POSSIBLE= 10

			CREATION			
LAV NAME	UNITS	TYPE	DATE	TIME	PROGRAM	DESCRIPTION
HBWP		I*2	3JUN82	17.19	UMATRIX	WORK PROD
HBWA		I*2	3JUN82	17.19	UMATRIX	WORK ATTR

REPORT 6. MATRIX FILE CONTENTS

A REPORT ON THE CONTENTS OF ANY MATRIX (OR "J") FILE IS CONTROLLED BY THE "REPORT6" ON THE &SELECT CARD. REPORT 6 DISPLAYS THE TABLE NUMBERS (AND DESCRIPTION IF PROVIDED BY THE USER) OF ALL INPUT J-FILES REFERENCED. IT PROVIDES INFORMATION ON THE J-FILE CREATION DATE AND THE INDIVIDUAL TABLES WHICH RESIDE ON EACH J-FILE. FOR EXAMPLE, CODING

```
REPORT6=J1
```

RESULTS IN THE FOLLOWING REPORT:

UMATRIX REPORT 6

D I R E C T O R Y O F J - F I L E J 1

ZONES= 5 CREATION: DATE=14JUN82 TIME=10.53.46
CREATED FROM J-FILE: DSN=UMTA.NCS.FIMPS

TABLE ENTRIES: TABLES PRESENT= 3 MAX TABLES POSSIBLE= 255

			CREATION			
TABLE	UNITS	TYPE	DATE	TIME	PROGRAM	DESCRIPTION
1001		I*4	14JUN82	10.53		HBW TRIPS
1002		I*4	14JUN82	10.53		HBO TRIPS
1003		I*4	14JUN82	10.53		NHB TRIPS

FILE TABLE

	FILENAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS
	J1-J8	FT11F001 -FT18F001	INPUT MATRIX FILES
	Z1-Z8	Z1-Z8	INPUT Z-FILES
OUTPUT	J9	FT19F001	OUTPUT MATRIX FILE
	Z9	Z9	OUTPUT Z-FILE

FOR EXAMPLE, FOR A TRIP GENERATION RUN IN UMATRIX/SLIM, ONE Z-FILE (Z1) CONTAINING SEVERAL ATTRIBUTE RECORDS OF HOUSEHOLD AND EMPLOYMENT DATA WOULD BE INPUT, AND ONE Z-FILE (Z9) CONTAINING SEVERAL ATTRIBUTE RECORDS OF TRIP PRODUCTIONS AND ATTRACTIONS WOULD BE OUTPUT. NO J-FILES WOULD BE SPECIFIED.

FOR A RUN TO ADD TWO TRIP TABLES, TWO J-FILES (J1 AND J2) MIGHT BE INPUT, AND ONE J-FILE (J9) OF THE RESULTING TRIP TABLE WOULD BE OUTPUT. ANY OF THE J-FILES MAY CONTAIN MORE THAN ONE TABLE, JUST AS A Z-FILE MAY CONTAIN MORE THAN ONE LAV. NO Z-FILE WOULD BE SPECIFIED IF ONLY MATRIX DATA WERE BEING MANIPULATED.

KEYWORD TABLE

	KEYWORD	TYPE	VALUE OR PURPOSE
&PARAM	SIZE	I	HIGHEST ZONE NUMBER ON OUTPUT TABLES MAXIMUM ZONES = 2500.
	Z9<A> <A>=LAVNAME	A800 (32)	LAV OPERATION STATEMENT (THE ALGEBRAIC EXPRESSION TO COMPUTE OR DERIVE THE LAV NAMED <A>)
	J9<A> <A>=001-032 = TABLE NO.	A800 (32)	MATRIX OPERATION STATEMENT (THE ALGEBRAIC EXPRESSION TO COMPUTE THE MATRIX WITH THE TABLE NUMBER <A>).
	SIZE9	I	ZONE SIZE OF NEW Z9 FILE
&SELECT	REPORT2	R(99)	DISPLAY INPUT AND OUTPUT MATRICES WHOSE TABLE #'S ARE LISTED
	PRINT2	R(100)	IN REPORT2, DISPLAY MATRIX ROWS FOR ZONES LISTED
	REPORT4	A10(99)	DISPLAY INPUT AND OUTPUT OF LAVS LISTED
	PRINT4	R(100)	ZONES FOR REPORT4 DISPLAY
	REPORT5	R(9)	DISPLAY CONTENTS OF Z-FILES LISTED
	REPORT6	R(9)	DISPLAY CONTENTS OF J-FILES LISTED

KEYWORD NOTES

&PARAM KEYWORDS

SIZE IS REQUIRED ON THE &PARAM CARD WHENEVER MATRICES ARE OUTPUT. THE VALUE OF SIZE IS THE NUMBER OF COLUMNS IN EACH OUTPUT MATRIX, AND WILL BE USED TO ESTIMATE CORE REQUIREMENTS. THUS,

```
SIZE = 180
```

SAYS THE INPUT AND OUTPUT MATRICES HAVE 180 COLUMNS. IF THE KEYWORD SIZE IS NOT SPECIFIED, UMATRIX/SLIM CANNOT DETERMINE OUTPUT J-FILE DIMENSIONS AND A FATAL ERROR OCCURS.

IN EXPRESSIONS THAT USE Z-FILES AND MATRICES TOGETHER, DIMENSIONALITY MUST BE HELD CONSTANT; I.E., Z-FILES AND MATRICES MUST HAVE THE SAME NUMBER OF ZONES, OR A FATAL ERROR WILL OCCUR.

Z9<A> DEFINES AN OPERATION STATEMENT CREATING A NEW ATTRIBUTE (LAV) ON THE Z-FILE. THE STATEMENT MUST BE ENCLOSED IN SINGLE QUOTES AND MAY REFERENCE OTHER LAVS AND TABLES. NORMAL ARITHMETIC OPERATORS (+ , - , / , * , **) AS WELL AS MANY OTHER SPECIAL FUNCTIONS ARE AVAILABLE (SEE COMPLETE UMATRIX DOCUMENTATION). <A> IS A USER-SPECIFIED ATTRIBUTE NAME, WITH A MAXIMUM OF 8 CHARACTERS. FOR EXAMPLE,

```
Z9DEN='Z1POP/Z1ACRES'
```

DEFINES THE CREATION OF AN ATTRIBUTE NAMED "DEN" LOCATED ON Z-FILE 9. Z9DEN IS CREATED FROM THE DIVISION Z1POP/Z1ACRES AND WILL HAVE THE SAME NUMBER OF ZONES (ELEMENTS) AS LAVS ON Z1.

NUMEROUS LAV OPERATION STATEMENTS MAY EXIST ON THE SAME &PARAM CARD. MULTIPLE Z-FILES MAY BE REFERENCED AS WELL. NEWLY CREATED LAVS MAY BE REFERENCED IN SUBSEQUENT OPERATION STATEMENTS ON THE SAME &PARAM CARD.

J9<XXX> DEFINES AN OPERATION STATEMENT CREATING A J9 OUTPUT TABLE. <XXX> IS THE 3-DIGIT TABLE NUMBER. TABLES MUST BE NUMBERED SEQUENTIALLY STARTING AT 001. UP TO 32 TABLES MAY BE OUTPUT IN A SINGLE UMATRIX RUN, BUT IN UMATRIX/SLIM, THE HIGHEST TABLE NUMBER WILL PROBABLY BE 003. THE TABLE NUMBER IS COMBINED WITH THE J9 KEYWORD TO FORM A 4 DIGIT OUTPUT TABLE, FOR EXAMPLE- J9001, J9002 AND J9003. AS WITH THE LAV OPERATION STATEMENTS, OTHER TABLES AND LAVS MAY BE REFERENCED AND THE ARITHMETIC OPERATORS ARE AVAILABLE. THE RIGHT-SIDE OF EACH OPERATION STATEMENT MUST BE ENCLOSED IN SINGLE QUOTES.

SIZE9 MUST BE SPECIFIED WHENEVER A Z-FILE (Z9) IS TO BE CREATED AND A SET OF LAVS OUTPUT ON IT. FOR UMATRIX/SLIM, SIZE9, WHERE 9 INDICATES OUTPUT FILE Z9, IS EQUATED TO THE NUMBER OF ELEMENTS (ZONES) IN THE NEW LAVS.

```
SIZE9=180
```

STATES THAT A NEW Z-FILE, Z9, WILL CONTAIN NEW ZONAL ATTRIBUTE RECORDS AND EVERY RECORD ON Z9 WILL HAVE 180 VALUES.

&SELECT KEYWORDS

REPORT2 ALLOWS FOR THE DISPLAY OF INPUT AND OUTPUT MATRICES, E.G.

```
REPORT2 = 1001,9001
```

WILL PRINT INPUT MATRIX 1001 AND OUTPUT MATRIX 9001. ALL ROWS OF INPUT TABLES ARE PRINTED FIRST, THEN OUTPUT ROWS.

PRINT2 LIMITS THE DISPLAY OF ROWS OF INPUT AND OUTPUT MATRICES IN REPORT2 TO THE ZONES LISTED. A ROW WHICH IS ALL ZEROES WILL WILL NOT BE PRINTED. IF THE ENTIRE MATRIX IS ALL ZEROES, ONLY THE FRIST TEN CELLS ARE PRINTED. FOR EXAMPLE, IF

```
PRINT2 = 1,10,50
```

THEN ROWS 1, 10 AND 50 ARE DISPLAYED FOR ALL MATRICES REFERENCED IN THE REPORT2 KEYWORD.

REPORT4 ALLOWS FOR THE DISPLAY OF ZONAL ATTRIBUTE VALUES, E.G.,

```
REPORT4 = 'Z1POP','Z1RETAIL','Z9HBOATTR'
```

WILL PRINT SPECIFIED ELEMENTS OF LAVS Z1POP, Z4RETAIL AND Z9HBOATTR. THE ZONES WHOSE VALUES ARE PRINTED ARE CONTROLLED THROUGH THE PRINT4 KEYWORD. REPORT4 LAV NAMES MUST BE ENCLOSED IN SINGLE QUOTES.

PRINT4 PERMITS DISPLAY OF SELECTED LAV ELEMENTS IN A REPORT4 FORMAT. FOR EXAMPLE, IF

```
PRINT4 = 1,-180,
```

THEN ZONES 1 THROUGH 180 OF ALL LAVS LISTED ON THE REPORT4 STATEMENT WILL BE DISPLAYED.

REPORT5 IS USED TO DISPLAY THE DIRECTORY OF ALL Z-FILES REFERENCED. IT PROVIDES A REPORT DESCRIBING EACH Z-FILE'S CREATION DATE, SPACE AVAILABLE, AND THE LAVS WHICH RESIDE ON EACH Z-FILE. FOR EXAMPLE,

```
REPORT5 = 1,9
```

PRINTS THE DIRECTORY OF ATTRIBUTE FILES Z1 AND Z9.

REPORT6 IS USED TO DISPLAY THE DIRECTORY OF ALL J-FILES REFERENCED. FOR EXAMPLE,

```
REPORT6 = 1
```

PRINTS THE DIRECTORY OF MATRIX FILE J1. TABLE NUMBERS, TABLE DESCRIPTION AND CREATION DATE ARE DISPLAYED.

GENERAL NOTES

LAV'S

LAV'S OR ATTRIBUTE RECORDS ARE DESIGNATED BY A USER-MNEMONIC NAME (MAXIMUM OF 8 CHARACTERS), PRECEDED BY THE Z-FILE NUMBER, E.G. Z1POP OR Z9TRIPS. UMATRIX/SLIM DETERMINES THE SIZE (NUMBER OF ZONES) OF LAVS FROM THE &PARAM SIZE9.

MATRICES

MATRICES ARE DESIGNATED BY A 3 DIGIT TABLE NUMBER PRECEDED BY THE J-FILE NUMBER; E.G. J2001 IS TABLE 1 ON FILE J2. UMATRIX/SLIM WILL USE THE &PARAM SIZE VALUE AS THE OUTPUT ZONES VALUE.

ONCE A J9 TABLE HAS BEEN CALCULATED, IT TOO CAN BE USED AS INPUT FOR ANOTHER TABLE EXPRESSION (I.E. IF THERE ARE 2 J9 TABLES, J9001 CAN BE USED AS TABLE INPUT IN J9002).

ARITHMETIC OPERATIONS

THROUGH THE USE OF ARITHMETIC OPERATORS, THE USER CAN SPECIFY SIMPLE LAV TRANSFORMATIONS. FOR INSTANCE, IF REGIONAL POPULATION IS EXPECTED TO INCREASE AT A RATE OF 15% BETWEEN THE BASE YEAR AND 1990, THEN A NEW LAV Z9POP1990, PROJECTED 1990 POPULATION, CAN BE CREATED THROUGH THE FOLLOWING EXPRESSION.

```
Z9POP1990 ='1.15 * Z1POP'
```

THE OTHER OPERATORS ARE: ADD (+), SUBTRACT (-), MULTIPLY (*), DIVIDE (/), AND EXPONETIATION (**).

LAV AND MATRIX MANIPULATION

UMATRIX/SLIM ALLOWS THE USER TO PERFORM VARIOUS LAV AND MATRIX CALCULATIONS SIMILAR TO THE EXAMPLES ABOVE. THIS INVOLVES ARITHMETIC OPERATIONS, CONDITIONAL OPERATIONS, AND SPECIAL MATRIX FUNCTIONS. ALL LAV AND MATRIX OPERATIONS ARE PERFORMED ON A CELL-BY-CELL BASIS. SEE THE FULL UMATRIX PROGRAM WRITEUP FOR A COMPLETE EXPLANATION OF LAV AND MATRIX MANIPULATION.

MATRIX TRANSPOSITION OPERATOR (TR)

THE MATRIX TRANSPOSE CAPABILITY ENABLES THE USER TO TRANSPOSE AN INPUT MATRIX. ITS USE IN TRANSPORTATION PLANNING IS USUALLY FOR "SPLITTING" P & A TRIPS TO O & D TRIPS. IT IS NOT PERMITTED TO TRANSPOSE A MATRIX GENERATED IN A PREVIOUS &PARAM EXPRESSION; E.G., TR(J9001) IS NOT PERMITTED, RATHER A SECOND UMATRIX RUN WOULD BE NECESSARY.

IT IS OFTEN NECESSARY TO TRANSPOSE A MATRIX WHEN A TRIP TABLE, BASED ON PRODUCTIONS AND ATTRACTIONS MUST BE SPLIT TO AN ORIGIN-DESTINATION TRIP TABLE FOR PROPER DIRECTIONALITY. THE TRANSPOSITION FUNCTION "TR" TRANSPOSES A MATRIX AS SHOWN BELOW.

IF:

```
                +-          -+
                |  10 50 70  |
J1001 =         |  20 90 30  |
                |  35 95 15  |
                +-          -+
```

THEN THE EXPRESSION

```
J9001 = TR(J1001)
```

WOULD RESULT IN

```
                +-          -+
                |  10 20 35  |
J9001 =         |  50 90 95  |
                |  70 30 15  |
                +-          -+
```

SUM OPERATOR

THE "SUM" OPERATOR, USED TO NORMALIZING PRODUCTIONS IN THE TRIP GENERATION SET-UP, IS USED TO SUM ALL ELEMENTS IN AN ATTRIBUTE RECORD. THE OUTPUT LAV GENERATED BY THE SUM FUNCTION WILL CONTAIN THE SAME VALUE IN ALL ITS CELLS.

E.G. IF:

$$ZIP = \begin{bmatrix} 1500 \\ 2000 \\ 500 \end{bmatrix} \quad \& \quad ZIA = \begin{bmatrix} 1000 \\ 2000 \\ 2000 \end{bmatrix}$$

THEN

$$Z9TOTP = \text{'SUM(ZIP)'} = \begin{bmatrix} 4000 \\ 4000 \\ 4000 \end{bmatrix}$$

$$Z9TOTA = \text{'SUM(ZIA)'} = \begin{bmatrix} 5000 \\ 5000 \\ 5000 \end{bmatrix}$$

$$Z9NORM = \text{'Z1TOTA/Z1TOTP'} = \begin{bmatrix} 1.25 \\ 1.25 \\ 1.25 \end{bmatrix}$$

$$Z9NEWPS = \text{'ZIP*Z9NORM'} = \begin{bmatrix} 1500*1.25 \\ 2000*1.25 \\ 500*1.25 \end{bmatrix} = \begin{bmatrix} 1875 \\ 2500 \\ 625 \end{bmatrix}$$

SAMPLE PRODUCTION RUN SET-UPS

THE FOLLOWING JCL AND CONTROL CARD SETUPS ILLUSTRATE SOME OF THE FUNCTIONS AVAILABLE IN UMATRIX/SLIM.

1. TRIP GENERATON MODEL WITH THREE TRIP PURPOSES.

```
// EXEC UMATRIX,CORE=256K,
//      Z1='DSN=HHEMP.DATA,VOL=SER=UMTA1',UNITJ1=3330,
//      Z9='DSN=TGEN90.DATA VOL=SER=UMTA1',UNITZ1=3330
//UMATRIX.SYSIN DD *
 UMATRIX/SLIM TRIP GENERATION
 <NOTE THAT AN UNLIMITED NUMBER EXPLANATORY "TITLE" CARD MAY PRECEDE
 THE &PARAM STATEMENT IN ANY UTPS PROGRAM.>

 TO APPLY A TRIP GENERATION MODEL, UMATRIX/SLIM USES TRIP PRODUCTION
 RATES PER HOUSEHOLD FOR EACH OF 3 INCOME LEVELS TO ESTIMATE ZONAL
 TRIP PRODUCTIONS.  ZONAL TRIP ATTRACTIONS ARE ESTIMATED USING
 ATTRACTION RATES PER EMPLOYEE FOR RETAIL EMPLOYMENT AND OTHER
 EMPLOYMENT. PRODUCTIONS ARE BALANCED TO REGIONAL ATTRACTIONS FOR
 HOME-BASED WORK TRIPS AND NONWORK TRIPS.

 ZONAL EMPLOYMENT AND HOUSEHOLD DATA ARE TAKEN FROM A ZONAL ATTRIBUTE
 FILE (HHEMP.DATA).  PRODUCTIONS AND ATTRACTIONS ARE OUTPUT AS ZONAL
 ATTRIBUTES TO A NEW FILE (Z9) FOR LATER INPUT INTO AGM/SLIM.

 &PARAM   SIZE9=180
     Z9HBWP1='1.10*Z1HHINC1',
     Z9HBWP2='1.80*Z1HHINC2',
     Z9HBWP3='2.00*Z1HHINC3',
     Z9TOTPROD='SUM(Z9HBWP1+Z9HBWP2+Z9HBWP3)',
     Z9HBWATTR='1.60*(Z1EMPLOY) + 1.70*(Z1RETAIL)',
     Z9TOTATTR='SUM(Z9HBWATTR)',
     Z9NORMAL='Z9TOTATTR/Z9TOTPROD',
     Z9HBWPROD='(Z9HBWP1+Z9HBWP2+Z9HBWP3)*Z9NORMAL',
     Z9HBOP='1.60*(Z1HHINC1+Z1HHINC2+Z1HHINC3) + 1.40*(Z1POP)',
     Z9HBOATTR='2.00*(Z1EMPLOY) +  9.00*(Z1RETAIL)
               + 1.00*(Z1HHINC1+Z1HHINC2+Z1HHINC3)',
     Z9NHBP='1.00*(Z1EMPLOY) +  4.00*(Z1RETAIL)
                + 0.50*(Z1HHINC1+Z1HHINC2+Z1HHINC3)',
     Z9NHBATTR='Z1NHBP',
     Z9TOTNWP='SUM(Z9HBOP+Z9NHBP)',
     Z9TOTNWA='SUM(Z9HBOATTR+Z9NHBTTRP)',
     Z9NORM2='Z9TOTNWA/Z9TOTNWP',
     Z9HBOPROD='Z9NORM2*Z9HBOP',
     Z9NHBPROD='Z9NORM2*Z9NHBPROD',

 &END
 &SELECT
     REPORT4='Z9HBWPROD','Z9HBWATTR',
             'Z9HBOPROD','Z9HBOATTR',
             'Z9NHBPROD','Z9NHBATTR',
     PRINT4=1,-5
 &END
```

2. MATRIX CALCULATIONS

A. THREE PERSON TRIP TABLES (BY PURPOSE) ARE ON INPUT FILE J1. IT IS DESIRED TO FACTOR THESE TABLES TO VEHICLE TRIPS BY APPLYING MODAL SPLIT AND OCCUPANCY FACTORS.

```
// EXEC UMATRIX,CORE=256K,
//  J1='DSN=GRAV90.TRIPS,VOL=SER=UMTA1',UNITJ1=3330,
//  J9='DSN=VEHI90.TRIPS,VOL=SER=UMTA1',UNITJ9=3330
//UMATRIX.SYSIN DD *
FACTOR HBW, HBO, & NHB TRIP TABLES FOR TRANSIT & OCCUPANCY
 &PARAM SIZE=180,
        J9001='(J1001 * 0.90) / 1.15',
        J9002='(J1002 * 0.98) / 1.40',
        J9003='(J1003 * 1.00) / 1.10'              &END
```

NOTICE THAT THE J<XXX> OPERATION STATEMENT MUST BE ENCLOSED WITHIN QUOTES AND THAT THE SIZE KEYWORD MUST BE CODED. THE FIRST FACTOR FOLLOWING THE TABLE NUMBER (E.G., 0.90) IS A SIMPLE AUTO MODE SPLIT FOR EACH TRIP PURPOSE AND THE SECOND (E.G., 1.15) IS THE AVERAGE AUTO OCCUPANCY FOR EACH TRIP PURPOSE.

B. IT IS DESIRED TO SPLIT P&A DAILY VEHICLE TABLES (ON J1) FROM THE ABOVE UMATRIX/SLIM RUN INTO A BALANCED DAILY VEHICLE O & D TABLE FOR ASSIGNMENT.

```
// EXEC UMATRIX,CORE=256K,
//  J1='DSN=VEHI90.TRIPS,VOL=SER=UMTA1',UNITJ1=3330,
//  J9='DSN=OD90.TRIPS,VOL=SER=UMTA1',UNITJ9=3330
//UMATRIX.SYSIN DD *
CONVERT P & A TABLES TO O & D
 &PARAM SIZE=180,
        J9001='.5 * (J1001 + J1002 + J1003)
            + .5 * TR(J1001 + J1002 + J1003)'    &END
```

NOTICE THE USE OF THE TRANSPOSITION FUNCTION REFERENCED BY "TR". A RUN TO CREATE A PEAK PERIOD VEHICLE O & D TABLE WOULD USE DIFFERENT FACTORS FOR EACH TRIP PURPOSE AND DIRECTION, SO THAT THE J9001 EQUATION MIGHT BE:

```
J9001 = '.20*J1001 + .05*J1002 + .05*J1003 +
      TR(.02*J1001 + .02*J1002 + .05*J1003)'
```

3

AGM/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

A G M / S L I M : GRAVITY MODEL PROGRAM

SUMMARY

AGM/SLIM IS A GRAVITY MODEL PROGRAM WHICH IS USED IN THE APPLICATION OF A GRAVITY-TYPE TRIP DISTRIBUTION MODEL. THE USER SHOULD BE THOROUGHLY FAMILIAR WITH THE GRAVITY MODELING PROCESS BEFORE ATTEMPTING TO APPLY THE PROGRAM. THIS WRITEUP COVERS AGM/SLIM APPLICATION ONLY.

INPUTS TO AGM/SLIM ARE:

(1) ZONAL TRIP PRODUCTIONS - NUMBER OF TRIPS PRODUCED BY A ZONE; CALLED "PRODUCTIONS" IN THE GRAVITY MODEL FORMULA.

(2) ZONAL TRIP ATTRACTIONS - NUMBER OF TRIPS ATTRACTED BY A ZONE; GRAVITY MODEL ITERATIONS ATTEMPT TO BALANCE ESTIMATED TRIPS INTO EACH ZONE WITH THIS NUMBER.

(3) "FRICTION" FACTORS - TIME DEPENDENT FACTORS USED IN THE GRAVITY MODEL FORMULA.

(4) TIME SKIM MATRIX - ZONE-TO-ZONE TRAVEL TIMES, INCLUDING TERMINAL AND INTRAZONAL TIMES; ALSO CALLED "SKIMS". USED IN THE GRAVITY MODEL FORMULA TO DETERMINE THE APPROPRIATE FRICTION FACTORS FOR EACH ZONE TO ZONE MOVEMENT.

A DIFFERENT SET OF PRODUCTIONS, ATTRACTIONS, AND F-FACTORS ARE INPUT FOR EACH TRIP PURPOSE. THE OUTPUT CONSISTS OF A MERGED MATRIX DATASET (J-FILE) CONTAINING UP TO THREE TRIP TABLES.

AGM/SLIM APPLIES THE USUAL GRAVITY MODEL TO ESTIMATE A TRIP DISTRIBUTION. APPLICATION MODE "A=T" SHOULD BE SELECTED ON THE &OPTION CARD. THE ZONAL TRIP PRODUCTIONS AND ATTRACTIONS ARE INPUT THRU P AND A Z-FILE DATASETS. AGM/SLIM NORMALIZES THE ATTRACTIONS, MAKING THEIR SUM EQUAL TO THE SUM OF THE PRODUCTIONS. TRIPS ARE CALCULATED BY APPLICATION OF THE GRAVITY MODEL FORMULA:

```
V(I,J) := P(I) * AF(J) * F(T(I,J)) / X(I) : I,J=1,ZONES
```

WHERE:

```
V(I,J) = TRIPS PRODUCED AT ZONE I AND ATTRACTED TO ZONE J
P(I)   = TRIPS PRODUCED AT ZONE I
AF(J)  = ATTRACTION FACTOR AT ZONE J
T(I,J) = TRAVEL TIME TO GO FROM ZONE I TO ZONE J
F      = FRICTION FACTOR (FUNCTION OF TRAVEL TIME)
X(I)   = NORMALIZATION CONSTANT (ACCESSIBILTY) FOR ZONE I
       = SUM (AF(N) * F(T(I,N)) : N=1,ZONES)
```

A MORE COMPLETE DESCRIPTION OF THE GRAVITY MODEL ITERATION PROCESS MAY BE FOUND IN THE FULL AGM PROGRAM WRITEUP.

REPORTS

THE FOLLOWING REPORTS ARE AVAILABLE IN AGM/SLIM.

REPORT 3. THE F-FACTOR DISTRIBUTION REPORT CONSISTS OF A GRAPH OF F-FACTORS FOR EACH OUTPUT TABLE. THIS REPORT IS ALWAYS PRINTED.

F-FACTORS FOR HB WORK

```
 0    6   12   18   24   30   36   42   48   54   60
 +----+----+----+----+----+----+----+----+----+----+ F-FACTOR PERCENT
 0.....................................................      2   5.364
 1.....................................................      2   5.364
 2.....................................................      1   4.853
 3.....................................................      1   4.551
 4.....................................................      1   4.332
 5.....................................................      1   4.157
 6.....................................................      1   4.009
 7.....................................................      1   3.880
 8.....................................................      1   3.765
 9.....................................................      1   3.660
10.....................................................      1   3.564
11.....................................................      1   3.475
12.....................................................      1   3.392
13.....................................................      1   3.313
14.....................................................      1   3.239
15.....................................................      1   3.169
16.....................................................      1   3.101
17.....................................................      1   3.037
18.....................................................      1   2.975
19.....................................................      1   2.916
20.....................................................      1   2.859
21.....................................................      1   2.804
22.....................................................      1   2.750
23.....................................................      1   2.699
24.....................................................      1   2.649
25.....................................................      1   2.600
26.....................................................      1   2.553
27.....................................................      1   2.507
28.....................................................      1   2.463
THE F-FACTORS FOR ALL SUBSEQUENT INTERVALS ARE EQUAL TO     1.
```

REPORT 5. ZONAL SUMMMARY REPORT

REPORT 5 SHOWS ESTIMATED TRIPS, AVERAGE TRIP LENGTH OF THE ESTIMATED TRIPS, ACCESSIBILITY, AND THE RATIO OF PERCENT TRIPS TO PERCENT ACCESSIBILITY INTO AND OUT OF EACH ZONE. IT ALSO SHOWS A COMPARISON OF ATTRACTIONS (A) TO ESTIMATED TRIPS ATTRACTED (TA). THIS REPORT IS PRINTED FOR EACH OUTPUT TRIP TABLE.

ZONAL SUMMARY FOR HB WORK TRIPS
(ACCESS SCALED TO TOTAL 10000)

	----TRIPS----		-TBAR--		-ACCESS-		%TRIPS/%ACC		---A VS TA---		
ZONE	IN(TA)	OUT(P)	IN	OUT	IN	OUT	IN	OUT	A	TA-A	TA/A
1	2855	1037	16	4	1993	2782	3.22	0.84	2856	-1	1.00
2	1059	1771	10	12	2329	2188	1.02	1.82	1058	1	1.00
3	258	595	17	23	1952	1734	0.30	0.77	259	-1	1.00
4	103	288	21	25	1798	1662	0.13	0.39	102	1	1.01
5	167	751	18	26	1928	1634	0.20	1.03	167	0	1.00
		4442		15		10000		1.00		0	
	4442		15		10000		1.00		4442		1.00

DEFINITIONS OF COLUMN HEADINGS IN REPORT 5:

TRIPS IN = TRIPS ESTIMATED INTO ZONE, INCLUDING INTRAZONALS.
TRIPS OUT = TRIPS ESTIMATED OUT OF ZONE, INCLUDING INTRAZONALS.

TBAR IN
TBAR OUT
ACCESS IN
ACCESS OUT
%TRIPS IN
%TRIPS OUT
%ACC IN
%ACC OUT
%TRIPS/%ACC

DESCRIPTIONS OF THESE COLUMNS MAY BE FOUND IN THE AGM FULL PROGRAM WRITEUP. ANALYSIS OF THE VALUES IN THESE COLUMNS IS NOT CRITICAL TO UNDERSTANDING THE GRAVITY MODEL RESULTS IN NORMAL APPLICATIONS.

A = OBSERVED (INPUT) ATTRACTIONS.
TA = ESTIMATED (OUTPUT) TRIPS ATTRACTED.

THE MARGINAL SUMS OF THE ESTIMATED TRIP MATRIX ARE EQUAL TO "P" ACROSS COLUMNS AND MAY OR MAY NOT BE EQUAL TO "A" DOWN THE ROWS, THE LATTER DEPENDING ON THE SUCCESS OF THE ITERATION PROCESS. I.E,

SUM (V(I,J) : J=1,ZONES) = P(I) : I=1,ZONES
SUM (V(I,J) : I=1,ZONES) NOT= A(J) : J=1,ZONES

THE COMPARISON OF THIS LATTER SUM TO A(J) APPEARS IN THE LAST 3 COLUMNS OF REPORT 5.

REPORT 8. TRIP LENGTH FREQUENCY DISTRIBUTION

REPORT 8 IS AN ESTIMATED TRIP LENGTH FREQUENCY DISTRIBUTION AND IS PRINTED FOR EACH OUTPUT TABLE AND FOR TOTAL TRIPS.

HB WORK
ESTIMATED TRIP LENGTH DISTRIBUTION
SKIM = HWY SKIM(TABLE 1001) TRIPS = HB WORK(TABLE 9001)
STRATIFIED BY F-FACTOR INTERVAL

```
 0    4    8   12   16   20   24   28   32   36   40
 +----+----+----+----+----+----+----+----+----+----+
 0.....................................                 33.5   33.5  1490
 1. (ALL COUNTS FROM INTERVAL   1 THRU  16 ARE ZERO)    0.0   33.5     0
17.................................                    27.2   60.8  1210
18.                                                    0.0   60.8     0
19........                                             5.4   66.2   242
20.                                                    0.0   66.2     0
21....                                                 2.2   68.4    97
22.                                                    0.0   68.4     0
23..                                                   0.8   69.2    34
24.                                                    0.0   69.2     0
25.                                                    0.0   69.2     0
26.                                                    0.0   69.2     0
27.                                                    0.0   69.2     0
28.....................................               30.8  100.0  1369
```

MEAN	VARIANCE	STD DEV	SUM(COUNT(I))	SUM(I*COUNT(I))
14.930	130.790	11.436	4442.	66319.

FILE TABLE

	FILENAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS
	Z1	Z1	ZONAL Z-FILE CONTAINING P & A LAVS FOR THREE TRIP PURPOSES
	J1	FT11F001	TRAVEL TIME MATRIX (SKIMS)
	F	A3	F-FACTORS
OUTPUT	J9	FT19F001	OUTPUT MATRIX FILE OF THREE TRIP TABLES BY TRIP PURPOSE

KEYWORD TABLE

	KEYWORD	TYPE	DEFAULT	VALUE OR PURPOSE
&PARAM	AITER	I(3)	1	MAXIMUM NUMBER OF ITERATIONS FOR ESTIMATING ATTRACTIONS FOR EACH OUTPUT TABLE.
	ZP<N>	A(10)		NAME OF LAV CONTAINING PRODUCTIONS FOR TABLE N.
	ZA<N>	A(10)		NAME OF LAV CONTAINING ATTRACTIONS FOR TABLE N.
	TABOUT	I	1	QUANTITY OF OUTPUT TABLES (USUALLY THREE IN UTPS/SLIM).
&OPTION	A=T	L	F	TO RUN PROGRAM IN APPLICATION ONLY MODE (MODE A), THE ONLY MODE AVAILABLE IN UTPS/SLIM.
&SELECT	REPORT	R(3)	3	LIST OF REPORT NUMBERS 3, 5, AND 8 FOR PRINTING.
	PRINT	R(200)	0	LIST OF SEVERAL PRODUCTION ZONE NUMBERS SPECIFYING ROWS OF OUTPUT TRIP TABLES TO BE PRINTED FOR CHECKING.

KEYWORD NOTES

&PARAM KEYWORDS THE &PARAM CARD MUST BE THE FIRST CONTROL CARD FOLLOWING THE TITLE CARD.

AITER IS THE MAXIMUM NUMBER OF TIMES THE PROGRAM ITERATES TO CALCULATE ATTRACTION FACTORS. AITER IS CODED POSITIONALLY FOR EACH OUTPUT TABLE. THE PROGRAM WILL ITERATE LESS THAN AITER IF THE CONVERGENCE CRITERION (DELA=0.10) IS SATISFIED. E.G., IF

```
AITER=5,3,3
```

THEN FOR TABLE 1 AGM WILL PERFORM UP TO 5 ITERATIONS, AND FOR TABLES 2 AND 3 UP TO 3 ITERATIONS, IN ORDER TO ESTIMATE ATTRACTION FACTORS.

TABOUT IS THE NUMBER OF OUTPUT TRIP TABLES TO BE CALCULATED BY AGM/SLIM. TABOUT IS ALSO THE NUMBER OF SETS OF INPUT NUMBER OF SETS OF PRODUCTIONS, ATTRACTIONS AND F-FACTORS WHICH THE USER MUST PROVIDE. E.G., IF

```
TABOUT=3
```

THEN, THERE MUST BE THREE SETS OF PRODUCTIONS, ATTRACTIONS, AND F-FACTORS INPUT, AND THREE TABLES WILL BE OUTPUT TO THE J9 FILE.

&OPTION KEYWORD THE &OPTION CARD MUST BE INPUT. IT FOLLOWS THE &PARAM CARD.

A=T IS A LOGICAL KEYWORD INSTRUCTING THE PROGRAM TO OPERATE IN THE APPLICATION ONLY MODE. FOR AGM/SLIM, THIS MUST ALWAYS BE CODED.

&SELECT KEYWORDS THE &SELECT CARD IS OPTIONAL, BUT IF NOT INCLUDED, ONLY REPORT 3 WILL BE GENERATED. IT CONTROLS THE SELECTION OF REPORTS AND OUTPUT MATRIX ROWS TO BE PRINTED. THE &SELECT CARD FOLLOWS THE &OPTION CARD.

REPORT IS A LIST OF REPORT NUMBERS TO BE PRINTED. FOR AGM/SLIM, CODE

```
REPORT=3,5,8,
```

PRINT IS A LIST OF ORIGIN ZONE NUMBERS SPECIFYING ROWS OF THE OUTPUT MATRICES TO BE PRINTED. E.G., IF

```
PRINT=2,4,-6
```

THEN ROWS 2, 4, 5 AND 6 WILL BE PRINTED FOR ALL OUTPUT TRIP TABLES. SELECT ONLY A FEW OR THE VOLUME OF PRINTED OUTPUT WILL BE EXCESSIVE.

F-FACTOR DATA CARD FORMAT

FRICTION FACTORS FOR EACH TRIP TABLE AND TRAVEL TIME INTERVAL ARE INPUT ON THE F FILE. IF F-FACTORS ARE MISSING FOR SOME TRAVEL TIME INTERVALS, AGM/SLIM LINEARLY INTERPOLATES FOR THE MISSING VALUES. HOWEVER, FOR EACH TABLE, A NON-ZERO F-FACTOR MUST BE GIVEN FOR 60 MINUTES, THE MAXIMUM TIME INTERVAL.

THE F-FACTOR CARDS MUST HAVE THE TRAVEL TIME CODED AS A RIGHT-JUSTIFIED INTEGER IN THE FIRST FIELD. THE F-FACTORS ARE RIGHT-JUSTIFIED DECIMAL NUMBERS WHICH MAY CONTAIN A DECIMAL POINT. IF NO DECIMAL POINT IS PRESENT, XXXXXX. IS ASSUMED. THE FORMAT FOR THE F-FACTOR RECORDS IS:

F-FACTOR RECORD FORMAT

COLUMN	FORMAT	CONTENTS
1-4	I4	TRAVEL TIME
9-14	F6.0	F-FACTOR FOR OUTPUT TABLE 1
15-20	F6.0	F-FACTOR FOR OUTPUT TABLE 2
21-26	F6.0	F-FACTOR FOR OUTPUT TABLE 3

FOLLOWING IS A SAMPLE SET OF F-FACTOR CARDS USING 5-MINUTE TIME INTERVALS, ALLOWING AGM TO INTERPOLATE.

```
 1     17000 45080 34000
 5      8900 15551  9900
10      1900  2714  1700
15       690   600   440
20       318   186   135
25       174    70    55
30       104    32    26
35        58    16    14
40        35     9     8
45        21     6     5
50        13     3     3
55         7     2     2
60         5     1     2
```

SAMPLE PRODUCTION RUN SETUP

1. APPLY AGM/SLIM WITH INPUT PRODUCTIONS, ATTRACTIONS, AND F-FACTORS.

```
//AGM EXEC AGM,CORE2=180K,
//     J1='DSN=URD.TRSKIM,VOL=SER=UMTA1',UNITJ1=3330,
//     J9='DSN=URD.BGR.AGMOUT,VOL=SER=UMTA1,SPACE=(TRK,(50,10))',
//        UNITJ9=3330,
//     Z1='DSN=URD.DATA(PROATT),VOL=SER=UMTA1',UNITP=3330,
//     F='DSN=URD.DATA(FFACT),VOL=SER=UMTA1',UNITA=3330
//AGM.SYSIN DD *

  GRAVITY MODEL RUN WITH 3 ITERATIONS, 3 TRIP PURPOSES
  J9 SPACE PARAMETER DEPENDS ON TYPE OF DISK AND NUMBER OF ZONES.
 &PARAM AITER=3,3,3,TABOUT=3,
        ZP1='Z1HBWP',ZA1='Z1HBWA',
        ZP2='Z1HBOP',ZA2='Z1HBOA',
        ZP3='Z1NHBP',ZA3='Z1NHBA' &END
 &OPTION A=T                      &END
 &SELECT REPORT=3,5,8             &END
```

2. SAME AS ABOVE, BUT FOR 5 ITERATIONS OF WORK TRIPS ONLY.

```
//AGM EXEC AGM,CORE2=180K,
//     J1='DSN=URD.TRSKIM,VOL=SER=UMTA1',UNITJ1=3330,
//     J9='DSN=URD.BGR.AGMWRK,VOL=SER=UMTA1,SPACE=(TRK,(50,10))',
//        UNITJ9=3330,
//     Z1='DSN=URD.DATA(PROATT),VOL=SER=UMTA1',UNITP=3330,
//     F='DSN=URD.DATA(FFACT),VOL=SER=UMTA1',UNITA=3330
//AGM.SYSIN DD *

  GRAVITY MODEL RUN FOR WORK TRIPS ONLY
  J9 SPACE PARAMETER DEPENDS ON TYPE OF DISK AND NUMBER OF ZONES.
 &PARAM AITER=5,TABOUT=1,
        ZP1='Z1HBWP',ZA1='Z1HBWA'  &END
 &OPTION A=T                      &END
 &SELECT REPORT=3,5,8             &END
```

4

HNET/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

H N E T / S L I M : HIGHWAY NETWORK BUILDER

SUMMARY

HNET/SLIM BUILDS, MAINTAINS, AND REPORTS DATA DESCRIBING A HIGHWAY NETWORK.

THE HIGHWAY NETWORK IS DESCRIBED IN TWO FILES COMPATIBLE WITH THE UTPS PROGRAMS UROAD AND UMATRIX. THE TWO FILES AND THEIR CONTENTS ARE:

(1) N-FILE - THIS FILE CONTAINS THE BASIC DEFINITION OF THE NETWORK. EACH NODE AND LINK IN THE NETWORK IS DESCRIBED HERE. STABLE ATTRIBUTES SUCH AS DISTANCE, GEOGRAPHIC LOCATION, AREA TYPE, OBSERVED SPEEDS, ETC. FOR LINKS ARE STORED HERE. THE N-FILE IS STRUCTURED TO MINIMIZE THE COST OF NETWORK UPDATING.

(2) LINK Z-FILE - ALL LINK ATTRIBUTES STORED IN THE N-FILE MAY ALSO BE STORED IN A Z-FILE. THIS Z-FILE IS CREATED FROM THE N-FILE AND IS INPUT TO PROGRAM UROAD/SLIM. UROAD/SLIM LINK DATA IS WRITTEN ON THE Z-FILE DURING AN ASSIGNMENT. THE Z-FILE MAY ALSO BE PROCESSED BY UMATRIX. Z-FILES ARE STRUCTURED TO MINIMIZE THE COST OF NETWORK ANALYSIS BY PROGRAMS UROAD AND UMATRIX.

INPUT. HNET/SLIM ACCEPTS THE FOLLOWING AS INPUT:

(1) LINK DATA CARDS DESCRIBING THE LINKS CONTAINED IN THE NETWORK.

(2) CONTROL CARDS (&PARAM, &OPTION, &SELECT) WHICH SPECIFY PARAMETERS, OPTIONS, REPORT SELECTIONS, ETC.

(3) SPEED/CAPACITY UPDATE CARDS TO CHANGE THE SPEED/CAPACITY TABLES USED BY HNET/SLIM IN LINK Z-FILE CREATION.

INPUT/OUTPUT. THE N-FILE (N1) AND THE LINK Z-FILE (Z1) MAY BE BOTH INPUT AND OUTPUT FILES. THEY ARE THE SUBJECT OF ALL HNET/SLIM PROCESSING.

OUTPUT. HNET/SLIM OPTIONALLY OUTPUTS THE FOLLOWING REPORTS:

1. LINK CARD ERROR MESSAGES
9. LINK DATA
15. UNUSED NODE NUMBERS
16. CONTENTS OF Z-FILE Z1 (LINK Z-FILE)
18. SPEED/CAPACITY TABLES

METHODOLOGY

NETWORK BUILDING - HNET/SLIM USES A COMBINED N-FILE AND Z-FILE RUN FOR NETWORK CONSTRUCTION. THE GENERAL PROCEDURE IS:

(1) INPUT OF LINK CARDS TO CREATE AND DEBUG THE N-FILE.

(2) CREATION OF LINK Z-FILE IN THE SAME PROGRAM RUN FOR ANALYSIS OR MANIPULATION BY UROAD AND UMATRIX.

THESE TWO PROCEDURES ARE PERFORMED IN ORDER WITHIN THE PROGRAM. HNET/SLIM ALLOWS THE CREATION OF A Z-FILE IN THE SAME RUN AS THE ADDITION, CHANGING, OR DELETING OF LINKS IN THE N-FILE THEREBY ALLOWING FINAL LINK CLEAN-UP TO OCCUR CONCURRENTLY. HNET/SLIM ALLOWS THE REPLACEMENT OF AN ATTRIBUTE IN A Z-FILE RECOGNIZING THAT CERTAIN ATTRIBUTE VALUES (E.G. GEOGRAPHIC LOCATION, LINK GROUP) MIGHT BE ADDED OR CHANGED AFTER THE NETWORK NODES AND LINKS HAVE BEEN ESTABLISHED.

HNET/SLIM ACCEPTS LINKS INTO THE N-FILE WITH LITTLE MORE THAN CORRECT NODE IDENTIFICATION. ALL ATTRIBUTE VALUES ARE RANGE-CHECKED, BUT THE DATA IS GENERALLY ACCEPTED AS IS (WITH APPROPRIATE MESSAGES) OR RESET TO A 'MISSING' VALUE. THUS THE CORRECTNESS OF ATTRIBUTE VALUES ARE THE USER'S RESPONSIBILITY. AT THE NETWORK STRUCTURE LEVEL, HNET/SLIM MAKES NO CHECKS OF LINK CONNECTIVITY. THE SUITABILITY OF THE NETWORK FOR ANALYSIS IS THE RESPONSIBILITY OF THE USER AND DEPENDS ON THE USER'S INTENTIONS.

FOR USERS FAMILIAR WITH NETWORK PROGRAM HR OR BUILDHR AND THEIR LIMIT OF 4 LINKS PER NODE, A SIGNIFICANT CHANGE IN HNET/SLIM IS THAT 8 LINKS ARE ALLOWED OUT OF A NODE.

CREATION OF NETWORK ALTERNATIVES - HNET/SLIM RECOGNIZES THAT CREATION OF ALTERNATIVE NETWORKS IS GENERALLY A MINOR REVISION AFFECTING FEWER THAN 10% OF ALL LINKS. A VERY COST-EFFECTIVE WAY TO GENERATE ALTERNATIVES IS TO CREATE NETWORK DATA WHICH INCLUDE ALL LINKS WHICH MIGHT BE CONSIDERED UNDER ANY ALTERNATIVE. THE BASIC NETWORK IS THEN CREATED BY MODIFYING LINK ATTRIBUTES (E.G. DIRECTION CODE, TIME, CAPACITY OR NO. OF LANES) IN THE N-FILE AND LINK Z-FILE.

FOR UTPS/SLIM, IT IS ASSUMED THAT CONSTRUCTION OF THE N-FILE AND THE LINK Z-FILE WILL BE SIMULTANEOUS, AND THAT ALL EDITING OF THE NETWORK WILL BE BY MEANS OF ADDS, DELETES, OR CHANGES TO THE N-FILE. IN ADDITION TO NETWORK DEBUGGING AND LINK ADDING, NORMALLY INVOLVING N-FILE EDITING, THE CHANGING OF LINK ATTRIBUTES IS ALSO TO BE ACCOMPLISHED BY N-FILE EDITING, RATHER THAN BY Z-FILE EDITING. VARIATIONS IN THE NETWORK FOR ANALYZING DIFFERENT FORECAST YEARS OR PROJECT ALTERNATIVES IS TO BE ACCOMPLISHED BY CREATING SEPARATE N-FILES AND Z-FILES IN THE SAME PROGRAM RUN. FOR CHANGES, THE N-FILE IS EDITED AND A NEW Z-FILE IS CREATED, AGAIN IN ONE PROGRAM RUN.

OUTPUT FILES

THE N-FILE CAN BE THOUGHT OF AS A DIRECT-ACCESS HISTORICAL RECORD FILE. EACH NODE AND LINK IN THE NETWORK HAS A RECORD TO DESCRIBE ITS ATTRIBUTES. BY "DIRECT-ACCESS" IS MEANT THAT A LINK RECORD CAN BE UPDATED OR DELETED WITHOUT REWRITING THE ENTIRE FILE. ONLY THOSE ATTRIBUTE VALUES EXPLICITLY CODED ON NODE AND LINK CARDS ARE STORED IN THE N-FILE.

THE Z-FILE ON THE OTHER HAND CONTAINS A RECORD FOR EACH ATTRIBUTE. THIS RECORD IS A LIST OF ATTRIBUTE VALUES (LAV) FOR ALL LINKS IN THE NETWORK. FOR EVERY LINK (A,B) THERE IS A CELL FOR THE A-TO-B LINK AND FOR THE B-TO-A LINK. LINKS CANNOT BE ADDED TO THE NETWORK AFTER THE LINK Z-FILE IS CREATED EXCEPT BY UPDATING THE CORRESPONDING N-FILE AND CREATING A NEW LINK Z-FILE.

THE LINK Z-FILE CONTAINS NOT ONLY THE INFORMATION FROM THE N-FILE BUT ALSO INFORMATION DETERMINED BY HNET/SLIM FROM OTHER SOURCES. AS HNET CREATES THE LINK Z-FILE, IF A MISSING VALUE IS ENCOUNTERED IN THE N-FILE, HNET LOOKS FOR A POSSIBLE REPLACEMENT FOR THAT MISSING VALUE. FOR EXAMPLE, A FREE FLOW TIME (FFT) IS COMPUTED FROM THE LINK DISTANCE AND SPEED, EVEN THOUGH ONLY THE SPEED (FFS) WAS CODED FOR N-FILE CREATION. ONLY THE LINK Z-FILE IS UPDATED IN THIS WAY, NOT THE N-FILE.

WHEN THE Z-FILE IS CREATED FORM THE N-FILE IN A PROGRAM RUN, HNET/SLIM READS SPEED/CAPACITY TABLES AND CREATES VALUES FOR SPEED AND CAPACITY BASED ON NUMBER OF LANES, AREA TYPE, AND FACILITY TYPE. THE USE OF THESE TABLES IS DESCRIBED IN THE NOTES SECTION BELOW.

REPORTS

REPORT 1 IS A PLAYBACK OF INPUT LINK CARDS WITH INTERSPERSED ERROR FLAGS, BUT ONLY IF THERE ARE ERRORS.

I N P U T L I N K D A T A C A R D I M A G E S

```
1---5---10---15---20---25---30---35---40---45---50---55---60---65---70-
C1  104    2       12                                  0 1
                                                       W
A1  137  1453.60   14                                  22A
                                 D                       W
1---5---10---15---20---25---30---35---40---45---50---55---60---65---70-
```

SUMMARY OF LINK DATA ERRORS BY FIELD - TOTAL ERRORS = 2

ACTION =	0	FOCUS =	0	ANODE =	0	BNODE =	0
D =	0	TC =	0	FT =	0	AT =	0
CC =	0	LU =	0	Z =	0	GL =	0
UC =	0	T/S FLAG =	0	FFS =	0	OS =	0
C =	0	OV =	0	NL =	1	LG =	1
FFT =	0	OT =	0	UT =	0		

THE MESSAGE FLAGS ARE AS FOLLOWS:

D (DEFAULT): A DEFAULT VALUE FOR THE FIELD ABOVE THIS FLAG REPLACES THE MISSING VALUE.

W (WARNING): THE VALUE IN THE FIELD ABOVE THIS FLAG CONTAINS AN INVALID CHARACTER OR EXCEEDS THE VALID RANGE. IN THE FORMER CASE, A MISSING VALUE WILL BE USED; IN THE LATTER CASE, THE VALUE CODED IS ACCEPTED.

E (ERROR) : AN ERROR IN THE ACTION CODE, FOCUS, ANODE OR BNODE MAKES THE LINK OR NODE IMPOSSIBLE TO IDENTIFY, OR THE DESIRED ACTION IMPOSSIBLE TO ASCERTAIN. THE CARD IS IGNORED.

REPORT 5, THE N-FILE UPDATE ACTION REPORT, IS A RECORD OF ACTIVITY FOR THE PROGRAM RUN.

N - F I L E U P D A T E A C T I O N R E P O R T

ANODE	BNODE	ACTION TAKEN	ANODE	BNODE	ACTION TAKEN
2	103	LINK VALUES CHANGED	5	6	LINK ADDED
105	115	LINK ADDED	115	105	LINK ADDED
123	126	LINK ADDED	124	123	LINK VALUES CHANGED
126	123	LINK ADDED			

REPORT 9 IS A LISTING OF LINK DATA FROM THE LINK Z-FILE. THIS IS THE ONLY HNET REPORT WHICH DISPLAYS THE CONTENTS OF THE Z-FILE. A LINK IS ONLY REPORTED IF BOTH ITS ANODE AND BNODE APPEAR IN THE &SELECT "RNODES" SELECTION.

L I N K D A T A W I T H L O A D S

A NODE	B NODE	U C	FREEFLOW TIME	FREEFLOW SP	---OBSERVED (BASE CAP	OBSERVED (BASE VOL	OBSERVED (BASE TIME	OBSERVED (BASE SP	OBSERVED (BASE DIS	)-- ---ASSIGNED (LOAD IMP	ASSIGNED (LOAD VOL	ASSIGNED (LOAD TIME	ASSIGNED (LOAD SP	1)-- V/C
1	101		3.00	10	90000		3.00	10	0.5	0.03	882	3.00	10	0.01
1	102		3.00	10	90000		3.00	10	0.5	0.03	299	3.00	10	0.00
2	103		1.20	15	90000		1.80	10	0.3	0.01	1780	1.20	15	0.02
2	104		1.20	15	90000		1.80	10	0.3	0.01	165	1.20	15	0.00
3	105		2.00	15	90000		2.00	15	0.5	0.02	1698	2.00	15	0.02
3	106		2.00	15	90000		2.00	15	0.5	0.02	739	2.00	15	0.01
4	107		1.20	15	90000		1.20	15	0.3	0.01	797	1.20	15	0.01
4	108		1.20	15	90000		1.20	15	0.3	0.01	881	1.20	15	0.01

COLUMN HEADINGS FOR REPORT 9 HAVE THE FOLLOWING MEANING:

UC = USE CODE (IGNORE IN HNET/SLIM)

FREE FLOW
TIME = FREE FLOW TIME IN MINUTES
SP = FREE FLOW SPEED IN MILES/HOUR

OBSERVED (BASE)
CAP = LINK CAPACITY = (LANE CAPACITY)*(NO. OF LANES)
VOL = OBSERVED VOLUME (BLANK IN HNET/SLIM)
TIME = OBSERVED TIME (OT) IN MINUTES
SP = OBSERVED SPEED (OS) IN MILES/HOUR
DIS = DISTANCE (D) IN MILES

ASSIGNED (LOAD X)
IMP = CONGESTED LINK IMPEDANCE (IGNORE IN HNET/SLIM)
VOL = ASSIGNED VOLUME (V<X>) IN VEH
TIME = CONGESTED TIME (CT<X>) IN MIN (IGNORE IN HNET/SLIM)
SP = CONGESTED SPEED (CS<X>) IN MI/H (IGNORE IN HNET/SLIM)
V/C = VOLUME TO CAPACITY RATIO (VC<X>)

ALL VALUES REPORTED ARE TAKEN FROM THE LINK Z-FILE, NOT FROM THE N-FILE.

REPORT 15 IS A LIST OF THE UNUSED NODE NUMBERS IN THE N-FILE.

U N U S E D N O D E N U M B E R S

NODES= 6, -100, 109, 125, 131, 140, 142, 144, -400

THE "-" INDICATES A RANGE OF UNUSED NODES FROM 6 THROUGH 100.

REPORT 16 DISPLAYS SPACE INFORMATION AND CONTENTS OF THE LINK Z-FILE.

C O N T E N T S O F Z - F I L E Z 1

LINKS= 126 CREATION: DATE=25MAR80 TIME=17.49.32 PROG=HNET
CREATED FROM DSN=UMTA.RR.NFILE

SPACE (WORDS):	TOTAL DATA= 15000	USED= 5350	UNUSED AVAILABLE= 9650	EMBEDDED FREE SPACE= 0

ATTRIBUTE ENTRIES: LAVS PRESENT= 11 MAX LAVS POSSIBLE=135

			CREATION			
LAV NAME	UNITS	TYPE	DATE	TIME	PROGRAM	DESCRIPTION
A	143	I*2	25MAR80	17.49	HNET	LINK ANODES
AT		I*2	25MAR80	17.49	HNET	AREA TYPE
B	143	I*2	25MAR80	17.49	HNET	LINK BNODES
C1	VEH/LN/H	I*4	25MAR80	17.49	HNET	CAPACITY
D	MI	R*4	25MAR80	17.49	HNET	DISTANCE
DC		I*1	25MAR80	17.49	HNET	DIRECTION CODE
FFS	MI/H	R*4	25MAR80	17.49	HNET	FREE FLOW SPEED
FFT	MIN	R*4	25MAR80	17.49	HNET	FREE FLOW TIME

REPORT 18 IS A DISPLAY OF THE SPEED/CAPACITY TABLES USED IN THE HNET/SLIM RUN. THE S/C TABLES ARE USED TO EXTRACT FREE FLOW SPEED AND CAPACITY FOR INCLUSION IN THE LINK Z-FILE. A TABLE FOR EACH AREA TYPE IS PRODUCED IN REPORT 18.

AREA TYPE AND FACILITY TYPE DEFINITIONS MAY BE FOUND BELOW UNDER LINK CARD CODING. FACILITY TYPES 4,7,8, AND 9 SHOULD BE IGNORED IN HNET/SLIM.

L I N K S P E E D A N D C A P A C I T Y T A B L E S

A R E A T Y P E 1

NL		FACILITY TYPE 1	2	3	4	5	6	7	8	9
1	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
2	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
3	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
4	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
5	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
6	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
7	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
8	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0
9	C	1750	800	600	700	10000	600	-1	-1	-1
	FFS	48.0	37.0	22.0	22.0	10.0	22.0	-1.0	-1.0	-1.0

UNITS: C (CAPACITY) IN VEH/LANE/H
FFS (FREE FLOW SPEED) IN MI/H
NL = NO. OF LANES

FILE TABLE

	FILE NAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS
	LINKS	FT02F001	LINK DATA CARDS
OUTPUT	N1	U1	HIGHWAY NETWORK N-FILE FOR BASIC PROGRAM OPERATION
	Z1	Z1	LINK Z-FILE CORRESPONDING TO N1

KEYWORD TABLE

	KEYWORD	TYPE	DEFAULT	VALUE OR PURPOSE
&PARAM	ZONES	I	NONE	ZONES IN NETWORK
	NODES	I	16383	HIGHEST PERMISSIBLE NODE
&SELECT	REPORT	R(17)	(SEE NOTES)	REQUESTED REPORT NUMBERS
	RNODES	R(100)	ALL	NODE NUMBERS FOR WHICH DISPLAY IS REQUESTED IN REPORT 9.

&PARAM KEYWORD NOTES

KEYWORDS ZONES AND NODES SET PARAMETER VALUES FOR N-FILES. WHEN AN N-FILE IS BEING CREATED FROM LINK CARDS, VALUES SHOULD BE SUPPLIED, AND THE VALUES SUPPLIED WILL BE STORED ON THE N-FILE PARAMETER RECORD. TO CHANGE THE PARAMETERS IN AN EXISTING N-FILE, VALUES OTHER THAN THE DEFAULT MUST BE SUPPLIED. FOR EXAMPLE, TO CHANGE NODES TO 2000 ON AN EXISTING N-FILE, CODE NODES=2000 ON AN N-FILE UPDATE RUN.

ZONES IS THE NUMBER OF ZONES IN THE NETWORK. E.G., ZONES=200 SPECIFIES 200 AS THE HIGHEST ZONE IN THE NETWORK. THE ZONES PARAMETER IS REQUIRED WHEN AN N-FILE IS BEING CREATED. THE ZONES VALUE IS STORED IN A SPECIAL RECORD ON THE LINK Z-FILE.

NODES IS THE HIGHEST PERMISSIBLE NODE IN THE NETWORK. E.G., NODES=1000 SPECIFIES 1000 AS THE HIGHEST NODE. NODES IS USED TO VERIFY INCOMING NODES ON THE LINK DATA CARDS AND DETERMINES THE SIZE OF SEVERAL DYNAMIC ARRAYS.

&SELECT KEYWORD NOTES

REPORT IS AN INTEGER REPRESENTING A SERIES OR RANGE (OR A COMBINATION OF BOTH) WHICH CONTROLS THE PRINTING OF HNET/SLIM REPORTS. FOR EXAMPLE, CODING

```
REPORT=16,18
```

INDICATES THAT REPORTS 16 AND 18 WILL BE PRINTED. REPORT 1 CONTAINS ERROR MESSAGES FOR FAILED FIELD EDITS AND NEED NOT BE SELECTED FOR HNET/SLIM, SINCE IT WILL BE PRINTED ANYWAY FOR CARDS WITH ERRORS.

RNODES IS A SERIES OR RANGE LISTING THE NODES TO BE DISPLAYED IN REPORT 9. FOR EXAMPLE, CODING

```
RNODES=1,-180
```

INDICATES THAT LINK DATA FOR NODES WHOSE A-NODE AND B-NODE IS IN THE RANGE 1 TO 180 WILL BE DISPLAYED.

Z1LAVS SPECIFIES THE LINK ATTRIBUTES TO BE POSTED TO THE LINK Z-FILE. FOR HNET/SLIM, A MAXIMUM OF 14 LINK ATTRIBUTES WOULD BE NEEDED TO BE WRITTEN TO THE LINK Z-FILE. THESE SHOULD BE SPECIFIED AS:

```
Z1LAVS= 'A',  'B', 'DC', 'D', 'FT', 'AT', 'GL','FFS',
        'FFT', 'OT', 'OS', 'C', 'NL', 'LG',
```

DESCRIPTION OF LAV CONTENTS

WHEN THE LAVS ARE WRITTEN TO THE LINK Z-FILE, THE UNITS AND A DESCRIPTIVE NAME ARE ALSO WRITTEN. THE UNITS AND DESCRIPTIVE NAMES ARE THE FOLLOWING:

LAV NAME	UNITS	DESCRIPTIVE NAME	TYPE
DC		DIRECTION CODE	I*1
D	MILES	DISTANCE	R*4
FT		FACILITY TYPE	I*1
AT		AREA TYPE	I*1
FFS	MI/H	FREE FLOW SPEED	R*4
FFT	MINUTES	FREE FLOW TIME	R*4
OT	MI/H	OBSERVED SPEED	R*4
OS	MINUTES	OBSERVED TIME	R*4
C	VEH/LN/H	HOURLY CAPACITY PER LANE	I*4
NL	LANES	NUMBER OF LANES	I*1
GL		GEOGRAPHIC LOCATION	I*1
LG		LINK GROUP	I*1
A		ANODE	I*2
B		BNODE	I*2

THESE NAMES ARE FURTHER DEFINED IN THE LINK DATA CARD DESCRIPTION BELOW. SINCE SOME ATTRIBUTES MAY NOT BE CODED IN THE N-FILE, LESS THAN THIS FULL SET MAY BE SPECIFIED. FOR EXAMPLE, A MINIMUM SET OF ATTRIBUTES FOR PATHBUILDING WOULD BE A-NODE, B-NODE, DC, D, AND FFT, IF THE USER HAD CODED SPEEDS FOR EACH LINK. BASICALLY, NOTHING IS GAINED BY SPECIFYING LINK ATTRIBUTES FOR THE Z-FILE WHEN THOSE ATTRIBUTES ARE MISSING IN THE N-FILE.

DC (DIRECTION CODE) IS AN INTERNALLY GENERATED ATTRIBUTE. ITS VALUE IS NORMALLY 2, MEANING A 2-WAY LINK.

GEOGRAPHIC LOCATION (GL) IS TAKEN FROM THE GL CODED ON THE LINK DATA CARDS AND STORED IN THE N-FILE. IF NOT CODED, GL WILL CONTAIN A MISSING VALUE, WHICH WILL NOT AFFECT NETWORK BUILDING OR ASSIGNMENT. IT IS TYPICALLY CODED FOR OBTAINING DISTRICT LEVEL SUMMARIES OF VMT FROM UROAD.

AREA TYPE (AT) IS EXTRACTED FROM THE N-FILE WHEN THE LINK IS BUILT. IF IT WAS NOT CODED, AREA TYPE WILL CONTAIN A MISSING VALUE. IT MAY BE USED IN HNET/SLIM TO ASSIGN SPEED AND TIME TO LINKS INSTEAD OF ESTIMATING OBSERVED SPEED ON EVERY LINK. A DESCRIPTION OF THE FACILITY TYPES AND AREA TYPES APPEARS BELOW UNDER LINK CARD CODING.

OT OR OS , DEPENDING ON REQUIREMENTS CAN EITHER BE OBSERVED OR FREEFLOW TIME OR SPEED. IF IT IS FREEFLOW, THE OT OR OS LAV NAME DOES NOT HAVE TO BE WRITTEN TO THE LINK Z- OR N-FILE BECAUSE FFT OR FFS WILL BE THE SAME AS OS OR OT.

FFS, FFT, AND C ARE COMPUTED WHEN THE Z-FILE IS BUILT OR UPDATED WITH THESE LAVS. THE PROCEDURE IS AS FOLLOWS:

A. CAPACITY IS TAKEN FROM THE S/C TABLE UNLESS ONE OF THE INDICES AT, FT, OR NL IS MISSING.

B. FREE FLOW SPEED IS TAKEN FROM THE S/C TABLE UNLESS ONE OF THE INDICES AT, FT, OR NL IS MISSING.

C. SPEEDS ARE SET TO MISSING OR ZERO IF DISTANCE IS MISSING OR ZERO.

D. TIMES ARE DERIVED FROM SPEEDS UNLESS DISTANCE IS MISSING.

E. THE DEFAULT FREE-FLOW SPEEDS (IN MI/H) AND DEFAULT CAPACITIES (IN VEH/LANE/H) IN THE S/C TABLE ARE AS FOLLOWS:

	ROAD FACILITY TYPE					
AREA TYPE	(1)	(2)	(3)	(4)	(5)	(6)
(1) C.B.D.	1750 48	800 37	600 22	700 22	10000 10	600 22
(2) FRINGE	1750 48	1000 44	550 25	550 29	10000 15	800 25
(3) RESID.	1750 67	1100 47	550 28	900 32	10000 15	800 28
(4) OUTER CBD	1750 58	1000 37	550 22	650 24	10000 15	800 22
(5) RURAL	1750 67	1100 47	550 28	900 32	10000 15	800 28

FOR HNET/SLIM, FOUR MODIFICATIONS TO THIS TABLE ARE SUGGESTED UNDER SPEED AND CAPACITY UPDATE CARDS AND IN THE SAMPLE SETUP.

REPORT 18 DISPLAYS THE FULL 3-DIMENSIONAL TABLE AFTER APPLICATION OF ANY UPDATES PROVIDED BY THE USER, FOR AREA TYPES 1-5, FACILITY TYPES 1-6, AND LANES 1-9.

LINK DATA CARDS

A HIGHWAY LINK IS A NODE PAIR (ANODE,BNODE) OR (A,B) AND AN IMPLIED DIRECTION (FROM A TO B). LINK DATA CARDS ARE USED TO ESTABLISH LINKS AND DESCRIBE LINK ATTRIBUTES IN THE N-FILE.

LINK INFORMATION IS INPUT TO HNET/SLIM VIA LINK DATA CARDS WHICH DESCRIBE THE BASIC LINK DATA FOR ALL LINKS IN THE NETWORK. THE LINK DATA CARDS EFFECT N-FILE LINK ADDITION, DELETION, AND CHANGES TO ATTRIBUTES ON EXISTING LINKS.

LINK DATA CARD FORMAT

COL	FORMAT	LAV NAME	CONTENTS	RANGE*
1	A1		ACTION CODE	A,C,D OR BLANK
2			BLANK	
3-7	I5	A	ANODE	1 TO NODES
8-12	I5	B	BNODE	1 TO NODES
13-16	F4.0	D	LINK DISTANCE	0 TO 99
17-18			BLANK	
19	I1	FT	FACILITY TYPE	1 TO 6
20	I1	AT	AREA TYPE	1 TO 5
21-27			BLANK	
28-29	I2	GL	GEOGRAPHIC LOCATION	1 TO 49
30			BLANK	
31	A1		TIME OR SPEED FLAG	T OR S
32-34			BLANK	
35-38	F4.0	OT,OS	OBSERVED SPEED OR OR TIME	>0 TO 999
39-48			BLANK	
49	I1	NL	NUMBER OF LANES	1 TO 9
50-51	I2	LG	LINK GROUP	1 TO 99
52-72			BLANK	
73-80	A8		SEQUENCE NUMBER	SUPPLIED BY HNET

LINK CARD CONTENTS

THE MINIMUM LINK Z-FILE NETWORK DATA REQUIRED BY UROAD/SLIM TO PERFORM A TRAFFIC ASSIGNMENT INCLUDES, IN ADDITION TO A-NODE AND B-NODE, A DISTANCE AND A SPEED ON EACH LINK. IF THE USER IS CONFIDENT OF LOCAL AREA TYPE AND FACILITY TYPE CODING, IT MAY BE EASIER TO LEAVE SPEED UNCODED, AND ALLOW HNET/SLIM TO LOOK UP A SPEED IN THE DEFAULT SPEED/CAPACITY TABLES. IF THE SPEED/CAPACITY TABLES ARE USED, THEY SHOULD BE MODIFIED WITH THE VALUES SHOWN IN THE SAMPLE RUNS DESCRIBED BELOW OR WITH VALUES APPROPRIATE FOR THE STUDY AREA.

IN ADDITION, FOR SCREEN LINE SUMMARIES OR DISTRICT SUMMARIES IN UROAD/SLIM, LG AND GL MAY ALSO BE CODED, ALTHOUGH THEY ARE NOT NECESSARY.

THE DESIGN OF THE LINK DATA CARDS FACILITATES A MINIMUM OF CODING EFFORT, WHILE ACCOMODATING ALL LINK CODING SITUATIONS. THE LINK CARD IS COMPOSED OF THREE CATEGORIES OF INFORMATION:

1. PURPOSE AND IDENTIFICATION
2. NON-DIRECTIONAL INFORMATION
3. DIRECTIONAL INFORMATION

PURPOSE AND IDENTIFICATION IS CONTAINED IN COLUMNS 1 TO 12 (ACTION,FOCUS,ANODE,BNODE). ACTION IS TO ADD, CHANGE, OR DELETE A PAIR OF DIRECTIONAL LINKS.

NON-DIRECTIONAL INFORMATION IS CONTAINED IN COLUMNS 13-30.

DIRECTIONAL INFORMATION IS CONTAINED IN COLUMNS 31-51 AND IN UTPS/SLIM IS ASSUMED THE SAME IN BOTH DIRECTIONS.

LINK CARD CODING

1. ACTION CODE (COLUMN 1) IS INTERPRETED BY HNET/SLIM AS FOLLOWS:

A OR BLANK	ADD THE LINK OR LINKS DESCRIBED BY THIS CARD TO THE N-FILE N1.
D	DELETE THE LINK OR LINKS DESCRIBED BY THIS CARD FROM THE N-FILE N1.
C	CHANGE THE DESCRIPTION OF THE LINK OR LINKS AS DESCRIBED BY THIS CARD. ONLY THOSE FIELDS WHICH ARE NOT BLANK WILL BE ALTERED.

2. FOCUS CODE (COLUMN 2) SHOULD BE LEFT BLANK TO INDICATE THAT THE ADDING, DELETING, OR CHANGING ACTION IS TO BE PERFORMED FOR BOTH DIRECTIONS ON THE LINK. SINCE IT IS RARE THAT A ONE-WAY LINK MAY NOT BE EASILY DESCRIBED AS PART OF A COUPLET, HNET/SLIM ASSUMES THAT EVERY LINK IS TWO-WAY, WITH IDENTICAL ATTRIBUTES (E.G., SPEED) IN EACH DIRECTION.

3. ANODE (COLUMNS 3-7) IS THE 'FROM' NODE OF THE LINK WHOSE ATTRIBUTES ARE GIVEN IN COLUMNS 32-51 OF THE LINK CARD. ANODE MUST BE A RIGHT-JUSTIFIED INTEGER LESS THAN OR EQUAL TO THE &PARAM NODES VALUE.

4. BNODE (COLUMNS 8-12) IS THE 'TO' NODE OF THE LINK WHOSE ATTRIBUTES ARE GIVEN IN COLUMNS 32-51 OF THE LINK CARD. BNODE MUST BE A RIGHT-JUSTIFIED INTEGER LESS THAN OR EQUAL TO THE &PARAM NODES VALUE.

5. D (COLUMNS 13-16) IS THE LINK DISTANCE IN MILES. NO DECIMAL POINT IS ASSUMED BY HNET/SLIM, BUT IF ONE IS EXPLICITLY CODED AT ANY POSITION IN THE FIELD, IT IS ACCEPTED.

6. FT (COLUMN 19) INDICATES THE FACILITY TYPE OF THE LINK. HNET/SLIM USES THE FACILITY TYPE AS AN INDEX INTO A SPEED/CAPACITY TABLE TO DETERMINE THE FREE FLOW SPEED AND CAPACITY PER LANE OF ALL LINKS. FT IS ALSO USED IN UROAD TO AGGREGATE BY FACILITY TYPE FOR SUMMARY REPORTS. THE FOLLOWING FACILITY TYPES ARE ASSUMED FOR HNET/SLIM:

FACILITY TYPE CODES	
CODE	INTERPRETATION
1	FREEWAY
2	EXPRESSWAY OR RURAL HIGHWAY
3	SLOW ARTERIAL (WITH PARKING)
5	CENTROID CONNECTOR
6	ARTERIAL (WITHOUT PARKING)

7. AT (COLUMN 20) IS THE AREA TYPE OF THE LINK. LIKE FACILITY TYPE, IT IS USED AS AN INDEX INTO THE SPEED/CAPACITY TABLES. THE FOLLOWING AREA TYPES ARE ASSUMED FOR HNET/SLIM:

AREA TYPE CODES	
CODE	INTERPRETATION
1	CBD
2	CBD FRINGE OR INDUSTRIAL
3	RESIDENTIAL
4	OUTLYING CENTER
5	RURAL

8. GL (COLUMNS 28-29) INDICATES THE GEOGRAPHIC LOCATION OF THE LINK. IT IS A RIGHT-JUSTIFIED INTEGER BETWEEN 1 AND 49. UROAD AGGREGATES LINK IMPACTS (E.G. VMT) BY GEOGRAPHIC LOCATION FOR SUMMARY REPORTS. THE UROAD USER CAN ARBITRARILY ASSIGN THE SAME GL VALUE TO LINKS TO BE AGGREGATED TOGETHER IN THESE REPORTS FOR SUMMARIES AT DISTRICT LEVEL OR CORRIDOR LEVEL.

9. COLUMN 31 CONTAINS A FLAG WHICH FOR HNET/SLIM INDICATES THAT SPEED DATA IS CODED IN COLUMNS 32-34. WHEN THE FLAG IS BLANK, HNET/SLIM ISSUES A WARNING IF COLUMNS 32-34 ARE NOT ALSO BLANK.

10. COLUMNS 35-38 CONTAIN THE OBSERVED SPEED OR OBSERVED TIME ON THE LINK. IF SPEED (OS) IS CODED ITS UNITS A MI/H. FOR

    TIME (OT) ITS UNITS ARE MINUTES. HNET/SLIM DOES NOT ASSUME A DECIMAL POINT, BUT ACCEPTS ONE EXPLICITLY CODED IN ANY COLUMN OF THE FIELD. HNET/SLIM WILL ASSIGN A VALUE TO TIME (FFT) BY RELATING SPEED TO DISTANCE.

    BY SPEED OR TIME IS MEANT THE ACTUAL SPEED OR TIME ON THE DURING THE TIME PERIOD OF INTEREST. SPEED OR TIME MAY BE USED BY THE FOLLOWING UTPS PROGRAMS:

    A. INET MAY USE OBSERVED SPEEDS TO ESTIMATE TRANSIT SPEEDS.

    B. HNET/SLIM (REPORT 9) COMPARES OBSERVED AND ASSIGNED SPEEDS FOR NETWORK CALIBRATION OR EVALUATION.

    C. UMATRIX MAY BE USED TO COMPARE SPEEDS OR TIMES WITH OTHER NETWORK VARIABLES.

    D. UROAD MAY USE TIME TO BUILD INITIAL PATHS AND OPTIONALLY TO SKIM THEM.

11. NL (COLUMN 49) IS THE NUMBER OF LANES ON THE (A,B) LINK. IT MUST BE BETWEEN 0 AND 9. UROAD USES THIS LANE COUNT AND CAPACITY PER LANE TO DETERMINE LINK CAPACITY.

12. LG (COLUMNS 50-51) INDICATES A LINK GROUP INTO WHICH THE LINK IS PLACED BY THE USER. IT IS A RIGHT-JUSTIFIED INTEGER BETWEEN 1 AND 99. UROAD SUMMARIZES VOLUMES BY LINK GROUP. SCREEN LINE VOLUMES ARE EASILY DETERMINED IF APPROPRIATE LINK GROUPS ARE CODED FOR LINKS CROSSING SCREENLINES OF INTEREST.

13. COLUMNS 52-72 SHOULD BE LEFT BLANK SO THAT HNET/SLIM BUILDS A LINK IN THE B-TO-A DIRECTION WITH SAME ATTRIBUTES AS CODED IN COLUMNS 31-51.

SPEED AND CAPACITY UPDATE CARDS

THESE CARDS PROVIDE THE USER A MEANS OF ENTERING ''CUSTOMIZED'' TABLES OF FREE-FLOW LINK SPEED AND POSSIBLE PER-LANE CAPACITY. THE SPEED/CAPACITY TABLES PROVIDE FOR ENTRIES FOR EACH OF 5 FACILITY TYPES AND 5 AREA TYPES. THE UPDATE CARDS MAY BY USED TO REPLACE ANY VALUE IN THE TABLES. IT SHOULD BE NOTED THAT THESE CARDS ARE PROCESSED SERIALLY, SO THAT THE CHANGES SPECIFIED IN A GIVEN CARD APPLY TO THE TABLES AS UPDATED BY ANY PREVIOUS CARDS. THIS FEATURE CAN SOMETIMES BE EXPLOITED TO REDUCE THE TOTAL NUMBER OF CARDS NEEDED.

THE HNET DEFAULT VALUES SHOULD BE MODIFIED FOR HNET/SLIM BY THE CARDS GIVEN IN SAMPLE SETUP (3) IN ORDER TO LOWER FREEWAY SPEEDS TO 55 MPH AND TO RAISE CERTAIN EXPRESSWAY SPEEDS TO 50 MPH TO ALLOW FOR CODING OF FASTER RURAL HIGHWAYS AS EXPRESSWAYS.

THESE CARDS ARE INPUT ON THE SYSIN FILE IMMEDIATELY FOLLOWING AN &DATA CARD AS SHOWN IN THE SAMPLE SETUP.

SPEED / CAPACITY UPDATE CARDS

COLUMNS	FORMAT	CONTENTS
2	I1	LOW AREA TYPE CODE
4	I1	HIGH AREA TYPE CODE
6	I1	LOW FACILITY TYPE
8	I1	HIGH FACILITY TYPE
10	I1	LOW NUMBER OF LANES
12	I1	HIGH NUMBER OF LANES
		THESE FIELDS SPECIFY THE INDIVIDUAL VALUES OR RANGES OF VALUES TO BE CHANGED IN EXISTING SPEED AND CAPACITY TABLES.
13	A1	CAPACITY OPERATOR APPLIED TO COLS. 14-18 BLANK = REPLACE EXISTING VALUE IN TABLE + = ADD TO EXISTING VALUE IN TABLE
14-18	F5.0	CAPACITY/LANE
19	A1	SPEED OPERATOR APPLIED TO COLS, 20-23 BLANK = REPLACE EXISTING VALUE IN TABLE + = ADD TO EXISTING VALUE IN TABLE
20-23	F4.2	SPEED
24-46		SAME FORMAT AS COLUMNS 1-23, OFFSET BY 23
47-69		SAME FORMAT AS COLUMNS 1-23, OFFSET BY 46

SAMPLE PRODUCTION RUN SETUPS

(1) BUILD N-FILE AND Z-FILE FROM LINK CARDS.

```
//BUILDN EXEC HNET,
// N1='DSN=UMTA.UTOWN.NFILE,VOL=SER=UMTA1',SPACEN1='(TRK,100)',
//      DISPN1='(,KEEP)',UNITN1=3330,
// Z1='DSN=UMTA.UTOWN.LZFILE,VOL=SER=UMTA1',SPACEZ1='(TRK,100)',
//      DISPZ1='(NEW,KEEP)',UNITZ1=3330
//HNET.LINKS DD DSN=UMTA.UTOWN.DATA(LINK),DISP=SHR,
//     VOL=SER=UMTA1,UNIT=3330
//HNET.SYSIN DD *
   BUILD N-FILE AND Z-FILE FROM LINK CARDS, UPDATE DEFAULT
   FREEFLOW SPEED TABLE
 &PARAM  NODES=600,ZONES=180      &END
 &SELECT REPORT=16,18,
         Z1LAVS= 'A',  'B', 'FT', 'AT', 'GL','OS','FFT',
                 'C', 'NL', 'LG',  'DC',  'D'              &END
 &DATA
 3 5 1 1 1 9+  0.0 55.0
 2 4 2 2 1 9+  0.0 40.0
 5 5 2 2 1 9+  0.0 50.0
 5 5 6 6 1 9+  0.0 35.0
```

(2) UPDATE N-FILE AND Z-FILE FROM LINK CARDS.

```
//UPDATN EXEC HNET,
// N1='DSN=UMTA.UTOWN.NFILE,VOL=SER=UMTA1',UNITN1=3330,
// Z1='DSN=UMTA.UTOWN.LZFILE,VOL=SER=UMTA1',UNITZ1=3330
//HNET.LINKS DD *
   (UPDATE LINK CARDS INSERTED HERE. FOR EXAMPLE--)
D    284   285
A    286   2870.83  65        5 S     30          111
A    287   2880.25  65        5 S     30          199
//HNET.SYSIN DD *
      UPDATE N-FILE AND Z-FILE FROM LINK CARDS
 &SELECT REPORT=9,16,18,RNODES=250,-299,
         Z1LAVS= 'DC',  'D', 'FT', 'AT', 'GL','FFS','FFT',
                 'C', 'NL', 'LG',  'A',  'B'            &END
 &DATA
 3 5 1 1 1 9+  0.0 55.0
 2 4 2 2 1 9+  0.0 40.0
 5 5 2 2 1 9+  0.0 50.0
 5 5 6 6 1 9+  0.0 35.0
```

5

UROAD/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

U R O A D / S L I M : HIGHWAY TRAFFIC ASSIGNMENT PROGRAM

SUMMARY

UROAD/SLIM IS THE UTPS HIGHWAY TRAFFIC ASSIGNMENT AND NETWORK ANALYSIS PROGRAM. IT PERFORMS THE BASIC NETWORK FUNCTIONS: PATH BUILDING, LOADING AND SKIMMING. UROAD/SLIM PERFORMS A SIMPLE PROBABALISTIC ASSIGNMENT OF A DAILY TRIP TABLE, WHICH COULD BE EITHER PERSON TRIPS OR VEHICLE TRIPS. DEFAULT SPEEDS BY FACILITY TYPE AND AREA TYPE OR CODED OBSERVED SPEEDS MAY BE USED. UROAD/SLIM ALSO SAVES THE SKIM TABLE OF INTERZONAL TRAVEL TIMES FOR POSSIBLE LATER USE BY A GRAVITY MODEL, A MODE SPLIT PROCEDURE, OR SIMPLY FOR CHECKING.

UROAD/SLIM INPUTS

UROAD/SLIM EXPECTS THE FOLLOWING AS INPUT:

(1) A TRIP TABLE CONTAINING TRIPS TO BE FACTORED AND ASSIGNED TO THE NETWORK,
(2) A SYSIN CARD FILE CONTAINING STANDARD UTPS CONTROL CARDS.

INPUT/OUTPUT

UROAD/SLIM USES A SINGLE LINK Z-FILE (Z1) FOR BOTH INPUT AND OUTPUT. THE NETWORK DESCRIPTION IS TAKEN FROM THIS REQUIRED FILE AND THE "LOAD DATA" GENERATED BY UROAD/SLIM ARE OUTPUT TO THIS SAME FILE. THE LOAD DATA INCLUDES FOR EACH LINK:

(1) ASSIGNED VOLUME,
(2) CONGESTED IMPEDANCE,
(3) CONGESTED TIME,
(4) CONGESTED SPEED, AND
(5) VOLUME-TO-CAPACITY RATIO.

UROAD/SLIM OUTPUTS

IN ADDITON TO THE LOAD DATA OUTPUT TO THE LINK Z-FILE, UROAD/SLIM OUTPUTS:

(1) A MATRIX J-FILE (J9) CONTAINING INTERZONAL TRAVEL TIMES;
(2) THE FOLLOWING REPORTS:
   (A) A LINK VOLUME REPORT,
   (B) A SCREENLINE VOLUME SUMMARY,
   (C) A REPORT ON FINAL CONTENTS OF THE LINK Z-FILE.
   (D) A VMT SUMMARY BY GEOGRAPHIC LOCATION.

METHODOLOGY

(1) NETWORK DESCRIPTION

UROAD/SLIM DEVELOPS AN INTERNAL NETWORK DESCRIPTION FROM SEVERAL EXTERNAL SOURCES, NAMELY FROM THE LINK Z-FILE AND VARIOUS CONTROL CARD KEYWORD VALUES.

THE LINK Z-FILE (HEREAFTER CALLED SIMPLY THE Z-FILE) CONTAINS LISTS OF ATTRIBUTIVE VALUES (LAV'S) WHERE THE LENGTH OF EACH LIST IS EQUAL TO THE NUMBER OF LINKS IN THE NETWORK. (SEE HNET/SLIM OPERATING INSTRUCTIONS.) EACH LAV IS GIVEN A NAME INDICATING THE ATTRIBUTE REPRESENTED. UROAD/SLIM ASSUMES THE FOLLOWING LAV NAMES:

LAV NAME	LINK ATTRIBUTE
A	ANODE
B	BNODE
DC	DIRECTION CODE
D	DISTANCE
FFT/FFS	FREE FLOW TIME OR SPEED
OT/OS	OBSERVED TIME OR SPEED
C	CAPACITY PER LANE
NL	NUMBER OF LANES
FT	FACILITY TYPE
GL	GEOGRAPHIC LOCATION
LG	LINK GROUP

(2) PATH BUILDING

THE TRAVEL TIME ON A STANDARD LINK IS TAKEN FROM THE LAV INDICATED BY THE &PARAM TLAV. TLAV DEFAULTS TO 'FFT' (FREE FLOW TIME). THE NUMBER OF LANES IS TAKEN FROM THE LAV 'NL'. IF NL IS ZERO, THE LINK'S CAPACITY IS ZERO SO THE LINK IS DELETED FROM THE INTERNAL UROAD/SLIM NETWORK.

(3) TRAFFIC ASSIGNMENT

(A) ALL-OR-NOTHING ASSIGNMENT

IN AN ALL-OR-NOTHING (AON) ASSIGNMENT, ALL TRIPS FROM I TO J ARE ASSIGNED TO A PATH OF MINIMUM IMPEDANCE BETWEEN I AND J. ALL OTHER PATHS ARE ASSIGNED NOTHING, HENCE THE TERM "ALL-OR-NOTHING." WHEN &PARAM THETA=0 IS CODED, AN A-O-N ASSIGNMENT OF TRIPS TO MINIMUM TIME PATHS IS PERFORMED.

(B) PROBABALISTIC ASSIGNMENT

WHEN THETA IS GREATER THAN ZERO, UROAD/SLIM PERFORMS A PROBABILISTIC MULTIPATH ASSIGNMENT IN WHICH THE TRIPS FOR EACH I-J PAIR MAY BE ASSIGNED TO MORE THAN ONE PATH FROM I TO J. FOR UROAD/SLIM, THETA=0.002 IS SUGGESTED.

(4) PATH SKIMMING

WHEN NO INPUT TRIP TABLE IS PROVIDED, NO ASSIGNMENT IS PERFORMED, BUT PATH SKIMMING IS PERFORMED IF REQUESTED. IN THIS CASE UROAD/SLIM BUILDS MINIMUM TIME PATHS FROM THE LINK TIMES. THESE PATHS ARE THEN SKIMMED TO FIND THE INTERZONAL TIMES.

REPORTS

VOLUMES PRINTED IN THE LINK VOLUME REPORT ARE IN THE SAME UNITS AS THEY APPEAR IN THE TRIP TABLES.

REPORT 4. LINK AND TURN VOLUMES
THIS REPORT LISTS THE LINK VOLUMES AND LINK SPEEDS RESULTING FROM THE ASSIGNMENT.

L I N K A N D T U R N V O L U M E S

A NODE	B NODE	A-TO-B VOLUME	A-TO-B SPD	2-WAY VOLUME	2-WAY AV. SPD	B NODE	A-TO-B VOLUME	A-TO-B SPD	2-WAY VOLUME	2-WAY AV. SPD
(1)	(101)	1042	10	3916	10	(102)	297	10	3154	10
(2)	(103)	2078	10	3120	10	(104)	626	10	1526	10
(3)	(105)	1815	15	2594	15	(106)	393	15	1407	15
(4)	(107)	365	15	993	15	(108)	1468	15	1972	15
(5)	(141)	3276	15	4038	15					
(101)	(1)	2874	10	3916	10	(113)	1042	22	3916-	14
(104)	(2)	900	10	1526	10	(116)	2874-	19	3916	21
	(117)	1172	24	4450+	11					

ROWS OF THIS REPORT THAT CONTAIN ZERO VOLUMES ON ALL LINKS ARE SUPPRESSED DURING PRINTING.

SYMBOLS FOLLOWING LINK VOLUMES IN THIS TABLE INDICATE THE VOLUME/CAPACITY RATIO OF THE LINK FOR PEAK HOUR CONDITIONS BY ASSUMING THAT PEAK HOUR VOLUMES ARE 12% OF THE ASSIGNED DAILY VOLUMES. THE SYMBOLS ARE:

SYMBOL	V/C RANGE
BLANK	0.00 GE V/C LT 0.75
-	0.75 GE V/C LT 1.00
+	1.00 GE V/C LT 1.25
*	1.25 GE V/C

REPORT 6. GEOGRAPHIC LOCATION SUMMARY
THIS REPORT SUMMARIZES VMT AND AVERAGE SPEED BY V/C, FACILITY TYPE, AND GEOGRAPHIC LOCATION.

G E O G R A P H I C L O C A T I O N A N D

F A C I L I T Y T Y P E S U M M A R Y

VMT (VEH-MI)
SPEED (MI/H)
DISTANCE (MI)

LINKS WITH VOLUME/CAPACITY LESS THAN 0.75

GEO LOC	1	2	3	4	6	OTHER	TOTAL
1	0	0	2105	0	1473	5819	9397
	0	0	24	0	8	11	11
	0	0	9	2	2	4	17
2	0	5391	4407	0	0	2002	11800
	0	47	23	0	0	15	27
	0	6	50	0	0	2	58
3	2514	0	0	0	0	2019	4533
	61	0	0	0	0	11	26
	3	0	25	0	0	4	29
ALL	2514	5391	6512	0	1473	9840	25730
	61	47	23	0	8	12	18
	3	6	83	2	2	7	104

TOTAL VHT = 1437 VEH-H
TOTAL DELAY = 13 VEH-H

TABLES ARE PRINTED FOR EACH OF THE FOLLOWING RANGES:

VOLUME/CAPACITY RATIO FROM 0.00 TO 0.75
VOLUME/CAPACITY RATIO FROM 0.75 TO 1.00
VOLUME/CAPACITY RATIO FROM 1.00 TO 1.25
VOLUME/CAPACITY RATIO 1.25 AND OVER

THESE REPORTS ARE DESIGNED FOR SYSTEM EVALUATION AND IMPACT ESTIMATION.

REPORT 8. VOLUME/CAPACITY SUMMARY
THIS REPORT SUMMARIZES V/C AND TOTAL VOLUME BY LINK GROUP. LINK GROUPING PERMITS DIRECT OUTPUT OF V/C AND TOTAL VOLUMES FOR GROUPS OF LINKS, FOR EXAMPLE LINKS CUT BY SCREEN LINES ACROSS MAJOR CORRIDORS. FOR THIS REPORT TO BE USEFUL, LINK GROUPS MUST HAVE BEEN CODED ON THE LINK CARDS INPUT TO HNET. IF A PERMANENT SET OF SCREENLINES HAS NOT BEEN ESTABLISHED, IT MAY BE SIMPLER TO SUM VOLUMES FROM REPORT 4 AS NEEDED.

L I N K G R O U P T R A F F I C S U M M A R Y

VOLUME/CAPACITY RATIO
TOTAL VOLUME

	LINK GROUP (UNITS)									
TENS	0	1	2	3	4	5	6	7	8	9
0	0.9	0.0	0.7	0.0	1.2	1.4	0.0	0.0	0.5	0.0
	27	0	33	0	84	29	0	0	110	0
10	1.0	1.1	0.0	0.0	0.9	0.0	1.6	0.0	0.0	1.3
	47	6	0	0	49	0	104	0	0	90
20	0.0	0.7	0.0	0.9	0.0	1.4	0.0	0.0	1.6	0.0
	0	25	0	53	0	17	0	0	49	0
.										
.										
.										
90	1.0	0.0	1.5	0.0	2.0	0.0	0.7	0.0	0.9	0.0
	33	0	7	0	4	0	9	0	34	0
REST	0.0	0.6	0.7	0.0	0.0	1.6	0.0	0.0	0.0	0.9
	0	47	7	0	0	68	0	0	0	26

REPORT 19. CONTENTS OF Z-FILE
THIS REPORT LISTS THE CONTENTS OF THE Z-FILE INCLUDING ANY LAVS OUTPUT BY THE CURRENT RUN OF UROAD/SLIM.

C O N T E N T S O F Z - F I L E Z 1

LINKS= 126 CREATION: DATE=16SEP80 TIME=10.34.10 PROG=HNET
CREATED FROM DSN=UMTA.NCS.NFILE

SPACE (WORDS):	TOTAL DATA= 15000	USED= 5400	UNUSED AVAILABLE= 9400	EMBEDDED FREE SPACE= 200

ATTRIBUTE ENTRIES: LAVS PRESENT= 25 MAX LAVS POSSIBLE=135

			CREATION			
LAV NAME	UNITS	TYPE	DATE	TIME	PROGRAM	DESCRIPTION
A	143	I*2	16SEP80	10.34	HNET	LINK ANODES
AT		I*1	16SEP80	10.34	HNET	AREA TYPE
B	143	I*2	16SEP80	10.34	HNET	LINK BNODES
D	MI	R*4	16SEP80	10.34	HNET	DISTANCE
DC		I*1	16SEP80	10.34	HNET	DIRECTION CODE
FFS	MI/H	R*4	16SEP80	10.34	HNET	FREE FLOW SPEED
FFT	MIN	R*4	16SEP80	10.34	HNET	FREE FLOW TIME
FT		I*1	16SEP80	10.34	HNET	FACILITY TYPE
GL		I*1	16SEP80	10.34	HNET	GEOGRAPHIC LOCATION
LG		I*1	16SEP80	10.34	HNET	LINK GROUP
NL		I*1	16SEP80	10.34	HNET	NUMBER OF LANES
C	VEH/LN/H	I*2	16SEP80	10.34	HNET	CAPACITY
OS	MI/H	R*4	16SEP80	10.34	HNET	OBSERVED SPEED
OT	MIN	R*4	16SEP80	10.34	HNET	OBSERVED TIME

FILE TABLE

	FILE NAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS
	J1	FT11F001	TRIP TABLE TO BE ASSIGNED TO THE NETWORK
OUTPUT	J9	FT19F001	INTERZONAL TRAVEL TIME MATRIX WHEN &SELECT TIME IS NAMED
I/O	Z1	Z1	LINK Z-FILE CONTAINING INPUT NETWORK DESCRIPTION & TO WHICH OUTPUT LAVS ARE WRITTEN WHEN LOADING

KEYWORD TABLE

	KEYWORD	TYPE	DEFAULT	MAX	VALUE OR PURPOSE
&PARAM	TABLES	I(4)	4*0	1255	TABLE NUMBER OF TRIP TABLE TO BE ASSIGNED
	THETA	D	0	10.0	ASSIGNMENT DIVERSION PARAMETERS USED TO SPECIFY THE TYPE OF ASSIGNMENT TO BE PERFORMED.
	TLAV	A8	'FFT'		NAME OF LAV CONTAINING LINK TIMES
	LAVN	1		99	LAV NUMBER TO BE APPENDED TO THE LAV OUTPUT (USUALLY 1 IN UROAD/SLIM)
&SELECT	REPORT	R(20)	NONE		REPORT NUMBERS OF REQUESTED REPORTS.
	TIME	A12	NONE		NAME OF OUTPUT TIME SKIM TABLE, IF SELECTED.

KEYWORD NOTES

&PARAM KEYWORDS

TABLES IS THE TRIP TABLE NUMBER TO BE USED. FOR EXAMPLE:

```
TABLES=1001
```

INDICATES THAT TABLE 001 ON FILE J1 IS TO BE INPUT TO THE RUN.

THETA IS A DECIMAL FRACTION WHICH GOVERNS THE PATHFINDING TECHNIQUE TO BE USED FOR THE ASSIGNMENT. THETA=.002 IS SUGGESTED TO PERFORM A PROBABALISTIC ASSIGNMENT IN UROAD/SLIM.

TLAV IS AN EIGHT CHARACTER LAV NAME FOR THE LAV IN THE Z1 FILE TO BE USED AS THE LINK TIMES. FOR EXAMPLE:

```
TLAV = 'OT'
```

INDICATES THAT FOR THIS ASSIGNMENT UROAD WILL USE THE OT (OBSERVED TIME) LAV INSTEAD OF THE DEFAULT 'FFT' LAV. THIS RESULTS IN UROAD USING THE OBSERVED SPEEDS AND TIMES THAT WERE CODED ONTO THE LINK CARDS WHEN HNET WAS RUN. THE DEFAULT, TLAV='FFT', RESULTS IN UROAD USING THE SPEEDS AND TIMES FROM THE HNET SPEED/CAPACITY TABLES.

LAVN IS AN INTERGER BETWEEN 1 AND 99 WHICH IS USED AS A SUFFIX FOR LAV OUTPUT NAMES. TYPICALLY IN UROAD/SLIM LAVN=1.

&SELECT KEYWORDS

REPORT IS A SET OF INTEGERS REPRESENTING REPORT NUMBERS WHICH THE USER DESIRES TO BE PRINTED. FOR EXAMPLE, IF:

```
REPORT=4,8,
```

THEN UROAD PRINTS REPORTS 4 AND 8.

TIME IS A 12 CHARACTER NAME FOR THE OUTPUT TIME SKIM TABLE. A NAME MUST BE SPECIFIED BY THE USER IF OUTPUT TIME SKIM TABLES ARE DESIRED. FOR EXAMPLE:

```
TIME='HIWAY TIME'
```

INDICATES THAT INTERZONAL TIMES ARE TO BE GENERATED AND OUTPUT TO THE J9 FILE (IF PRESENT) WITH THE TABLE NAME 'HIWAY TIME'. UNITS ARE WHOLE MINUTES.

SAMPLE PRODUCTION RUN SETUPS

(1) ALL-OR-NOTHING TRAFFIC ASSIGNMENT USING OBSERVED SPEEDS

```
//NROAD1 EXEC UROAD,CORE=320K,TIME=10,
//    Z1='DSN=UMTA.RDC.UTOWN.Z1FILE1,VOL=SER=UMTA1',UNITZ1=3330,
//    J1='DSN=URD79.TRIPS,VOL=SER=UMTA1',UNITJ1=3330,
//    J9='DSN=ALT0.SKIMS,VOL=SER=UMTA1',UNITJ9='3330,
//    SPACE=(TRK,(1,1))'
//UROAD.SYSIN DD *
 ASSIGN DAILY VEHICLE TRIPS TO ALL-OR-NOTHING PATHS
 &PARAM THETA=0,TABLES=1001,TLAV='OT',LAVN=1  &END
 &SELECT REPORT=4,8                           &END
```

(2) STOCHASTIC TRAFFIC ASSIGNMENT USING HNET DEFAULT SPEEDS

```
 //NROAD EXEC UROAD,CORE=350K,TIME=1,
//    Z1='DSN=UMTA.RDC.UTOWN.Z1FILE1,VOL=SER=UMTA1',UNITZ1=3330,
//    J1='DSN=URD79.TRIPS,VOL=SER=UMTA1',UNITJ1=3330,
//    J9='DSN=ALT0.SKIMS,VOL=SER=UMTA1',UNITJ9='3330,
//    SPACE=(TRK,(1,1))'
//UROAD.SYSIN DD *
 ASSIGN DAILY VEHICLE TRIPS (THETA=0.002)
 &PARAM THETA=.002,TABLES=1001,LAVN=1     &END
 &SELECT REPORT=4,6                       &END
```

(3) SKIM NETWORK LINK Z-FILE FOR TRAVEL TIMES ONLY

```
 //NROAD EXEC UROAD,CORE=350K,TIME=1,
//    Z1='DSN=UMTA.RDC.UTOWN.Z1FILE1,VOL=SER=UMTA1',UNITZ1=3330,
//    J9='DSN=ALT0.SKIMS,VOL=SER=UMTA1',UNITJ9='3330,
//    SPACE=(TRK,(1,1))'
//UROAD.SYSIN DD *
 SKIM UTOWN NET FOR HIGHWAY TRAVEL TIMES
 &PARAM  TLAV='OT'                        &END
 &SELECT TIME='HIWAY TIME'                &END
```

6

UMCON/SLIM

U R B A N T R A N S P O R T A T I O N P L A N N I N G S Y S T E M

U M C O N / S L I M : MATRIX MODIFICATION PROGRAM

SUMMARY

UMCON/SLIM IS USED PRIMARILY TO MODIFY SKIM TABLES BY INSERTING INTRAZONAL TIMES AND ADDING HIGHWAY TERMINAL TIMES TO THE SKIM TABLES FROM UROAD. THIS IS DONE PRIOR TO USING THE SKIM TABLES IN A GRAVITY MODEL RUN IN AGM/SLIM. INPUT CONSISTS OF A SINGLE SKIM TABLE OF TRAVEL TIMES FROM UROAD AND A SET OF MODIFICATION CARDS.

USING THE MODIFICATION CARDS, ONE OR MORE MATHEMATICAL OPERATIONS MAY BE PERFORMED ON ANY OR ALL ELEMENTS OF A TABLE. THE OUTPUT CONTAINS THE TABLE OF MODIFIED TIMES, I.E., THE TABLE WHICH INCLUDES THE INTRAZONAL AND TERMINAL TIMES.

REPORTS

UNCOM REPORTS ARE GENERATED AUTOMATICALLY. THERE IS NO REPORT KEYWORD; HOWEVER THE PRINTING OF MATRIX ROWS IN REPORT 7 IS CONTROLLED BY THE &SELECT PRINT OPTION.

REPORT 4. SUMMARY OF THE TOTAL VALUE OF ALL CELLS INPUT AND OUTPUT FOR EACH MATRIX/TABLE.

MCON4 405 (INFORMATION): SUM OF MATRIX ELEMENTS OUTPUT

OLD TABLE NO.	TOTAL	NEW TABLE NO.	TOTAL
101	136	1	386
103	206	2	248
203	52	3	63

REPORT 5. CARD IMAGE REPORT OF THE INPUT MODIFICATION CARDS.

```
          I N P U T   M O D I F I C A T I O N   C A R D S
1---5---10---15---20---25---30---35---40-- ... 55---60---65---70--
 10011001    1    2    2   3+   10. 1001        1    1   3  2.
1---5---10---15---20---25---30---35---40-- ... 55---60---65---70--
MCON3 304 (INFORMATION):  1 MODIFICATION CARD(S) READ.
```

REPORT 7. OUTPUT ROWS FOR ORIGIN ZONES INDICATED IN THE PRINT KEYWORD OF THE &SELECT CARD.

INTERCHANGE VALUES FROM ZONE 1 DATASET J9 TABLE NUMBER 1

UNITS	0	1	2	3	4	5	6	7	8	9
TENS		1	2	3	4	5	6	7	8	9
1	10	11	12	13	14	15	16	17	18	19
2	20	21	22	23	24	25	26	27	28	29
3	30	31	32	33	34					

TOTAL = 595 MEAN = 17.500

FILE TABLE

	FILENAME	DDNAME	CONTENTS OR FUNCTION
INPUT	SYSIN	FT05F001	PROGRAM CONTROL CARDS
	J1	FT11F001	INPUT MATRIX FILE
OUTPUT	J9	FT19F001	OUTPUT MATRIX FILE (TRIP TABLE/SKIM TABLE)
	-	FT06F001	PROGRAM REPORTS AND MESSAGES

KEYWORD TABLE

	KEYWORD	TYPE	DEFAULT	VALUE OR PURPOSE
&PARAM	TABLES	I(99)	101	LIST OF INPUT TABLE INPUT NUMBERS EXPRESSED AS FILE NUMBER AND 3-DIGIT TABLE NUMBER (DEFAULT IS A 2 DIGIT TABLE NUMBER)
	CARDS	I	100	APPROXIMATE NUMBER OF MODIFICATION CARDS INPUT (MUST BE >= ACTUAL NUMBER)
	ZONES	I(99)	0	INPUT TABLE SIZES
	NAME<N>	A(12)	UMCON	A TITLE FOR EACH OUTPUT MATRIX
&SELECT	PRINT	R(200)	0	LIST CONTROLLING PRINTING OF OUTPUT ROWS (REPORT 7)

KEYWORD NOTES

&PARAM KEYWORDS

TABLES DEFINES THE FILE NUMBER AND TABLE NUMBER OF THE INPUT TABLES TO BE PROCESSED. THERE CAN BE UP TO 99 TABLE VALUES USED. TABLE VALUES MUST BE INPUT IN ASCENDING NUMERICAL ORDER. I.E.

TABLES=1001,1002.

INPUTS THE 1ST AND 2ND TABLES ON J1.

OUTPUT TABLES ARE IN THE ORDER INDICATED IN THE TABLES PARAMETER LIST. THEY ARE NUMBERED FROM 1 TO THE NUMBER OF TABLES OUTPUT, REGARDLESS OF THE INPUT NUMBERS.

CARDS IS USED IN CORE ALLOCATION TO SPECIFY HOW MUCH CORE SHOULD BE ALLOCATED FOR MODIFICATION CARDS. IF NO MODIFICATION CARDS ARE BEING INPUT THIS PARAMETER CAN BE SET TO ZERO.

CARDS=250

STATES THAT 250 OR FEWER MODIFICATION CARDS WILL BE INPUT.

ZONES SPECIFIES THE NUMBER OF (ZONES) COLUMNS ON EACH TABLE BEING INPUT.

NAME<N> IS CODED TO PROVIDE A TITLE TO BE STORED IN THE COMMENTS RECORDS AT THE BEGINNING OF AN OUTPUT MATRIX FILE. EACH NAME CAN BE CODED WITH UP TO 12 ALPHANUMERIC CHARACTERS ENCLOSED IN SINGLE QUOTES FOR EACH OUTPUT TABLE. CODING

NAME1='AUTO TRIPS', NAME2='TOTAL TRIPS'

WILL RESULT IN AUTO TRIPS BEING WRITTEN AS AN IDENTIFIER FOR THE FIRST TABLE AND TOTAL TRIPS AS AN IDENTIFIER FOR THE SECOND TABLE. IF NO NAME IS SPECIFIED, THE DEFAULT IS UMCON.

&SELECT KEYWORDS

PRINT CONTROLS PRINTING OF OUTPUT ROWS OF THE MATRIX J9 IN REPORT 7.

PRINT=1,5

WILL CAUSE ROWS 1 AND 5 OF ALL OUTPUT MATRICES TO BE PRINTED IN REPORT 7. THE DEFAULT IS NOT TO PRINT ANY ROWS.

DATA CARD FORMATS

THE MODIFICATION CARDS MUST BE PRECEDED BY A 9'S CARD (9 IN CARD COLUMN 1) IN THE CONTROL CARD STREAM.

MODIFICATION CARD

MODIFICATION CARD	
COLUMN	CONTENTS (FIRST HALF OF CARD)
1	BLANK
2- 5	FIRST FILE AND TABLE NUMBER (E.G., 1001)
6- 9	LAST FILE AND TABLE NUMBER (E.G., 1002)
10-14	PRODUCTION ZONE NUMBER (LOW END OF RANGE)
15-19	PRODUCTION ZONE NUMBER (HIGH END OF RANGE)
20	BLANK
21-24	ATTRACTION ZONE NUMBER (LOW END OF RANGE)
25-28	ATTRACTION ZONE NUMBER (HIGH END OF RANGE)
29	OPERATION CODE (*,/,+,-,=,<,>)
30-36	OPERAND (DECIMAL POINT OK)
	CONTENTS (SECOND HALF OF CARD)
38-41	FIRST FILE AND TABLE NUMBER (E.G., 1001)
42-45	LAST FILE AND TABLE NUMBER (E.G., 1002)
46-50	PRODUCTION ZONE NUMBER (LOW END OF RANGE)
51-55	PRODUCTION ZONE NUMBER (HIGH END OF RANGE)
56	BLANK
57-60	ATTRACTION ZONE NUMBER (LOW END OF RANGE)
61-64	ATTRACTION ZONE NUMBER (HIGH END OF RANGE)
65	OPERATION CODE (*,/,+,-,=,<,>)
66-72	OPERAND (DECIMAL POINT OK)

EACH CARD ALLOWS TWO OPERATIONS TO BE SPECIFIED, ONE ON EACH HALF OF THE CARD.

THE OPERATION CODE INDICATES WHAT MATHEMATICAL OPERATION IS TO TAKE PLACE ON THE INDICATED TABLE CELLS.

OPERATION CODES (COLUMNS 29 AND 65)		
CODE	OPERATION	RESULTS
*	MULTIPLICATION	MULTIPLIES ELEMENT(S) BY OPERAND
/	DIVISION	DIVIDES ELEMENT(S) BY OPERAND
+	ADDITION	ADDS OPERAND TO ELEMENT(S)
-	SUBTRACTION	SUBTRACTS OPERAND FROM ELEMENT(S)
=	REPLACEMENT	REPLACES ELEMENT(S) WITH OPERAND

RULES FOR MODIFICATION CARDS

(A) MODIFICATION CARDS CAN BE IN ANY SEQUENCE. THEY ARE SORTED SO THAT THE MODIFICATION WITH THE LOWEST ORIGIN ZONE RANGE IS PERFORMED FIRST, THE SECOND NEXT AND SO ON.

(B) EITHER HALF OF A MODIFICATION CARD MAY BE LEFT BLANK.

SAMPLE PRODUCTION RUN SETUP

EXAMPLE OF INSERTING INTRAZONAL HIGHWAY SKIMS AND HIGHWAY TERMINAL TIMES.

```
//MCONT4 EXEC UMCON,CORE=160K,
//  J1='DSN=URD.HIMPS,VOL=SER=UMTA1',UNITJ1=3330,
//  J9='DSN=URD.TIMPS,VOL=SER=UMTA1,SPACE=(TRK,(1,1))',
//       UNITJ9=3330
//UMCON.SYSIN DD *
      UMCON RUN TO MERGE TERMINAL AND INTRAZONAL TIMES
      WITH THE HIGHWAY ZONE-TO-ZONE TRAVEL TIMES (URD.HIMPS).
      MODIFICATION CARDS WILL BE USED TO INSERT COMMON
      TERMINAL TIMES FOR EACH PRODUCTION (ATTRACTION) ZONE OVER
      THE RANGE OF ATTRACTION (PRODUCTION) ZONES.  FOR EXAMPLE,
      PRODUCTION ZONE TERMINAL TIME FOR ZONE 1 IS 5 MINUTES.
      WITH ADDITIONAL MODIFICATION CARDS, INTRAZONAL TIMES
      WILL BE INSERTED.  FOR EXAMPLE, ZONE 1 HAS AN INTRAZONAL
      TRAVEL TIME OF 4 MINUTES.  THE FINAL MERGED IMPEDANCE
      MATRIX (URD.TIMPS) WILL BE USED FOR GRAVITY MODEL DISTRIBU-
      TION OF TRIPS.  FINAL TOTAL TRAVEL TIMES WILL BE
      PRINTED FOR EACH ZONE AND INTERCHANGE.
 &PARAM CARDS=8,ZONES=5,TABLES=1001,NAME1='AUTO TIME' &END
 &SELECT PRINT=1,-5 &END
 &DATA
99999
 10011001   1   5   1   1+   4  10011001   1   5   2   2+   3
 10011001   1   5   3   3+   2  10011001   1   5   4   4+   2
 10011001   1   5   5   5+   2  10011001   1   1   1   5+   4
 10011001   2   2   1   5+   3  10011001   3   3   1   5+   2
 10011001   4   4   1   5+   2  10011001   5   5   1   5+   2
 10011001   1   1   1   1+   4  10011001   2   2   2   2+   9
 10011001   3   3   3   3+  10  10011001   4   4   4   4+  12
 10011001   5   5   5   5+  13
```