USER'S MANUAL FOR THE NOISE 1 AREA COMPUTER PROGRAM FOR TRANSPORTATION NOISE PREDICTION

Report Under Project Entitled "Area Computer Model For Transportation Noise Prediction: Phase 1 — Adaptation of MICNOISE"

by

Dan Sullivan
Graduate Assistant

and

J. K. Haviland
Faculty Research Engineer

Virginia Highway & Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia
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FOREWORD

This report contains a user's manual for the Noise 1 computer program, which concludes the work on "Area Computer Model for Transportation Noise Prediction: Phase 1 — Adaptation of MICNOISE", as described in the working plan submitted in June 1974.[1] In that plan, it was proposed to calculate L_{10} noise levels due to a network of highways on a two-dimensional basis, and then to plot L_{10} contours on a highway map.

It was found that the required coordinates of the highways can be supplied on punched cards by the Photogrammetry Section of the Central Office of the Virginia Department of Highways and Transportation. In preparing data for contour plotting, it was found advisable to divide the area into sectors, with each sector being surrounded by the edges of roads or by external boundaries. In this manner, the singular lines which would be present along the roads were avoided.

The XYNETICS contouring program was used. Unfortunately, the quality of the contours produced was so low that it was necessary to post the calculated L_{10} levels, and then to draw in the L_{10} contours by hand.

In this Phase 1 version of the area computer model, vertical terrain corrections have been omitted, pending a better understanding of computing times required. Otherwise, the MICNOISE algorithms are adhered to.

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INTRODUCTION

This report constitutes a user's manual for the NOISE 1 computer program prepared under Phase 1 of a study of area computer models. The need to predict the noise associated with highways has resulted in considerable research on highway noise and several computerized versions of noise prediction models have been devised. The present MICNOISE 2 computer program predicts noise on a point-by-point basis, and lacks the capability to predict noise at several points except by rerunning the program. However a highway planner needs information throughout the area where a proposed highway will be located and a program that could predict noise levels on an area-wide basis would be of considerable value.

This new program, NOISE 1, is designed to accomplish this purpose. NOISE 1 predicts the L_{10} noise levels throughout an area and stores the results in a form suitable for processing by a contouring program that produces a map of the region with noise contours drawn on it.

The algorithm used for calculating L_{10} is essentially the same as that used in the MICNOISE program down to a distance of 100 feet (30.5 m) from a roadway. For lesser distances, an inverse distance law is used. No elevation or barrier corrections are made.

The major sources of input for NOISE 1 are the highway coordinates and elevation data, which can be punched directly onto cards as they are read from aerial photographs. However, by exercising an option, these data can be filed ahead of time, and can be read directly from the file into NOISE 1. The remaining input data are supplied on cards. The complete NOISE 1 program is presently on the program library of the IBM 370 at the Computer Center of the Virginia Department of Highways and Transportation in Richmond.

DESCRIPTION OF PROGRAM

An overall flow diagram for the NOISE 1 program is shown in Figure 1. A listing of the program is given in Appendix A.

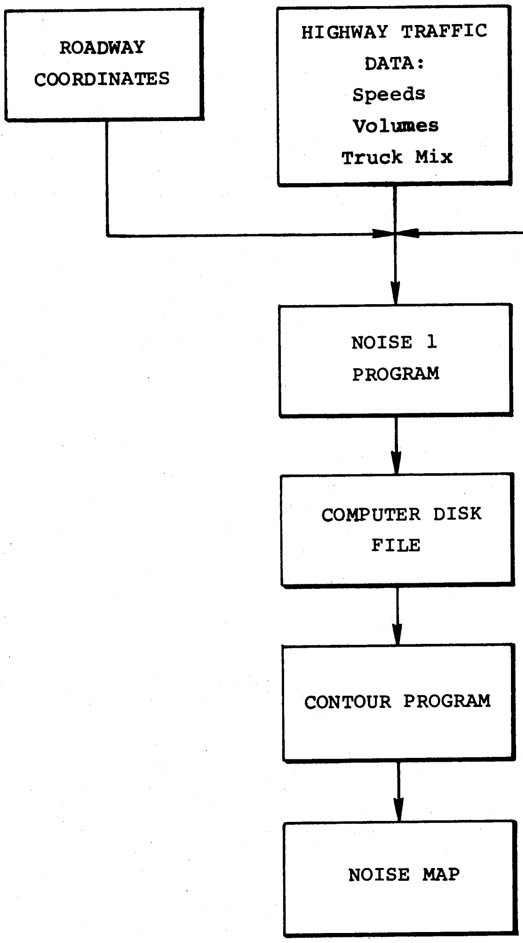

Figure 1. Flowchart for NOISE 1.

Noise Calculations

The sector, a region enclosed by roads, is the basic unit used for noise calculations (Figure 2). Computations are performed for points within each sector, taking one sector at a time. Noise levels are also computed for points along each sector's boundary. Each roadway and each sector is assigned a number by the program user for identification purposes.

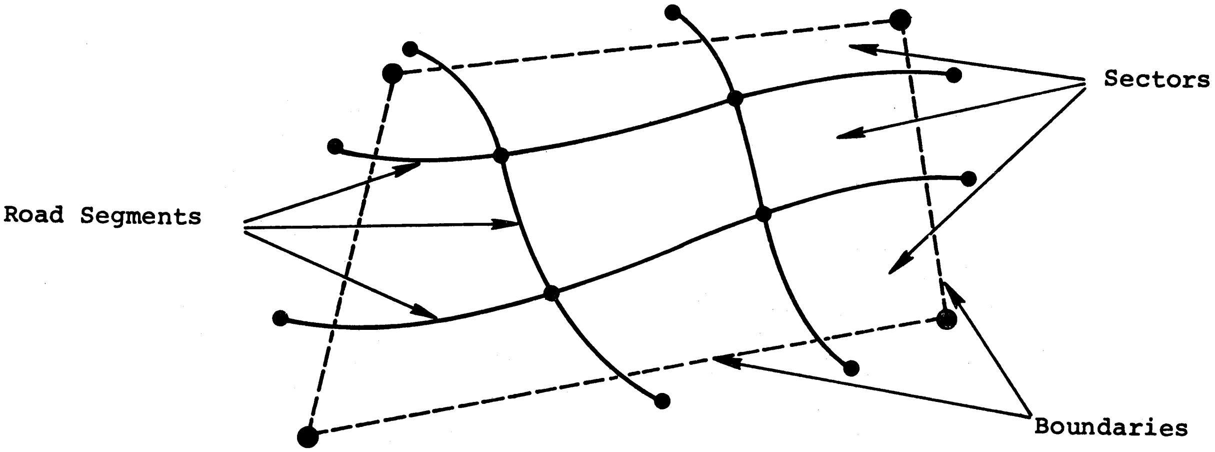

Figure 2. Road segments, sectors, and boundaries.

The program performs calculations in four major stages. The first stage is the input stage. Each record of data is printed as it is read and checked for errors in card type and card sequence. If errors are detected, asterisks (***) are printed to the right of the data in error. After all the data are read, the traffic and road location data are checked for missing road links. If omissions are detected a message will appear listing the numbers of the roads that have been omitted. Also, immediately after input, the coordinates are rotated about the point (X1M, Y1M), which becomes the origin of the transformed coordinates.

The second stage of the program begins with the reading of a sector card (type 8). This stage arranges the road points surrounding a sector into clockwise order. The points are then offset by the width of the road to position the points at the road's edge. Grid points are next inserted within each sector and around the sector's edge. These are the points at which noise computations will be made.

The third stage performs the actual calculations of the noise levels. An overall background level of 45 dB is assumed. Each point on a road is first screened on the basis of its proximity to the point at which the noise level is desired. Only road segments which are at a distance of 2,500 feet (762 m) or less are used to compute the noise level. For each segment, the perpendicular distance (d) and the subtended angle (θ) are first determined as shown in Figure 3.

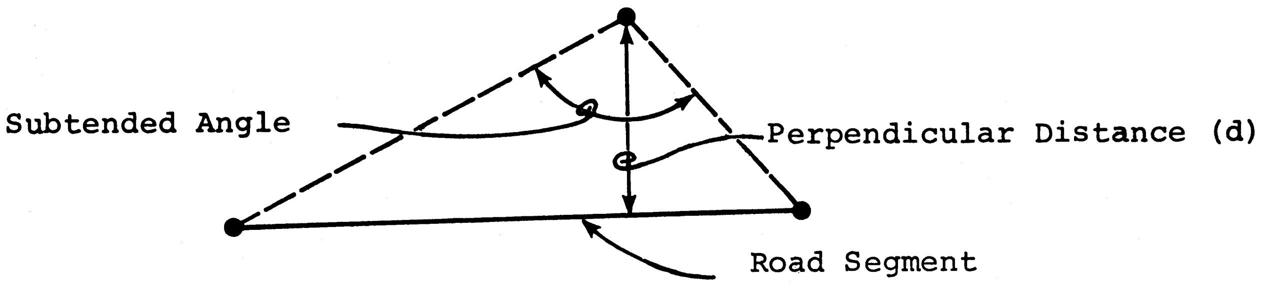

Figure 3. Noise calculation geometry.

Next, noise levels are computed for cars and trucks separately and are added to the accumulated values at the points. The formulas used for the noise calculations are:

For cars:

$$L_{50}\ \text{(dBA)} = 10\ \text{Log}_{10}\left[\frac{1000VaSa^{2}\theta}{d^{1.5}}\ \tan\ h\left(\frac{0.119Va}{Sa}\right)\right] - 1$$

Where Va = volume of automobile traffic (vehicles/hour)

Sa = speed of automobiles (mph)

d = perpendicular distance to the road (feet)

θ = subtended angle

For trucks:

$$L_{50}\ \text{(dBA)} = 10\ \text{Log}_{10}\left[\frac{1000V_{t}\theta}{S_{t}d^{1.5}}\ \tan h\ \left(\frac{0.119V_{t}}{S_{t}}\right)\right] + 65$$

where Va = volume of truck traffic (vehicles/hour)

Sa = speed of truck traffic (mph)

d = perpendicular distance to the road

θ = subtended angle

The correction used for converting the L_{50} values to L_{10} values is the same as that used in MICNOISE 5. The L_{50} value is increased from 2 to 13 dB depending upon the speed, volume, and distance of the segment from the noise point.

For greater computing speed, dB-summing is achieved by numerical addition of mean square sound pressures, with one-time conversion to decibels after summation is complete. Also, the distance correction changes to the inverse distance law below 100 feet (30.5 m), and to a constant below 10 feet (3.05 m). This has a negligible effect on predicted values, but avoids difficulties with numerical singularities in certain cases.

The fourth stage is the output phase in which the data for each point in the sector are placed on disk storage with other information needed to produce a contour map of the area. After the results for all of the sectors have been written onto the disk, the entire file is printed to create a visible record of the file's contents.

Inputs to the Program

As can be seen from Figure 1 the basic inputs to the model are of three main types:

1. Roadway location data. These data consist of coordinates along road centerlines. The location of an entire road network is stored in the computer memory. These coordinates are obtained from maps or aerial photographs. The Photogrammetry Section has a man-machine system which can transfer this information directly from aerial photographs onto punched cards.

2. Highway traffic data. These data come from transportation surveys and planning studies. Volumes and speeds of traffic as well as the fraction of traffic consisting of trucks are needed.

3. Other information. This is mainly coding information that is supplied by the user. One item already mentioned is the type 8 sector card, this consists of assignments of road segments to the sectors they surround.

Output of the Computer Program

The printed output of NOISE 1 consists of a copy of the input data and a copy of the output file to be used as input to the contouring program. The input data are listed as they are read. Cards with incorrect sequence numbers, type numbers or other errors are noted on the listing with asterisks (***) to the right of the corresponding line of output.

The listing of the output file contains the data required as input to the contouring program. The meaning of each instruction can be found in the XYNETICS contouring program manual.

A sample of input and output is given in Appendix A.

PREPARATION OF INPUT DATA

1. It is almost impossible to begin work on assembling the necessary data without a map of the region under consideration. Preferably this map will also have a grid indicating surveyor's coordinates to facilitate the transfer of data onto punched cards.

2. An origin point should be chosen. This point can be located anywhere although the most convenient location is at or near the lower left corner of the map. The coordinates of this point in the real (map) coordinate system and in plotter coordinates should be determined. (See Figure 8, page 18 .)

3. The first step after a map has been obtained is to identify the major roads of the region. Only major arterial streets have enough traffic to produce substantial amounts of noise. Little used roads and residential streets should not be considered since these do not contribute significantly to the noise levels.

4. After the roadways have been identified, they should be divided into segments and each segment should be numbered. The basic rules for segmenting and numbering are as follows:

   a. Each segment of roadway must have a number assigned to it. If any numbers of the overall sequence are omitted, this fact will be recorded in the output, but calculations will proceed.

   b. Road segments should contain reasonably uniform traffic parameters throughout. New segments should begin where speed or traffic volumes change.

   c. A divided road is treated as two one-way roads with a different number assigned to each one-way segment. The traffic parameters used here should be recorded for each direction separately under that direction's roadway number.

   d. Nodes should be placed at intersections of all numbered roads. Road segments must end at nodes.

   e. Each road segment must have a direction, indicated by an arrow, which specifies the order in which road data points are to be taken. It is preferable that all arrows should run in the same general direction to simplify data collection. (For example, all the arrows could point from south to north and east to west.)

5. Prepare a table with a description of each road segment and the traffic data for this road as in the sample given in Table 1. There will be no actual traffic counts for some road segments; in such cases, the traffic will have to be estimated. If no peak hour traffic counts (Q) are available a good estimate is one-tenth of the average daily traffic.

6. Get roadway location data. This procedure consists of selecting points at intervals along the roads in the directions indicated, and recording their X and Y coordinates. (The Z coordinates can also be recorded but this information is not needed by the present program. Later editions of the program will require the Z coordinate.) The Photogrammetry Section at the Virginia Department of Highways and Transportation has the capability to produce punched cards with this information directly from aerial photographs.

Table 1

Sample Traffic Data

No.	Route	From — To	ADT	Q	TIMIX	ST	SA
38	"	Country Club Rd. to Sterling St. (WB)	6,300	650	5	45	45
41	"	Sterling St. to Mason St. (WB)	6,700	520	5	35	35
42	"	Mason St. to Main St.	8,200	530	5	25	25
46	"	Court Square (WB)	3,100	260	5	25	25
108	"	Court Square to Liberty St.	4,000	400	5	25	25
43	"	Liberty St. to High St.	4,700	400	5	25	25
44	"	High St. to Willow St.	4,800	320	5	35	35
91	"	Willow St. to Waterman Drive	5,000	500	5	35	35
70	"	Waterman Drive to El, 883,000	5,300	470	5	45	45
69	"	N270,000 to Rt. 974 (EB)	4,800	490	5	55	55
114	"	Rt. 974 to I81 (EB)	4,800	490	5	55	55
36	"	I81 to Country Club Rd. (EB)	4,700	410	5	55	55
39	"	Country Club Rd. to Sterling St. (EB)	6,400	500	5	45	43
40	"	Sterling St. to Mason St. (EB)	7,600	700	5	30	30
45	"	Court Square (EB)	3,700	320	5	25	25
107	Rt. 659	N265,000 to I81	5,000	500	5	45	45
57	& Port Rep.	I81 to Hillcrest Drive	7,500	580	5	35	35
58	& Maryland	Hillcrest Drive to Main St.	6,200	560	5	35	35
47	"	Main St. to High St.	4,500	450	5	35	35
110	Rt. 753	Hall Drive to Gay St.	3,000	300	5	25	25
23	"	Gay St. to Kratzer Avenue	2,100	200	5	25	25
83	"	Kratzer Avenue to Edom Rd.	2,100	200	5	35	35
84	"	Edom Rd. to Charles St.	1,900	190	5	35	35
24	"	Charles St. to N305,000	1,600	140	5	45	45
5	Country Club	Market St. to Carlton St.	2,800	230	5	35	35
6	& Rt. 974	Carlton St. to I81	1,700	150	5	35	35
97	"	I81 to Rt. 925	1,000	100	5	35	35

KEY

ADT	Average Daily Traffic
Q	Peak 1 Hour Traffic Volume
TMIX	Truck Traffic Percentage
ST	Speed of Trucks
SA	Speed of Cars

The spacing of the coordinate points along the roads is a critical item that needs further elaboration. Since the roads are assumed to be straight between points, inaccuracies will result if too few points are used. However, the time (and cost) of running the computer program varies as the square of the total number of points. In most cases it is better to err on the side of too few points than too many.

A rough figure for spacing points is about one point for each 1,000 feet (305 m) of straight roadway. If the road is curved, points should be spaced so that the road does not differ from the straight line equivalent by more than a specified amount. Without specific instructions to the contrary, this might be taken as 30 ft. (9.1 m). See Table 2 for typical values.

Table 2

Guidelines for Road Point Spacing

	Max. Error Allowed (d)			
Radius of Curve (r)	30 ft. (9 m)	20 ft. (6 m)	10 ft. (3 m)	5 ft. (1.5 m)
	Max. Arc Distance Between Points (S)			
3,000 ft. (914 m)	850 ft. (259 m)	693 ft. (211 m)	490 ft. (149 m)	346 ft. (106 m)
1,000 ft. (305 m)	491 ft. (150 m)	401 ft. (122 m)	283 ft. (86 m)	200 ft. (61 m)
300 ft. (91 m)	271 ft. (82 m)	220 ft. (67 m)	155 ft. (47 m)	110 ft. (33 m)
100 ft. (31 m)	159 ft.* (48 m)	129 ft. (39 m)	90 ft. (27 m)	64 ft. (19 m)
30 ft. (9 m)	94 ft.* (29 m)	74 ft.* (23 m)	50 ft.* (15 m)	35 ft. (11 m)

Note: Formula used is $S = 2r \cos^{-1} (1 - d/r)$.

* S exceeds arc length for a right angle.

The data for each segment must begin and end at a node point. Several roads may have endpoints at a given node; care should be taken to ensure that the coordinates recorded for these endpoints are within ten feet of each other.

7. Decide on the boundaries of the study. The boundaries are straight-line segments used to complete sectors which are not completely defined by roadway segments. The basic rules for these boundaries are as follows:

   a. Road segments extending outward must cross the boundaries. See Figure 4.

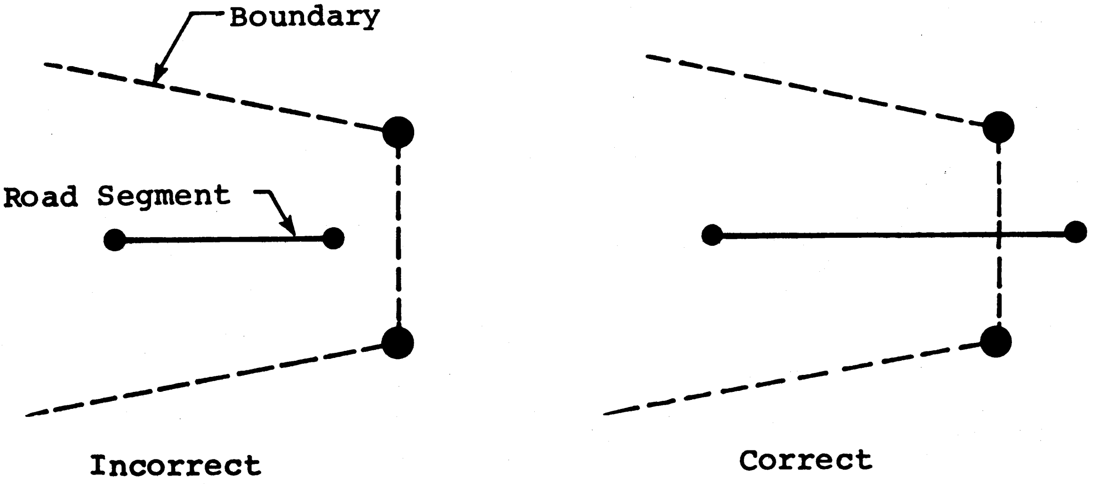

Figure 4. Road segments must cross boundary.

   b. The endpoints of the boundaries should be chosen away from the centerlines of the roads (at least 100 feet (30.5 m). See Figure 5.

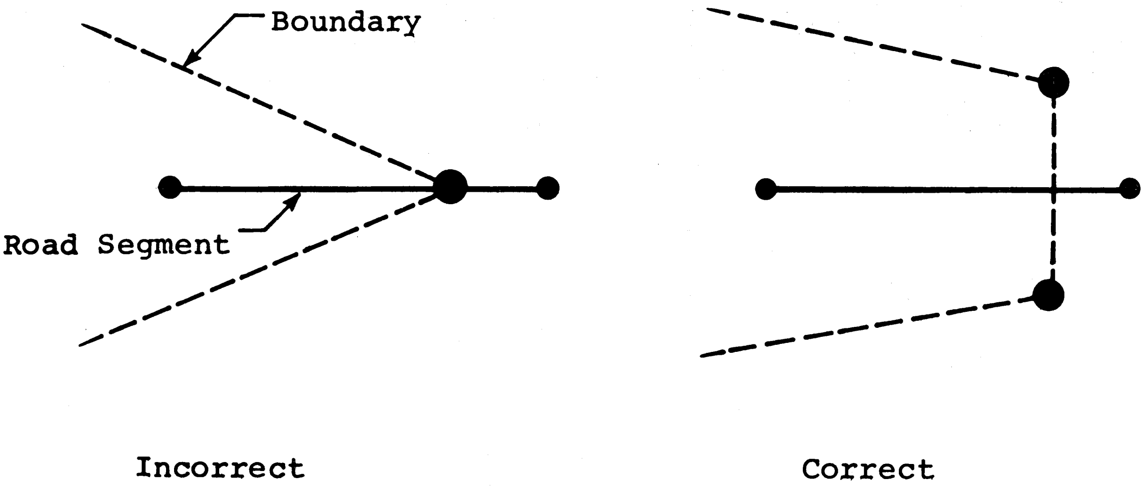

Figure 5. Endpoints of boundaries should be away from roads.

c. The boundaries should be numbered in clockwise order from 1. See Figure 6.

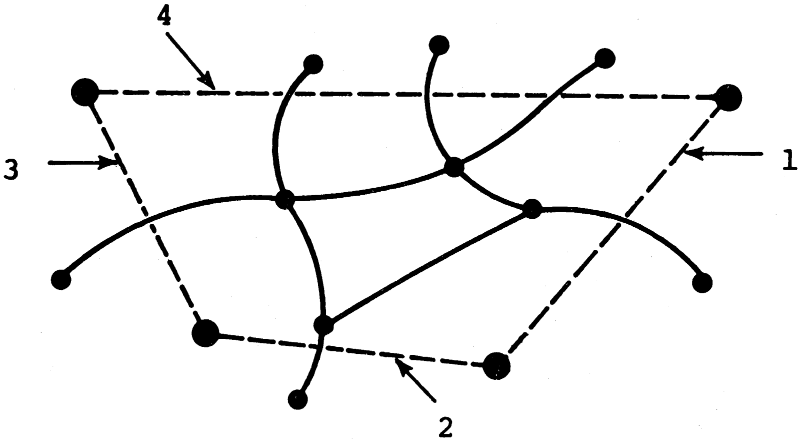

Figure 6. Numbering of boundaries.

8. Identify the sectors. Each closed loop of road or road boundary combination defines a sector. They may be numbered for the user's convenience.

9. Code the information onto punched cards.

Preparation of Punched Cards

The basic types of input cards and the information listed on each is displayed in Table 3. A detailed description of each card type follows. For each of the cards with a type number the first column is reserved for the type number and the next three columns contain a job number which is used for identification.

Table 3

Summary of Input Cards

Type	Information
0.	Tells on which file the highway (type 5) data are located.
1.	Title to be printed out on the map.
2.	Information to control the plotting program.
3.	Size of grid used in noise computations, origin (in real coordinates of the map's coordinate system).
4.	Number of rows, columns and neighbors used in the contour program. Information needed to position and scale the map on the output plot.
5.	X, Y and Z (Z is optional but will be used in later versions) coordinates of each road segment.
6.	Traffic data (volume, speed truck mix and road width).
7.	X, Y and Z (Z optional) coordinates of a boundary segment.
8.	Sector data (segment numbers of the bounding roads).
~	Error correction card for errors in the highway data.

Card Type 0 — Location of Highway Data Set.

This card indicates the data set from which the highway data are to be read. (Disc file or punched cards.)

Column	Contents	Type of Field
1	0	Integer I1
2-4	3 digit job number	Integer I3
5-7	Input data set number for highway data 1 = Disc File 5 = Punched Cards	Integer I3

Card Type 1 — Title Card

Column	Contents	Type of Field
1	1	Integer I1
2-4	3 digit job number	Integer I3
5-80	Title to be printed in lower left-hand corner of the map	Alphanumeric A76

Card Type 2 — Plot Card Information

This card is identical to the plot card needed by the XYNETICS contouring program except for the first four columns. Normally the following format will be sufficient.

Column	Contents	Type of Field
1	2	Integer I1
2-4	3 digit job number	Integer I3
5-80	Plot card information. The standard set is as follows:	
11-13	45.	
18-20	45.	
25-26	5.	
31-32	5.	
36-37	15.	
41	2.	
42-43	-1.	
45	5.	
51-52	2.	
56-57	.1	
61-62	1.	
65-67	.05	
71-73	.32	

All other columns are blank. This card instructs the contour program to produce contour lines at 5-dB intervals beginning with 45 dB. Also each control point is posted with the value of its noise level. To modify this card, consult the XYNETICS contour program manual.

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Card Type 3 — Geometric Data I

This card contains two types of data. JROWS and JCOLS indicate the number of mesh points in each sector that are used for sound computation. JROWS is the number of vertical points and JCOLS is the number of horizontal points. The values are the same for each sector unless changed on the sector card. See Figure 7.

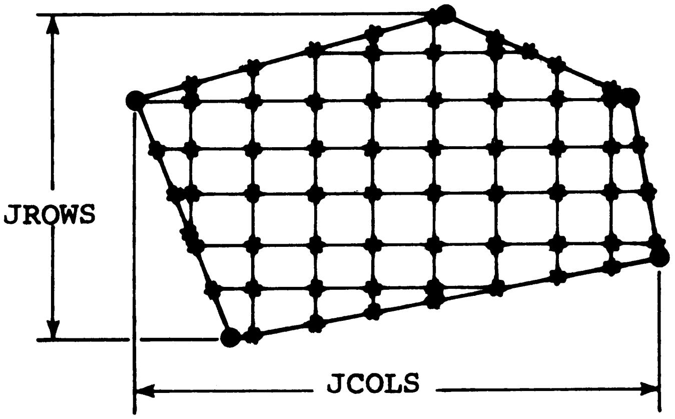

Figure 7. Noise calculation grid.

The standard value for JROWS and JCOLS is 10, giving a 10 by 10 grid for each sector. X1M and Y1M are the coordinates in feet of the map origin in the stateplane coordinate system. (See Figure 8, page 18 .)

Column	Contents	Type of Field
1	3	Integer I1
2-4	3 digit job number	Integer I3
5	blank	
6-10	"JROWS" (normally 10)	Integer I5
11-15	"JCOLS" (normally 10)	Integer I5
16-20	blank	
21-30	X1M	Real F10.0
31-40	Y1M	Real F10.0
41-80	blank	

Card Type 4 — Geometric Data II

Card Type 4 contains information that is needed to produce a contour map.

NROWS, NCOLS and NGHBRS are numbers needed by the contour program to produce contour lines. Standard values for these variables are:

NROWS	-	20
NCOLS	-	20
NGHBRS	-	5

The XYNETICS contour program manual should be consulted for further information regarding NROWS, NCOLS and NGHBRS.

X1P and Y1P are the coordinates of the map's origin in plotter coordinates, measured in inches from the border of the map.

SCALE — The scale of the map in feet per inch (no metric equivalent, input to the XYNETICS plotter is in inches.)

ANGLE — The counterclockwise angle of rotation of the map into the plot, measured in degrees (see Figure 8).

XT and YT — The size of the plot (inches). XT and YT are used to position a border around the map.

Column	Contents	Type of Field
1	4	Integer I1
2-4	3 digit job number	Integer I3
5	blank	
6-10	NROWS	Integer I5
11-15	NCOLS	Integer I5
16-20	NGHBRS	Integer I5
21-30	X1P	Real F10.0
31-40	Y1P	Real F10.0
41-50	SCALE	Real F10.0
51-60	ANGLE	Real F10.0
61-70	XT	Real F10.0
71-80	YT	Real F10.0

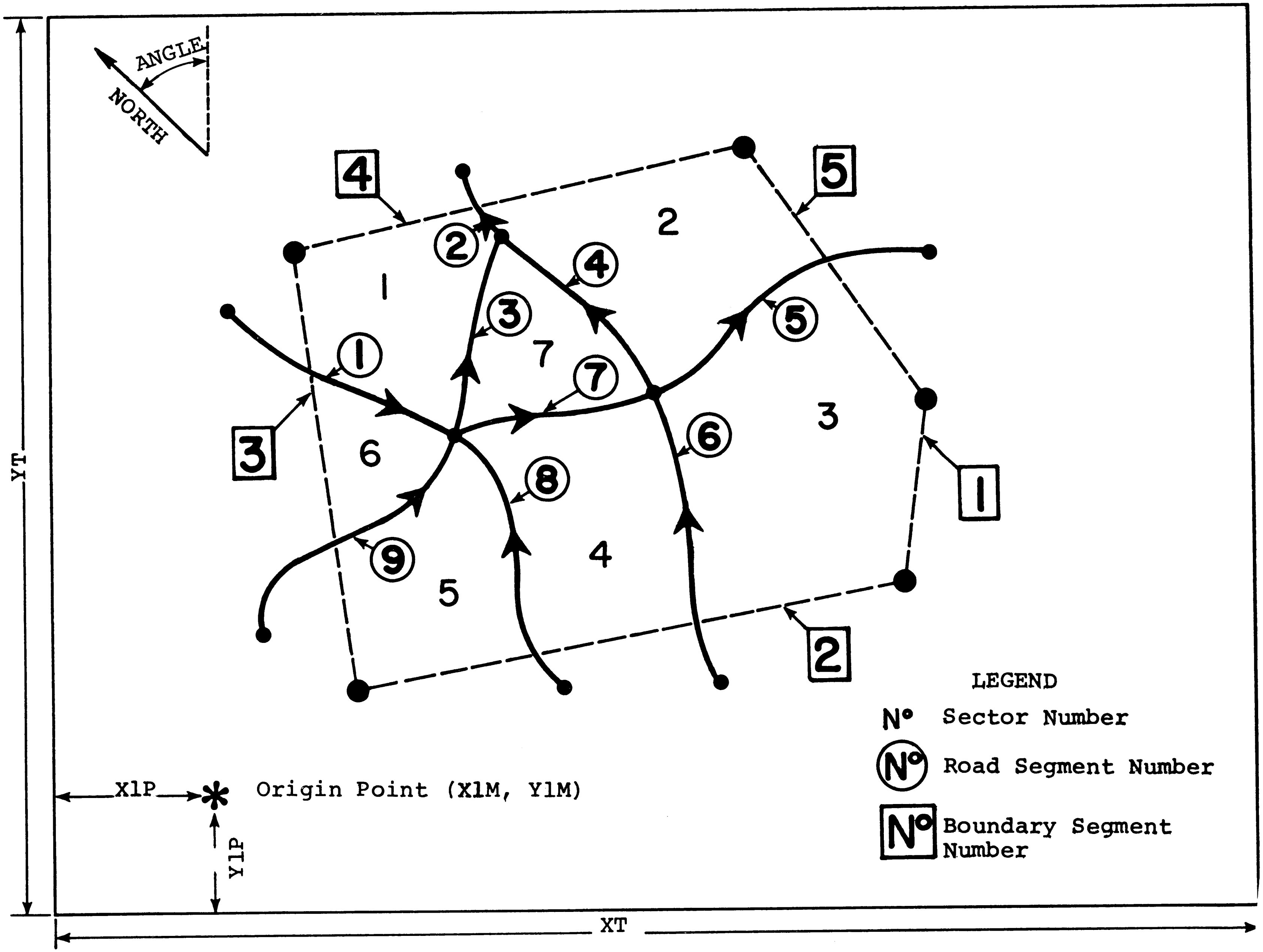

Figure 8. Explanation of X1P, Y1P, X1M, Y1M, ANGLE, XT, YT, and numbering schemes for road segments, boundary segments and sectors.

Card Type 5 — Highway Locations

This card contains the coordinates of the road segments. Each card has space for the X, Y, and Z coordinates of two points, in feet. The segment number (ISEG) identifies the road segment that is being read. The sequence number (ISQ) is used to order the cards for each road segment, starting at 1, when the segment has more than two points (see Table 4). If a card is out of sequence, or if the sequence is broken, the complete segment will be omitted.

The last card may be used to input a single point by putting the second X coordinate (columns 51-60) equal to zero.

Column	Contents	Type of Field
1	5	Integer I1
2-4	3 digit job number	Integer I3
5	blank	
6-10	Sequence number (ISQ)	Integer I5
11-15	Road segment number (ISEG)	Integer I5
21-30 31-40	X coordinates of a Y point on the road segment	Real F10.0 Real F10.0
41-50	Z (Z coordinate is optional)	Real F10.0
51-60 61-70	X coordinates of a Y point on the road	Real F10.0 Real F10.0
71-80	Z (Z coordinate is optional)	Real F10.0

Table 4

Sample Highway Location Card Sequence

	Card Type / Job Number	Sequence Number	Road Segment Number	Coordinates					
				1st point			2nd point		
				X	Y	Z	X	Y	Z
Road Segment #3	5503	1	3	1894202.00	284442.00	0.0	1894253.00	284428.00	0.0
	5503	2	3	1894324.00	284411.00	0.0	1894426.00	284392.00	0.0
	5503	3	3	1894522.00	284372.00	0.0	1894603.00	284355.00	0.0
	5503	4	3	1894663.00	284343.00	0.0	1894711.00	284332.00	0.0
	5503	5	3	1894761.00	284331.00	0.0			
Road Segment #4	5503	1	4	1897780.00	288991.00	0.0	1897716.00	289095.00	0.0
	5503	2	4	1897593.00	289300.00	0.0	1897484.00	289483.00	0.0
	5503	3	4	1897383.00	289648.00	0.0	1897321.00	289745.00	0.0

Last point in segments.

The first 5 cards are coordinates of points for road segment #3. The sequence numbers increase from one to five. Note that the last set of coordinates in the fifth card are left blank; this is because segment 3 has an odd number of points on it. This space would have been filled in if segment 3 had had 10 points instead of nine. After the fifth card is read the sequence number is reset to one in order to read data for segment #4.

Card Type 6 — Traffic Data

This card contains information on traffic volumes, speed, truck mix and the width of the roadway. There will be one traffic card for each road segment.

Column	Contents	Type of Field
1	6	Integer I1
2-4	3 digit job number	Integer I3
5	blank	
6-10	blank	
11-15	Road segment number	Integer I5
21-30	Vehicles per day on this segment, ADT (optional)	Real F10.0
31-40	Peak vehicle traffic, Q (vehicles/hour)	Real F10.0
41-50	Fraction of total traffic consisting of trucks, T mix (between 0 and 1)	Real F10.0
51-60	Speed of trucks on this segment, ST (mph)	Real F10.0
61-70	Speed of cars on this segment, SA (mph)	Real F10.0
71-80	Distance in feet from the road's centerline to the edge (feet). If this value is not known, twenty feet is an acceptable estimate.	Real F10.0

Card Type 7 — Boundaries

This card gives the coordinates of the bounding segments for the area under study. This card is similar in format to card type #5 except that each segment may contain only two points, thus there is no sequence number.

Column	Contents	Type of Field
1	7	Integer I1
2-4	3 digit job number	Integer I3
5	blank	
6-10	blank	
11-15	Boundary segment number	Integer I5
16-20	blank	
21-30	X } coordinates of first	Real F10.0
31-40	Y } point on the segment	Real F10.0
41-50	Z } (Z is optional)	Real F10.0
51-60	X } coordinates of second	Real F10.0
61-70	Y } point on the segment	Real F10.0
71-80	Z } (Z is optional)	Real F10.0

Card Type 8 — Sector Data Card

This card specifies the road segments and boundary segments that determine each sector. A separate card is required for each sector. The segments must be listed in clockwise order and are coded as follows:

Road segment in which the direction of the arrow is clockwise about the sector	Segment number
Road segment in which the direction of the arrow is counterclockwise about the sector	Negative segment number
Boundary segment (always clockwise)	90,000 + the boundary segment number

In cases where a sector has both road segments and boundary segments surrounding it, the boundary segments must precede the road segments in the input data.

A provision has also been made to change the values of NCOLS, NROWS, and NGHBRS for a single sector. If one or more of these values is to be changed, all of the three variables must be specified. The new values are used for the current sector only.

Column	Contents	Type of Field
1	8	Integer I1
2-4	3 digit job number	Integer I5
5	NGHBRS (if a change is desired, otherwise this column is blank)	Integer I1
6-10	Sector number	Integer I5
11-15	NROWS (if a change is desired, otherwise this field is left blank)	Integer I5
16-20	NCOLS (if a change is desired, otherwise this field is left blank)	Integer I5
21-80	Segments bounding this sector in clockwise order. (Maximum number of segments per sector is 12)	Integer 12I5

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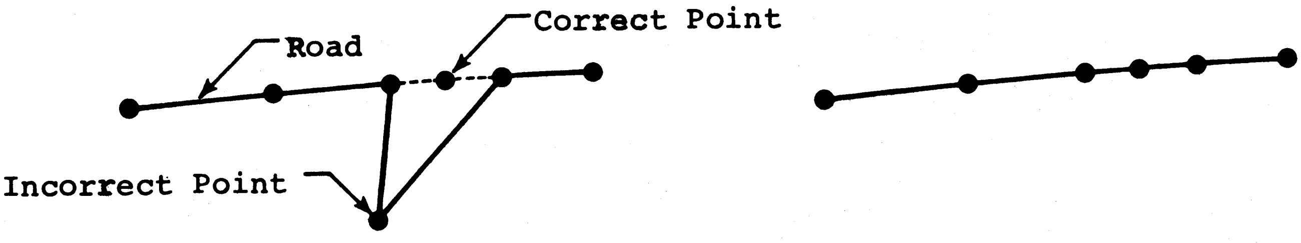
Error Correction Card (no type number)

This card is used to replace bad points in the highway location data (data from cards of type 5). Often the data as stored on a disc file will have a mistake, and for one or two points, it is easier to replace the bad data point than to correct the file. (A bad data point is defined as one in which X, Y, or Z coordinates have been given incorrect values but the card has otherwise been read correctly. The correction card can only be used to correct this type of error. See Figure 9.)



Before Correction

After Correction

Figure 9. Correction of incorrect data.

Here the fourth point of a road segment has a bad value. To correct this point one needs to know:

1. Road segment number
2. Sequence number of the card with an error
3. Position of the bad point on the card 1 = first point, 2 = second point
4. Corrected X, Y, Z (optional) coordinates of the point

Column	Contents	Type of Field
1-5	Road Segment number	Integer I5
6-10	Sequence number	Integer I5
11-15	Position on card (1 or 2)	Integer I5
21-30	X corrected coordinates	Real F10.0
31-40	Y of the point	Real F10.0
41-50	Z	Real F10.0

PREPARATION OF COMPUTER RUN

Declaring Files

File handling is a complicated subject and many pages could be written on it. The following section is an attempt to provide a simplified presentation so that the program can be used without extensive study of IBM's Job Control Language (JCL). The files that are used by NOISE 1 are exclusive files stored on magnetic discs. The files used should be cataloged when originally created so that afterwards they can be accessed simply by referring to their name.

Output Files

The output file (referenced by the program as data set #2) is used to store the output from the program. This file is also used as input to the contour program. An output file is created with the following series of instructions.

```
//FT02F001 DD DSN=name of file,UNIT=SYSDA,DISP=(CATLG,DELETE),

//  SPACE=(TRK,(5,1),RLSE),DCB=(RECEM=VB,LRECL=84,BLKSIZE=8404)

// VOL=SER=VHPP00
```

These instructions create a variable record length file of a size of 5-20 tracks. This size is sufficient for most uses. The variable record length file (produced by the "RECFM=VB" statement) must be used for the output file.

Once a file has been created it may be rewritten over and over and is accessed with the following card

```
//FT02F001 DD DSN=name of file,UNIT=SYSDA,DISP=(OLD,KEEP)
```

The new data will be written onto the old file. Any old data which may be on the file are erased.

Input Files

Due to the large quantity of data needed to locate the positions of the roads, provisions have been made to read these data (card type 5) from disc storage. If this is desired, then the value of INPT on data card #0 must be 1 and the following JCL card is used to access the data.

```
//FT01F001 DD DSN=name of file,UNIT=SYSDA,DISP=(OLD,KEEP)
```

Program Deck Setup

The job control language cards needed for this program are straightforward except for three areas: the use of a sort program on the highway data (type 5), the declaration of the files to be used for input and output, and the need to reopen the input file after each end of file card in the data deck.

Since it is often inconvenient to take roadway location data in sequence, a stored sort program is used to sort out the highway location file. The sorted information is stored on a temporary disc file "&&TMP", which is used as the input to the main noise program. The sort program is called and executed by the module of cards indicated on page 28 and produces a temporary file with all the records ordered by segment and sequence numbers.

The program is currently stored on a disc file under the name NOISE1; the examples on the next two pages give the card sequences that will retrieve and run the program. Two examples are given; the first reads data exclusively from punched cards while the second reads the highway data from a disc file and uses the sort program.

BASIC PROGRAM

(All input from punched cards)

```
      Job Card
// EXEC PROG=NOISE1
//STEPLIB DD DSN=RC0.PROGLIB,DISP=SHR
//FT06F001 DD SYSOUT=A
//FT02F001 DD DSN=output file name,
// UNIT=SYSDA,DISP=(OLD,KEEP)
//FT05F001 DD *
      Data Cards of type 1-5
/*
//FT05F002 DD *
      Data Cards of type 6
/*
//FT05F003 DD *
      Data Cards of type 7
/*
//FT05F004 DD *
      Error Correction Cards (if any)
/*
//FT05F005 DD *
      Data Cards of type 8
/*
//
```

Sample Run With Roadway Data Stored on a File, Using Sort Program

```
            Job Card
         //STEPA EXEC SORTDS,PRIME=5
 Sort    //SORTIN DD DSN=name of file to be sorted,DISP=(OLD,KEEP)
Program  //SORTOUT DD DSN=&&TMP,DISP=(NEW,PASS)
         // UNIT=SYSDA,DCB=(RECFM=F,LRECL=80,BLKSIZE=80),
         // SPACE=(80,1300)
         //SYSIN DD *
           SORT FIELDS=(11,5,CH,A,6,5,CH,A),SIZE=E1300
           END
         //STEPB EXEC PROG=NOISE1
         //STEPLIB DD DSN=RCO.PROGLIB,DISP=SHR
         //FT01F001 DD DSN=&&TMP,UNIT=SYSDA,
         // DISP=(OLD,PASS)
         //FT02F001 DD DSN=Output file name,UNIT=SYSDA,
         // DISP=(OLD,KEEP)
         //FT06F001 DD SYSOUT=A
         //FT05F001 DD *
            Data Cards of types 1,2,3,4,6
         /*
         //FT05F002 DD *
            Data Cards of type 7
         /*
         //FT05F003 DD *
            Error Correction Cards (if any)
         /*
         //FT05F004 DD *
            Data cards of type 8
         /*
         //
```

REFERENCES

1. J. K. Haviland, Working Plan, "Area Computer Model for Transportation Noise Prediction: Phase I — Adaptation of MICNOISE", VHTRC 73-WP25, June 1974.

2. J. K. Haviland, D. F. Noble, and H. L. Golub, "Verification of MICNOISE Computer Program for the Prediction of Highway Noise", VHTRC 73-R37, March 1974.

APPENDIX A

LISTING AND SAMPLE RUN — NOISE 1

1850

```
FORTRAN IV G LEVEL  21                MAIN                DATE = 75028          10/25/47                PAGE 0001

 0001              DIMENSION PLOT(19),TITLE(19)
 0002              DIMENSION IDATA(2,4)
 0003              DIMENSION TRAFIC(6,200),HIWAY(3,3000),NHIWAY(2,200)
 0004              DIMENSION ISECTR(13),IBOND(20),BOUND(2,50),DATA(3,1000),IBD(12)
 0005              DIMENSIONX(2),Y(2),Z(2),Q(2),COR(2)
 0006              DIMENSION POINT(2,400),WIDTH(400),BNDRY(2,400)
 0007              REAL VAL(12)/13.1,12.8,12.,10.87,8.19,5.63,4.,3.,2.13,1.5,
                  2 1.26,1.13/
 0008              REAL ARG(12)/20.,100.,200.,300.,600.,1500.,3000.,6000.,15000.,
                  2 40000.,100000.,800000./
 0009              REAL CNPT/4HCNPT/
 0010              DIMENSION CARD(20)
 0011            1 FORMAT(I1,I3,19A4)
 0012            2 FORMAT(I1,I3,I1,3I5,6G10.0)
 0013            3 FORMAT(I1,I3,I1,3I5,12G5.0)
 0014          901 FORMAT(1X,I1,I3,19A4)
 0015          902 FORMAT(1H+,100X,5H*****)
 0016          904 FORMAT(1X,I1,I3,I1,3I5,6F12.2)
 0017          909 FORMAT(' TRAFFIC DATA FOR SEGMENT',I4,' IS MISSING')
 0018          910 FORMAT(1X,I1,I3,I1,15I5)
 0019          911 FORMAT(1X/' *********************'/)
 0020          913 FORMAT(' HIGHWAY DATA FOR SEGMENT',I4,' IS MISSING')
 0021          914 FORMAT('1 INPUT DATA')
 0022          917 FORMAT(' ROAD DOES NOT CROSS BOUNDARY SECTOR',I4,' ROADS',2I8)
 0023          918 FORMAT(1X,2F10.0)
 0024          921 FORMAT(' SECTOR',I4,'SKIPPED')
 0025          922 FORMAT(' NHIWAY',3I6)
 0026          923 FORMAT(1X,3I8)
 0027          931 FORMAT(1X,3F10.0)
 0028          952 FORMAT(1X,6E20.5)
 0029          953 FORMAT(1X,3I10)
 0030              ZERO=0
 0031              INPT=5
 0032              JNPT=2
 0033              READ(5,4)ITP,JOB,JUNT
 0034            4 FORMAT(I1,2I3)
            C READ INITIAL INFORMATION (CARD TYPES 1-4)
 0035              DO 8 N=1,12
 0036              ARG(N)=ALOG10(ARG(N))
 0037            8 CONTINUE
 0038              NERR=0
 0039              DQUIT=2500*2500
 0040              WRITE(6,914)
 0041              READ(5,1) ITP,JOB,TITLE
 0042              WRITE(6,901)ITP,JOB,TITLE
 0043              IF (ITP.EQ.1) GO TO 10
 0044              WRITE(6,902)
 0045              NERR=MAX0(2,NERR)
 0046           10 CONTINUE
 0047              READ(5,1) ITP,JOB,PLOT
 0048              WRITE(6,901)ITP,JOB,PLOT
 0049              IF (ITP.EQ.2) GO TO 20
 0050              WRITE(6,902)
 0051              NERR=MAX0(3,NERR)
 0052           20 CONTINUE
 0053              READ(5,2)ITP,JOB,NDUM,JROWS,JCOLS,NDUM,X1M,Y1M,DUM,DUM,DUM,DUM
 0054              WRITE(6,904)ITP,JOB,NDUM,JROWS,JCOLS,NDUM,X1M,Y1M,DUM,DUM,DUM,DUM
 0055              IF (ITP.EQ.3) GO TO 30
```

```
      WRITE(6,902)
      NERR=MAX0(3,NERR)
   30 CONTINUE
      READ(5,2)ITP,JOB,NDUM,NNROWS,NNCOLS,NNGHBR,X1P,Y1P,SCALE,ANGLE,
     2 XT,YT
      WRITE(6,904)ITP,JOB,NDUM,NNROWS,NNCOLS,NNGHBR,X1P,Y1P,SCALE,ANGLE,
     2 XT,YT
      XTABLE=AMIN1(XT+1.,85.)
      YTABLE=AMIN1(YT+3.5,52.)
      WRITE(2,850) XTABLE,YTABLE
  850 FORMAT(3HJOB,77X/4HPHS1,76X/4HDIMT,2X,2G8.3,58X)
      IF (ITP.EQ.4) GO TO 40
      WRITE(6,902)
      NERR=MAX0(3,NERR)
   40 CONTINUE
      IREF=0
      NWAY=0
      ITST=0
      ISEG=0
      DO 52 I=1,200
      NHIWAY(1,I)=0
   52 NHIWAY(2,I)=0
   50 CONTINUE
   55 CONTINUE
      NISEG=ISEG
C READ HIWAY DATA (CARD TYPE 5)
      READ(JUNT,2,END=85)ITP,JOB,NDUM,ISQ,ISEG,NDUM,X(1),Y(1),Z(1),
     2 X(2),Y(2),Z(2)
      WRITE(6,904)ITP,JOB,NDUM,ISQ,ISEG,NDUM,X(1),Y(1),Z(1),X(2),Y(2),
     2 Z(2)
      ITST=MAX0(ITST,ISEG)
      IF(NISEG.EQ.ISEG) GO TO 53
      IREF=1
      IF(NISEG.EQ.0) GO TO 51
      NHIWAY(2,NISEG)=NWAY
   51 CONTINUE
      NHIWAY(1,ISEG)=NWAY+1
   53 CONTINUE
      IF (ITP.EQ.5) GO TO 57
      WRITE(6,902)
      NERR=MAX0(3,NERR)
      GO TO 55
   57 CONTINUE
      IF(IREF.EQ.ISQ) GO TO 60
      WRITE(6,902)
      NERR=MAX0(2,NERR)
      NHIWAY(1,ISEG)=0
      GO TO 55
   60 CONTINUE
      DO 80 I=1,2
      IF(X(I).EQ.0) GO TO 80
   70 CONTINUE
      NWAY = NWAY+1
      HIWAY(1,NWAY)=X(I)
      HIWAY(2,NWAY)=Y(I)
      HIWAY(3,NWAY)=Z(I)
   80 CONTINUE
      IREF=IREF+1
      GO TO 55
   85 CONTINUE
      NHIWAY(2,ISEG)=NWAY
C TEST TO SEE IF THERE ARE ANY MISSING SEGMENTS
      DO 90 I=1,ITST
      IF (NHIWAY(1,I).NE.0) GO TO 87
      WRITE(6,913) I
      NERR=MAX0(1,NERR)
   87 CONTINUE
   90 CONTINUE
C SET TRAFIC =0
      DO 101 I=1,200
      DO 101 J=1,6
  101 TRAFIC(J,I)=0
C READ TRAFFIC DATA (CARD TYPE 6)
  100 CONTINUE
      READ(5,2,END=115)ITP,JOB,NDUM,NDUM,ISEG,NDUM,VDAY,VPEAK,TMIX,ST,
     2 SA,DROW
      WRITE(6,904)ITP,JOB,NDUM,NDUM,ISEG,NDUM,VDAY,VPEAK,TMIX,ST,SA,
     2 DROW
  105 CONTINUE
      IF (ITP.EQ.6) GO TO 110
      WRITE(6,902)
      NERR=MAX0(3,NERR)
      GO TO 100
  110 CONTINUE
      TRAFIC(1,ISEG)=VDAY
      TRAFIC(2,ISEG)=VPEAK
      TRAFIC(3,ISEG)=TMIX
      TRAFIC(4,ISEG)=ST
      TRAFIC(5,ISEG)=SA
      TRAFIC(6,ISEG)=DROW
      GO TO 100
  115 CONTINUE
C TEST FOR MISSISNG TRAFFIC DATA
      DO 120 I=1,ITST
      IF(TRAFIC(1,1).NE.0) GO TO 120
      WRITE(6,909) I
      NERR=MAX0(1,NERR)
  120 CONTINUE
  130 CONTINUE
C READ ARTIFICIAL BOUNDARIES
C BOUNDARIES SHOULD BE IN CLOCKWISE ORDER
C WITH TWO POINTS DEFINING A BOUNDARY SEGMENT
      IBNDMX=0
  135 CONTINUE
      READ(5,2,END=145)ITP,JOB,NDUM,ISQ,ISEG,NDUM,X(1),Y(1),Z(1),
     2 X(2),Y(2),Z(2)
      WRITE(6,904)ITP,JOB,NDUM,ISQ,ISEG,NDUM,X(1),Y(1),Z(1),X(2),Y(2),
     2 Z(2)
      IF(ITP.EQ.7) GO TO 138
      WRITE(6,902)
      NERR=MAX0(3,NERR)
      GO TO 135
  138 CONTINUE
      IBNDMX=MAX0(IBNDMX,2*ISEG)
      DO 140 I=1,2
      BOUND(1,2*ISEG+I-2)=X(I)
      BOUND(2,2*ISEG+I-2)=Y(I)
      BOUND(3,2*ISEG+I-2)=Z(I)
  140 CONTINUE
      GO TO 135
  145 CONTINUE
      READ(5,5,END=146) ISEG,ISQ,NO,TAX,TAY,TAZ
    5 FORMAT(3I5,5X,3F10.0)
      IF (NHIWAY(1,ISEG).EQ.0) GO TO 146
      KANT=NHIWAY(1,ISEG)+2*(ISQ-1)+NO-1
      WRITE(6,923)ISEG,ISQ,NO
      WRITE(6,923) ISEG,NHIWAY(1,ISEG),KANT
      HIWAY(1,KANT)=TAX
      HIWAY(2,KANT)=TAY
      HIWAY(3,KANT)=TAZ
      GO TO 145
  146 CONTINUE
C ROTATE COORDINATES
      ANGLE=ANGLE*3.14159/180
      DO 175 IPOINT=1,NWAY
      AHIWAY=(HIWAY(1,IPOINT)-X1M)*COS(ANGLE)
    2 -(HIWAY(2,IPOINT)-Y1M)*SIN(ANGLE)
      HIWAY(2,IPOINT)=(HIWAY(2,IPOINT)-Y1M)*COS(ANGLE)
    2 +(HIWAY(1,IPOINT)-X1M)*SIN(ANGLE)
      HIWAY(1,IPOINT)=AHIWAY
  175 CONTINUE
      DO 180 IPOINT=1,IBNDMX
      ABOUND=(BOUND(1,IPOINT)-X1M)*COS(ANGLE)
    2 -(BOUND(2,IPOINT)-Y1M)*SIN(ANGLE)
      BOUND(2,IPOINT)=(BOUND(2,IPOINT)-Y1M)*COS(ANGLE)
    2 +(BOUND(1,IPOINT)-X1M)*SIN(ANGLE)
      BOUND(1,IPOINT)=ABOUND
  180 CONTINUE
C SET ISECTR=0
      DO 147 L= 1,13
  147 ISECTR(L)=0
  150 CONTINUE
C READ SECTOR DATA (ISECTR(N))
      READ(5,3,END=830)ITP,JOB,INGHBR,ISECT,IROWS,ICOLS,(IBD(N),N=1,12)
      WRITE(6,910)ITP,JOB,INGHBR,ISECT,IROWS,ICOLS,(IBD(N),N=1,12)
  155 CONTINUE
      IF (ITP.EQ.8) GO TO 160
      WRITE(6,902)
  160 CONTINUE
      IF (IROWS.EQ.0) GO TO 163
      NROWS=IROWS
      NCOLS=ICOLS
      NGHBRS=INGHBR
      GO TO 165
  163 CONTINUE
      NROWS=NNROWS
      NCOLS=NNCOLS
      NGHBRS=NNGHBR
  165 CONTINUE
      DO 170 N=1,12
      ISECTR(N)= IBD(N)
C TEST FOR MISSING HIGHWAY SEGMENTS
      IA=ISECTR(N)
      IF(ISECTR(N).GT.90000) IA= ISECTR(N)-90000
      IF(ISECTR(N).LT.0) IA=-ISECTR(N)
      IF(ISECTR(N).EQ.0) GO TO 170
      IF(NHIWAY(1,IA).NE.0) GO TO 170
      WRITE(6,921) ISECT
      GO TO 150
  170 CONTINUE
C     COMPUTE BOUNDARY POINTS
C SET UP I AND J  I=CURRENT SEGMENT, J= NEXT SEGMENT
      J=0
      NAT =0
      I=0
  195 CONTINUE
      ISTART =0
  200 CONTINUE
      IF (J.EQ.1) GO TO 500
      I=I+1
      J=I+1
      IF  (ISECTR(J).EQ.0) J=1
      IF  (ISECTR(I).GT.90000) GO TO 330
      IF(ISECTR(J).GT.90000 ) GO TO 250
C ROAD-ROAD INTERSECTION
      IF(ISECTR(I).GT.0) GO TO 220
C BACKWARD LINK
      IF (ISTART.NE.0) GO TO 210
      ISTART=NHIWAY(2,-ISECTR(I))
  210 CONTINUE
      IFIN=NHIWAY(1,-ISECTR(I))
      INC=-1
      IXXX=-ISECTR(I)
      GO TO 240
  220 CONTINUE
C FORWARD LINK
      IF (ISTART.NE.0) GO TO 230
      ISTART=NHIWAY(1,ISECTR(I))
  230 CONTINUE
      IFIN=NHIWAY(2,ISECTR(I))
      INC=1
      IXXX=ISECTR(I)
  240 CONTINUE
C STORE POINTS IN CLOCKWISE ORDER
      IPOINT =ISTART
  245 CONTINUE
      NAT =NAT+1
      IPOINT =IPOINT +INC
      POINT(1,NAT)=HIWAY(1,IPOINT)
      POINT(2,NAT)=HIWAY(2,IPOINT)
      WIDTH(NAT)=TRAFIC(6,IXXX)
      IF(IPOINT.EQ.IFIN) GO TO 195
      GO TO 245
  250 CONTINUE
C ROAD-BOUNDARY INTERSECTION
      IF(ISECTR(I).GT.0) GO TO 270
C BACKWARD LINK
      IF(ISTART.NE.0) GO TO 260
      ISTART=NHIWAY(2,-ISECTR(I))
  260 CONTINUE
      IFIN=NHIWAY(1,-ISECTR(I))
      INC=-1
      IXXX=-ISECTR(I)
      GO TO 285
  270 CONTINUE
C FORWARD LINK
      IF(ISTART.NE.0) GO TO 280
      ISTART=NHIWAY(1,ISECTR(I))
  280 CONTINUE
      IFIN=NHIWAY(2,ISECTR(I))
      IXXX=ISECTR(I)
      INC=1
  285 CONTINUE
C SETUP FOR CROSSING TEST
      LOCK=2*(ISECTR(J)-90000)-1
      X1=BOUND(1,LOCK)
      X2=BOUND(1,LOCK+1)
      Y1=BOUND(2,LOCK)
      Y2 =BOUND(2,LOCK+1)
      IPOINT=ISTART-INC
  290 CONTINUE
      IPOINT=IPOINT+INC
      IPNT=IPOINT+INC
      IF(IPOINT.EQ.ISTART) GO TO 295
C STORE A ROAD POINT
      NAT =NAT+1
      POINT(1,NAT)=HIWAY(1,IPOINT)
      POINT(2,NAT)=HIWAY(2,IPOINT)
      WIDTH(NAT)=TRAFIC(6,IXXX)
  295 CONTINUE
C TEST FOR END OF ROAD
      IF(IPOINT.NE.IFIN) GO TO 300
      WRITE(6,917) ISECT,ISECTR(I),ISECTR(J)
      WRITE(6,921)ISECT
      GO TO 150
  300 CONTINUE
C TEST FOR DIVISION BY ZERO
      IF(X2.NE.X1) GO TO 310
C TEST FOR CROSSING
      IF((HIWAY(1,IPOINT)-X2)*(HIWAY(1,IPNT)-X2).GT.0) GO TO 290
C STORE INTERSECTION POINT
      NAT= NAT+1
      POINT(2,NAT)=((HIWAY(2,IPOINT)-HIWAY(2,IPNT))
     2 /(HIWAY(1,IPOINT)-HIWAY(1,IPNT)))
     3 *(X2-HIWAY(1,IPOINT))+HIWAY(2,IPOINT)
      POINT(1,NAT)=X1
      WIDTH(NAT)=TRAFIC(6,IXXX)
      GO TO 195
  310 CONTINUE
C TEST FOR CROSSING
      XERT=HIWAY(2,IPOINT)-(Y1+(Y2-Y1)/(X2-X1)*(HIWAY(1,IPOINT)-X1))
      XART=HIWAY(2,IPNT)-(Y1+(Y2-Y1)/(X2-X1)*(HIWAY(1,IPNT)-X1))
      IF(XERT*XART.GT.0) GO TO 290
C STORE INTERSECTION POINT
      X3=HIWAY(1,IPOINT)
      X4=HIWAY(1,IPNT)
      Y3= HIWAY(2,IPOINT)
      Y4=HIWAY(2,IPNT)
      IF (X4.NE.X3) GO TO 320
C STORE INTERSECTION POINT
```

```
      NAT= NAT+1
      POINT(1,NAT)=X3
      POINT(2,NAT)=Y1+(Y2-Y1)/(X2-X1)*(X3-X1)
      WIDTH(NAT)=TRAFIC(6,IXXX)
      GO TO 195
  320 CONTINUE
      NAT = NAT+1
      POINT(1,NAT)=((Y1-Y3)+X3*(Y4-Y3)/(X4-X3)-X1*(Y2-Y1)/(X2-X1))
     2 /((Y4-Y3)/(X4-X3)-(Y2-Y1)/(X2-X1))
      POINT(2,NAT)=Y1+(Y2-Y1)/(X2-X1)*(POINT(1,NAT)-X1)
      WIDTH(NAT)=TRAFIC(6,IXXX)
      GO TO 195
  330 CONTINUE
      IF (ISECTR(J).GT.90000) GO TO 430
C BOUNDARY - ROAD INTERSECTION
      IF (ISECTR(J).GT.0) GO TO 350
C BACKWARD LINK
      ISTART=NHIWAY(2,-ISECTR(J))
      IFIN=NHIWAY(1,-ISECTR(J))
      INC=-1
      GO TO 370
  350 CONTINUE
C FORWARD LINK
      ISTART=NHIWAY(1,ISECTR(J))
      IFIN=NHIWAY(2,ISECTR(J))
      INC=1
  370 CONTINUE
C SET UP
      LUCK=2*(ISECTR(I)-90000)-1
      X1=BOUND(1,LUCK)
      X2=BOUND(1,LUCK+1)
      Y1=BOUND(2,LUCK)
      Y2=BOUND(2,LUCK+1)
      IPOINT=ISTART-INC
  375 CONTINUE
      IPOINT=IPOINT+INC
C TEST FOR THE END OF THE ROAD
      IF(IPOINT.NE.IFIN) GO TO 380
      WRITE(6,917) ISECT,ISECTR(I),ISECTR(J)
      WRITE(6,921)ISECT
      GO TO 150
  380 CONTINUE
      IPNT=IPOINT+INC
      ISTART=IPOINT
      IF(X2.NE.X1) GO TO 400
C TEST FOR CROSSING
      IF((HIWAY(1,IPOINT)-X2)*(HIWAY(1,IPNT)-X2).GT.0) GO TO 375
C STORE POINT
      NAT=NAT+1
      POINT(1,NAT)=X1
      POINT(2,NAT)=((HIWAY(2,IPOINT)-HIWAY(2,IPNT))/(HIWAY(1,IPOINT)
     2 -HIWAY(2,IPNT)))*(X2-HIWAY(1,IPOINT))+HIWAY(2,IPOINT)
      WIDTH(NAT)=0
      GO TO 200
C TEST FOR CROSSING
  400 XERT=HIWAY(2,IPOINT)-(Y1+(Y2-Y1)/(X2-X1)*(HIWAY(1,IPOINT)-X1))
      XART=HIWAY(2,IPNT)-(Y1+(Y2-Y1)/(X2-X1)*(HIWAY(1,IPNT)-X1))
      IF (XERT*XART.GT.0) GO TO 375
```

```
C STORE POINT
      X3=HIWAY(1,IPOINT)
      X4=HIWAY(1,IPNT)
      Y3=HIWAY(2,IPOINT)
      Y4=HIWAY(2,IPNT)
      IF((X4-X3).NE.0) GO TO 420
      NAT = NAT+1
      POINT (1,NAT)=X3
      POINT(2,NAT)=Y1+(Y2-Y1)/(X2-X1)*(X3-X1)
      WIDTH(NAT)=0
      GO TO 200
  420 CONTINUE
      NAT=NAT+1
      POINT(1,NAT)=((Y1-Y3)+X3*(Y4-Y3)/(X4-X3)-X1*(Y2-Y1)/(X2-X1))
     2 /((Y4-Y3)/(X4-X3)-(Y2-Y1)/(X2-X1))
      POINT(2,NAT)=Y1+(Y2-Y1)/(X2-X1)*(POINT(1,NAT)-X1)
      WIDTH(NAT)=0
      GO TO 200
  430 CONTINUE
C BOUNDARY-BOUNDARY POINT
      LUCK=2*(ISECTR(I)-90000)-1
      NAT=NAT+1
      POINT(1,NAT)=BOUND(1,LUCK+1)
      POINT(2,NAT)=BOUND(2,LUCK+1)
      WIDTH(NAT)=0
      GO TO 195
  500 CONTINUE
  505 CONTINUE
C COMPUTE RIGHT OF WAY OFFSET
      MAT=0
      NOTCH=1
      DO 540 IPOINT=1,NAT
C SET UP THREE CONSECUTIVE POINTS IN CLOCKWISE ORDER
      IPNT1=IPOINT-NOTCH
      IF(IPNT1.GT.0) GO TO 510
      IPNT1=NAT
  510 CONTINUE
      IPNT2=IPOINT+1
      IF(IPNT2.LE.NAT) GO TO 520
      IPNT2=1
  520 CONTINUE
C SET UP GEOMETRY
      AX=POINT(2,IPOINT)-POINT(2,IPNT1)
      AY=POINT(1,IPNT1)-POINT(1,IPOINT)
      BX=POINT(2,IPNT2)-POINT(2,IPOINT)
      BY=POINT(1,IPOINT)-POINT(1,IPNT2)
      IF(BX*BX+BY*BY.NE.0) GO TO 525
      NOTCH=2
      GO TO 540
  525 CONTINUE
      NOTCH=1
      A=WIDTH(IPOINT)
      B=WIDTH(IPNT2)
      MAT=MAT+1
      IF((AY*BX).EQ.(AX*BY)) GO TO 530
      CY=(A*BX*SQRT(AX*AX+AY*AY)-B*AX*SQRT(BX*BX+BY*BY)) /(AY*BX-BY*AX)
      CX=(A*BY*SQRT(AX*AX+AY*AY)-B*AY*SQRT(BX*BX+BY*BY))/(AX*BY-AY*BX)
      BNDRY(1,MAT)=POINT(1,IPOINT)+CX
```

```
                  BNDRY(2,MAT)=POINT(2,IPOINT)+CY
                  GO TO 540
              530 CONTINUE
            C COMPUTE BOUNDARY POINTS PARALLEL LINES
                  IF(AX*AX+AY*AY.EQ.0) GO TO 540
              535 CONTINUE
                  CX=AX/SQRT(AX*AX+AY*AY)
                  CY=AY/SQRT(AX*AX+AY*AY)
                  BNDRY(1,MAT)=CX*A+POINT(1,IPOINT)
                  BNDRY(2,MAT)=CY*A+POINT(2,IPOINT)
                  IF(A.EQ.B) GO TO 540
                  MAT=MAT+1
                  BNDRY(1,MAT)=CX*B+POINT(1,IPOINT)
                  BNDRY(2,MAT)=CY*B+POINT(2,IPOINT)
              540 CONTINUE
              545 CONTINUE
                  IF(MAT.GT.2) GO TO 550
                  WRITE(6,921) ISECT
                  GO TO 150
              550 CONTINUE
            C COMPUTE POINTS WITHIN A SECTOR AND SET UP THE "DATA" FILE
            C FIND MAX AND MIN POINTS OF THE SECTOR
                  SXMAX=BNDRY(1,1)
                  SXMIN=BNDRY(1,1)
                  SYMAX=BNDRY(2,1)
                  SYMIN=BNDRY(2,1)
                  DO 570 IPOINT=1,MAT
                  SXMAX=AMAX1(SXMAX,BNDRY(1,IPOINT))
                  SXMIN=AMIN1(SXMIN,BNDRY(1,IPOINT))
                  SYMAX=AMAX1(SYMAX,BNDRY(2,IPOINT))
                  SYMIN=AMIN1(SYMIN,BNDRY(2,IPOINT))
            C PUT BOUNDARY POINTS INTO DATA
                  DO 570 M=1,2
                  DATA(M,MAT-IPOINT+1)=BNDRY(M,IPOINT)
              570 CONTINUE
                  DELTX=(SXMAX-SXMIN)/JCOLS
                  DELTY=(SYMAX-SYMIN)/JROWS
                  IGRID=0
                  YA=SYMIN
              600 CONTINUE
                  XA=SXMIN
              610 CONTINUE
            C FIND THE POINTS INSIDE THE BOUNDARY
                  ISIGN=-1
                  DO 675 IPOINT=1,MAT
                  IF (BNDRY(1,IPOINT).GE.XA) GO TO 640
                  IMESS=-1
                  GO TO 650
              640 CONTINUE
                  IMESS=1
              650 CONTINUE
                  IPNT=IPOINT-1
                  IF(IPNT.EQ.0) IPNT= MAT
                  IF (BNDRY(1,IPNT).GE.XA) GO TO 653
                  IMASS=-1
                  GO TO 655
              653 CONTINUE
                  IMASS=1
```

```
  655 CONTINUE
      IF(BNDRY(1,IPOINT).EQ.BNDRY(1,IPNT)) GO TO 670
      TEST=(BNDRY(2,IPNT)-YA)+(BNDRY(2,IPOINT)-BNDRY(2,IPNT))
     2 /(BNDRY(1,IPOINT)-BNDRY(1,IPNT))*(XA-BNDRY(1,IPNT))
      IF(TEST) 670,680,660
  660 CONTINUE
      ISIGN=IMASS*IMESS*ISIGN
  670 CONTINUE
  675 CONTINUE
      IF(ISIGN.NE.1) GO TO 690
  680 CONTINUE
      IGRID=IGRID+1
      DATA(1,MAT+IGRID)=XA
      DATA (2,MAT+IGRID)=YA
  690 CONTINUE
      XA=XA+DELTX
      IF(XA.LT.SXMAX) GO TO 610
      YA=YA+DELTY
      IF(YA.LT.SYMAX) GO TO 600
      IBMESS=0
      DO 691IPOINT=1,MAT
      XQ=SXMIN
      YQ=SYMIN
      IPNT=IPOINT+1
      IF(IPNT.GT.MAT)IPNT=1
  681 CONTINUE
      XQ=XQ+DELTX
      IF((BNDRY(1,IPOINT)-XQ)*(BNDRY(1,IPNT)-XQ).GE.0) GO TO 685
      IBMESS=IBMESS+1
      DATA(1,MAT+IGRID+IBMESS)=XQ
      DATA(2,MAT+IGRID+IBMESS)=BNDRY(2,IPOINT)
     2 +(BNDRY(2,IPNT)-BNDRY(2,IPOINT))/(BNDRY(1,IPNT)-BNDRY(1,IPOINT))
     3 *(XQ-BNDRY(1,IPOINT))
  685 CONTINUE
      IF(XQ.LT.AMAX1(BNDRY(1,IPOINT),BNDRY(1,IPNT))) GO TO 681
  686 CONTINUE
      YQ=YQ+DELTY
      IF((BNDRY(2,IPOINT)-YQ)*(BNDRY(2,IPNT)-YQ).GE.0)GO TO 687
      IBMESS=IBMESS+1
      DATA(2,MAT+IGRID+IBMESS)=YQ
      DATA(1,MAT+IGRID+IBMESS)=BNDRY(1,IPOINT)
     2 +(BNDRY(1,IPNT)-BNDRY(1,IPOINT))/(BNDRY(2,IPNT)-BNDRY(2,IPOINT))
     3 *(YQ-BNDRY(2,IPOINT))
  687 CONTINUE
      JBMESS=IBMESS-1
      DO 688 KILL=1,JBMESS
      IF(DATA(2,MAT+IGRID+KILL).NE.DATA(2,MAT+GRID+IBMESS)) GO TO 688
      IF(DATA(1,MAT+IGRID+KILL).NE.DATA(1,MAT+GRID+IBMESS)) GO TO 688
      IBMESS=IBMESS-1
      GO TO 689
  688 CONTINUE
  689 CONTINUE
      IF(YQ.LT.AMAX1(BNDRY(2,IPOINT),BNDRY(2,IPNT))) GO TO 686
  691 CONTINUE
C COMPUTE NOISE AT EACH POINT IN THE SECTOR
      NDATA=IGRID+MAT+IBMESS
      NBOUND=MAT
      MATPL=MAT+1
      DO 760 NAK=1,NDATA
      SOUND=10**4.5
      DO 750 ISEG=1,ITST
C SETUP TRAFFIC DATA
      VA=TRAFIC(2,ISEG)*(1-TRAFIC(3,ISEG))
      SA=TRAFIC(5,ISEG)
      VT=TRAFIC(2,ISEG)*TRAFIC(3,ISEG)
      ST=TRAFIC(4,ISEG)
      VT=AMAX1(VT,1.)
      VA=AMAX1(VA,1.)
      IF (SA*ST.EQ.0) GO TO 750
      N=NHIWAY(1,ISEG)
      M=NHIWAY(2,ISEG)-1
      IF(NHIWAY(1,ISEG).EQ.0) GO TO 750
      DO 750 NSEG=N,M
C SETUP GEOMETRIC DATA
      BX=HIWAY(1,NSEG)
      CX=HIWAY(1,NSEG+1)
      BY=HIWAY(2,NSEG)
      CY=HIWAY(2,NSEG+1)
      AX=DATA(1,NAK)
      AY=DATA(2,NAK)
      D2=(AX-BX)**2+(AY-BY)**2
      D1=(AX-CX)**2+(AY-CY)**2
C COMPUTE PERPENDICULAR DISTANCE TO ROAD
      IF((DQUIT.LT.D1).AND.(DQUIT.LT.D2)) GO TO 750
      DIST=((CX-AX)*(CY-BY)+(CY-AY)*(BX-CX))
     2 /SQRT((CY-BY)**2+(BX-CX)**2)
      IF(DIST.LT.0) DIST=-DIST
      IF (DIST.EQ.0) GO TO 750
C COMPUTE SUBTENDED ANGLE
      Q24=(BX-AX)*(CX-AX)+(BY-AY)*(CY-AY)
      Q23=SQRT(((BX-AX)**2+(BY-AY)**2)*((CX-AX)**2+(CY-AY)**2))
      THETA=ARCOS(Q24/Q23)
C L10 CORRECTION
      Q(1)=ALOG10(VA*DIST/SA)
      Q(2)=ALOG10(VT*DIST/ST)
      DO 730 NIX=1,2
      IF(Q(NIX).GT.ARG(1)) GO TO 700
      COR(NIX)=13.1
      GO TO 730
  700 CONTINUE
      NUM=1
  710 CONTINUE
      NUM=NUM+1
      IF(Q(NIX).GT.ARG(NUM) ) GO TO 710
      IF(NUM.LT.12) GO TO 720
      COR(NIX)=1.13
      GO TO 730
  720 CONTINUE
      COR(NIX)=(Q(NIX)-ARG(NUM-1))/(ARG(NUM)-ARG(NUM-1))*
     2 (VAL(NUM)-VAL(NUM-1))+VAL(NUM-1)
      COR(NIX)=10**(.1*COR(NIX))
  730 CONTINUE
      DMIN=10.
      THD=AMAX1(THETA,ABS(DMIN/SQRT(D2)-DMIN/SQRT(D1)))
     2 /AMAX1((DIST/100)**1.5,DIST/100,DMIN/100)
C SOUND OF CARS
```

```
          ZOT=VA*SA**2*THD*TANH(.119*VA/SA)/3.14159
          ZOT=AMAX1(ZOT,1E-10)
          SONDA=ZOT*10**(-.1)*COR(1)
    CSOUND OF  TRUCKS
          ZAT=VT*THD*TANH(.119*VT/ST)/(3.14159*ST)
          ZAT=AMAX1(ZAT,1E-10)
          SONDT=ZAT*10**6.5*COR(2)
    C TOTAL SOUND
          SOUND=SOUND+SONDT+SONDA
      750 CONTINUE
          SOUND=10*ALOG10(SOUND)
          DATA(3,NAK)=SOUND
      760 CONTINUE
      770 CONTINUE
          IF (NERR.LT.3) GO TO 800
          STOP
      800 CONTINUE
          SXOR=X1P+.5+SXMIN/SCALE
          SYOR=Y1P+3.+SYMIN/SCALE
          WRITE(2,851) SCALE,SCALE,SXMIN,SXMAX,SYMIN,SYMAX,SXOR,SYOR
      851 FORMAT(4HPHS1,76X/4HMAPS,2X,6F8.0,2F8.3,10X)
          WRITE(2,852) INPT
      852 FORMAT(4HPHS2,76X/4HCNPT,2X,I3,8H 1 2 3 4,5H(4A4),58X)
          FINAL=0
          DO 805 N=MATPL,NDATA
          IF(N.EQ.NDATA) FINAL=1.
          WRITE(JNPT,853) (DATA(L,N),L=1,3),FINAL
      853 FORMAT(4A4)
      805 CONTINUE
          WRITE(2,874)
      874 FORMAT(4HCPST,2X,8H     .100,8H     .100,2H-1,2H 1,54X)
          WRITE(2,854) NROWS,NCOLS,NGHBRS
      854 FORMAT(4HGRID,2X,2I8,I3,55X)
          WRITE(2,855) NBOUND
      855 FORMAT(4HPHS3,76X/4HMASK,2X,I8,66X)
          DO 810 N1=1,NBOUND,4
          N2=MIN0(N1+3,NBOUND)
          DO 808 J=1,4
          TDATA(1,J)=0.
          TDATA(2,J)=0.
      808 CONTINUE
          JMAX=N2-N1+1
          DO 809 J=1,JMAX
          TDATA(1,J)=DATA(1,N1+J-1)
          TDATA(2,J)=DATA(2,N1+J-1)
      809 CONTINUE
          WRITE(2,856) ((TDATA(L,J),L=1,2),J=1,4)
      856 FORMAT(4HMSKB,2X,8F8.0,10X)
      810 CONTINUE
          WRITE(2,857) PLOT
      857 FORMAT(4HPLOT,19A4/4HPHS4,76X)
          IUNITS=1
          NL=NBOUND-1
          DO 815 N1=1,NL
          N2=N1+1
          WRITE(2,858) ((DATA(L,N),L=1,2),N=N1,N2),IUNITS
      858 FORMAT(4HLINE,2X,2F8.0,8X,2F8.0,8X,I2,24X)
      815 CONTINUE
      WRITE(2,858) DATA(1,N2),DATA(2,N2),DATA(1,1),DATA(2,1),IUNITS
      GO TO 150
  830 CONTINUE
      WRITE(2,871)
  871 FORMAT(4HPAUS,2X,39HLIFT PEN IF BORDER AND LEGEND NOT REQ,D,35X)
      XC=1.
      YC=1.5
      IF(XTABLE.LT.27.) GO TO 835
      WRITE(2,859)XC,YC,TITLE
  859 FORMAT(4HTEXT,2X,2F8.3,8X,8H      .5,10X,7A4,4X/4HCTEX,2X,
     2 12A4,26X)
      GO TO 840
  835 WRITE(2,860) XC,YC,(TITLE(L),L=1,7)
  860 FORMAT(4HTEXT,2X,2F8.3,8X,8H      .5,10X,7A4,4X)
  840 CONTINUE
      XC=XTABLE-10.5
      YC=.5
      WRITE(2,861) XC,YC,SCALE
  861 FORMAT(4HTEXT,2X,2F8.3,8X,8H      .3,10X,7HSCALE =,F10.0,11H  FT.
     */ IN.,4X)
      PXMIN=.5
      PXMAX=XTABLE-.5
      PYMIN=3.
      PYMAX=YTABLE-.5
      WRITE(2,870)PXMIN,PYMIN,PXMIN,PYMAX,PXMIN,PYMAX,PXMAX,PYMAX,
     2 PXMAX,PYMAX,PXMAX,PYMIN,PXMAX,PYMIN,PXMIN,PYMIN
  870 FORMAT(4HLINE,2X,2F8.2,8X,2F8.2,34X)
      WRITE(2,872)
  872 FORMAT(3HEND,77X/4HSTOP,76X)
      REWIND 2
      WRITE(6,862) INPT
  862 FORMAT(33H1 PLOT CARD IMAGES ON FILE, INPT=,I3//)
  845 READ(2,863,END=846) CARD
      WRITE(6,864) CARD
      IF(CARD(1).NE.CNPT) GO TO 845
  849 CONTINUE
      READ(JNPT,863,END=846) (CARD(N),N=1,4)
      WRITE(6,865)(CARD(N),N=1,4)
      IF(CARD(4).NE.1.) GO TO 849
  863 FORMAT(20A4)
  864 FORMAT(1H0,20A4)
  865 FORMAT(1X,4F20.3)
      GO TO 845
  846 CONTINUE
      GO TO 999
  999 CONTINUE
      END
```

```
 INPUT DATA
1  1FIRST TEST RUN.  L10 CONTOURS IN DANSVILLE CITY CENTER.
2  1     42.     42.    2.    2.   30   5-1 5     2.   .1   1.  .05   .1
3   10    5    5    0  2000000.00   300000.00        0.0         0.0         0.0         0.0
4   10    3    3    4         0.0         0.0    1000.00      -30.00       60.00       30.00
5   10    1    1    0  1992500.00   312990.00        0.0  2018481.00   327990.00         0.0
5   10    1    2    0  2014731.00   334486.00        0.0  2040712.00   349486.00         0.0
5   10    1    3    0  2022231.00   321495.00        0.0  2048212.00   336495.00         0.0
5   10    1    4    0  2025981.00   315000.00        0.0  2022231.00   321495.00         0.0
5   10    1    5    0  2022231.00   321495.00        0.0  2018481.00   327990.00         0.0
5   10    1    6    0  2018481.00   327990.00        0.0  2014731.00   334486.00         0.0
5   10    1    7    0  2014731.00   334486.00        0.0  2010981.00   340981.00         0.0
5   10    1    8    0  2040712.00   349486.00        0.0  2048212.00   336495.00         0.0
6   10    0    1    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    2    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    3    0     0000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    4    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    5    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    6    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    7    0    10000.00     1000.00       0.50       50.00       50.00       25.00
6   10    0    8    0    10000.00     1000.00       0.50       50.00       50.00       25.00
7   10    0    1    0  2000043.00   300025.00        0.0  1985043.00   325956.00         0.0
7   10    0    2    0  1985043.00   325956.00        0.0  2036919.00   355956.00         0.0
7   10    0    3    0  2036919.00   355956.00        0.0  2051919.00   330025.00         0.0
7   10    0    4    0  2051919.00   330025.00        0.0  2000043.00   300025.00         0.0
8   10    1    0    09000190002   -7   -6   -1    0    0    0    0    0    0    0
8   13    2    3    39000290003   -2    7    0    0    0    0    0    0    0    0
8   13    3    0    0    2    8   -3    5    6    0    0    0    0    0    0    0
8   13    4   10   109000390004    4    3    0    0    0    0    0    0    0    0
8   15    5    6    69000490001    1   -5   -4    0    0    0    0    0    0    0
```

```
 PLOT CARD IMAGES ON FILE, INPT=  5


JOB

PHS1

DIMT  61.0     33.5

PHS1

MAPS     1000.    1000.      25.   29975.   15025.   29978.     0.525   18.025

PHS2

CNPT     5 1 2 3 4(4A4)
             6014.949                 18015.344                    45.000                    0.0
            12005.059                 18015.344                    45.000                    0.0
            17995.168                 18015.344                    45.000                    0.0
            23985.277                 18015.344                    45.000                    0.0
             6014.949                 21006.117                    45.000                    0.0
            12005.059                 21006.117                    45.000                    0.0
            17995.168                 21006.117                    45.000                    0.0
            23985.277                 21006.117                    45.000                    0.0
             6014.949                 23996.891                    45.000                    0.0
            12005.059                 23996.891                    45.000                    0.0
            17995.168                 23996.891                    45.000                    0.0
            23985.277                 23996.891                    45.000                    0.0
             6014.949                 26987.664                    45.000                    0.0
            12005.059                 26987.664                    45.000                    0.0
            17995.168                 26987.664                    45.000                    0.0
            23985.277                 26987.664                    45.000                    0.0
             6014.949                 29961.328                    45.000                    0.0
            12005.059                 29965.605                    45.000                    0.0
            17995.168                 29969.883                    45.000                    0.0
            23985.277                 29974.160                    45.000                    0.0
            29969.820                 29978.438                    88.720                    0.0
            29975.387                 23331.188                    91.720                    0.0
            29975.375                 23996.891                    91.717                    0.0
            29975.332                 26987.664                    45.000                    0.0
            29975.293                 29978.438                    90.336                    0.0
            29975.387                 22280.398                    91.751                    0.0
            29975.156                 18015.344                    45.000                    0.0
            29975.316                 21006.117                    91.717                    0.0
             6014.949                 15024.648                    45.000                    0.0
            12005.059                 15024.629                    45.000                    0.0
            17995.168                 15024.609                    45.000                    0.0
            23985.277                 15024.590                    45.000                    1.000

CPST        .100      .100-1 1

GRID          3         3  4

PHS3

MASK          5

MSKB        37.   15025.   29975.   15025.   29975.   22500.   29975.   29978.

MSKB        25.   29957.       0.       0.       0.       0.       0.       0.

PLOT        42.      42.     2.      2.    30     5-1 5      2.    .1    1.   .05    .1
```

```
PHS4

LINE      37.   15025.              29975.   15025.           1

LINE   29975.   15025.              29975.   22500.           1

LINE   29975.   22500.              29975.   29978.           1

LINE   29975.   29978.                 25.   29957.           1

LINE      25.   29957.                 37.   15025.           1

PHS1

MAPS     1000.    1000.   30025.   59957.   22525.   30000.   30.525   25.525

PHS2

CNPT   5 1 2 3 4(4A4)
          36011.617            24020.203             45.000            0.0
          41997.949            24020.203             45.000            0.0
          47984.281            24020.203             45.000            0.0
          53970.613            24020.203             45.000            0.0
          36011.617            25515.113             45.000            0.0
          41997.949            25515.113             45.000            0.0
          47984.281            25515.113             45.000            0.0
          53970.613            25515.113             45.000            0.0
          36011.617            27010.023             45.000            0.0
          41997.949            27010.023             45.000            0.0
          47984.281            27010.023             45.000            0.0
          53970.613            27010.023             45.000            0.0
          36011.617            28504.934             45.000            0.0
          41997.949            28504.934             45.000            0.0
          47984.281            28504.934             45.000            0.0
          53970.613            28504.934             45.000            0.0
          59956.945            22562.656             84.742            0.0
          59955.730            24020.203             66.800            0.0
          59954.488            25515.113             45.000            0.0
          59953.246            27010.023             45.000            0.0
          59952.004            28504.934             45.000            0.0
          59950.766            29999.844             45.000            0.0
          36011.617            22530.883             45.000            0.0
          41997.949            22536.473             45.000            0.0
          47984.281            22542.066             45.000            0.0
          53970.613            22547.656             45.000            0.0
          59956.945            22553.250             85.889            0.0
          30025.371            24020.203             91.720            0.0
          30025.348            25515.113             45.000            0.0
          30025.328            27010.023             45.000            0.0
          30025.305            28504.934             91.701            0.0
          36011.617            29982.750             45.000            1.000

CPST      .100     .100-1 1

GRID         3         3   3

PHS3

MASK         4

MSKB   30025.   29978.   30025.   22525.   59957.   22553.   59951.   30000.

PLOT      42.      42.      2.      2.     30     5-1 5     2.    .1    1.   .05    .1

PHS4
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```
LINE    30025.   29978.            30025.   22525.           1

LINE    30025.   22525.            59957.   22553.           1

LINE    59957.   22553.            59951.   30000.           1

LINE    59951.   30000.            30025.   29978.           1

PHS1

MAPS     1000.     1000.   30025.   59976.     7525.   22475.   30.525   10.525

PHS2

CNPT    5 1 2 3 4(4A4)
           36015.117            10514.762              45.000               0.0
           42005.238            10514.762              45.000               0.0
           47995.359            10514.762              45.000               0.0
           53985.480            10514.762              45.000               0.0
           36015.117            13504.887              45.000               0.0
           42005.238            13504.887              45.000               0.0
           47995.359            13504.887              45.000               0.0
           53985.480            13504.887              45.000               0.0
           36015.117            16495.012              45.000               0.0
           42005.238            16495.012              45.000               0.0
           47995.359            16495.012              45.000               0.0
           53985.480            16495.012              45.000               0.0
           36015.117            19485.137              45.000               0.0
           42005.238            19485.137              45.000               0.0
           47995.359            19485.137              45.000               0.0
           53985.480            19485.137              45.000               0.0
           59975.363            10514.762              45.000               0.0
           59975.422            13504.887              45.000               0.0
           59975.480            16495.012              45.000               0.0
           59975.539            19485.137              45.000               0.0
           36015.117             7524.711              45.000               0.0
           42005.238             7524.691              45.000               0.0
           47995.359             7524.672              45.000               0.0
           53985.480             7524.652              45.000               0.0
           30025.055            10514.762              45.000               0.0
           30025.016            13504.887              91.719               0.0
           30025.074            16495.012              91.720               0.0
           30025.234            19485.137              45.000               0.0
           30025.391            22475.262              94.151               0.0
           36015.117            22475.250              45.000               0.0
           42005.238            22475.230              45.000               0.0
           47995.359            22475.211              45.000               1.000

CPST      .100      .100-1 1

GRID        3         3  4

PHS3

MASK        5

MSKB    30025.   22475.   30025.   15000.   30025.    7525.   59975.    7525.

MSKB    59976.   22475.       0.        0.       0.       0.       0.       0.

PLOT     42.     42.     2.     2.    30    5-1 5      2.    .1    1.   .05    .1

PHS4

LINE    30025.   22475.            30025.   15000.           1
LINE    30025.  15000.          30025.   7525.          1

LINE    30025.   7525.          59975.   7525.          1

LINE    59975.   7525.          59976.  22475.          1

LINE    59976.  22475.          30025.  22475.          1

PHS1

MAPS     1000.    1000.   30025.  59976.      22.    7494.   30.525    3.022

PHS2

CNPT    5  1  2  3  4(4A4)
           36015.211             1516.097              45.000               0.0
           42005.324             1516.097              45.000               0.0
           47995.438             1516.097              45.000               0.0
           53985.551             1516.097              45.000               0.0
           36015.211             3010.635              45.000               0.0
           42005.324             3010.635              45.000               0.0
           47995.438             3010.635              45.000               0.0
           53985.551             3010.635              45.000               0.0
           36015.211             4505.172              45.000               0.0
           42005.324             4505.172              45.000               0.0
           47995.438             4505.172              45.000               0.0
           53985.551             4505.172              45.000               0.0
           36015.211             5999.707              45.000               0.0
           42005.324             5999.707              45.000               0.0
           47995.438             5999.707              45.000               0.0
           53985.551             5999.707              45.000               0.0
           36015.211               25.837              45.000               0.0
           42005.324               30.115              45.000               0.0
           47995.438               34.393              45.000               0.0
           53985.551               38.671              45.000               0.0
           59975.664                2.949              45.000               0.0
           30025.176             1516.097              91.699               0.0
           30025.156             3010.635              45.000               0.0
           30025.137             4505.172              45.000               0.0
           30025.117             5999.707              91.719               0.0
           36015.211             7478.648              45.000               0.0
           42005.324             7482.551              45.000               0.0
           47995.438             7486.453              45.000               0.0
           53985.551             7490.355              45.000               0.0
           59951.477             7494.242              97.258               0.0
           59975.664               47.652              45.000               0.0
           59974.441             1516.097              45.000               1.000

CPST       .100      .100-1 1

GRID        10        10  3

PHS3

MASK         4

MSKB    59969.    7494.   30025.    7475.   30025.      22.   59976.      43.

PLOT      42.      42.      2.      2.    30    5-1 5      2.     .1     1.    .05     .1

PHS4

LINE    59969.   7494.          30025.   7475.          1

LINE    30025.   7475.          30025.     22.          1
LINE    30025.     22.         59976.     43.          1

LINE    59976.     43.         59969.   7494.          1

PHS1

MAPS     1000.    1000.     37.  29975.      0.   14975.    0.537    3.000

PHS2

CNPT    5 1 2 3 4(4A4)
              6024.871               2995.054              45.000             0.0
             12012.453               2995.054              45.000             0.0
             18000.035               2995.054              45.000             0.0
             23987.617               2995.054              45.000             0.0
              6024.871               5989.953              45.000             0.0
             12012.453               5989.953              45.000             0.0
             18000.035               5989.953              45.000             0.0
             23987.617               5989.953              45.000             0.0
              6024.871               8984.855              45.000             0.0
             12012.453               8984.855              45.000             0.0
             18000.035               8984.855              45.000             0.0
             23987.617               8984.855              45.000             0.0
              6024.871              11979.758              45.000             0.0
             12012.453              11979.758              45.000             0.0
             18000.035              11979.758              45.000             0.0
             23987.617              11979.758              45.000             0.0
                47.250               2995.054              45.000             0.0
                44.761               5989.953              45.000             0.0
                42.271               8984.855              45.000             0.0
                39.782              11979.758              45.000             0.0
                37.293              14974.660              90.824             0.0
              6024.871              14974.648              45.000             0.0
             12012.453              14974.629              45.000             0.0
             18000.035              14974.609              45.000             0.0
             23987.617              14974.590              45.000             0.0
              2432.309              14974.660              91.712             0.0
             29975.078               8984.855              91.718             0.0
             29975.039              11979.758              45.000             0.0
             29975.199                555.688              91.661             0.0
             29975.160               2995.054              45.000             0.0
             29975.117               5989.953              91.718             0.0
              6024.871                  4.418              45.000             0.0
             12012.453                  8.694              45.000             0.0
             18000.035                 12.971              45.000             0.0
             23987.617                 17.247              45.000             1.000

CPST      .100     .100-1 1

GRID         6          6  5

PHS3

MASK         5

MSKB    29975.     22.  29975.    7500.  29975.   14975.      37.   14975.

MSKB       50.      0.       0.      0.      0.       0.       0.       0.

PLOT      42.     42.     2.     2.    30    5-1 5    2.    .1    1.   .05   .1

PHS4

LINE    29975.     22.         29975.    7500.          1
LINE    29975.   7500.          29975.  14975.         1
LINE    29975.  14975.             37.  14975.         1
LINE       37.  14975.             50.      0.         1
LINE       50.      0.          29975.     22.         1
PAUS  LIFT PEN IF BORDER AND LEGEND NOT REQ,D
TEXT     1.000   1.500              .5          FIRST TEST RUN.  L10 CONTOUR
CTEX  S IN DANSVILLE CITY CENTER.
TEXT    50.500   0.500              .3          SCALE =     1000.  FT. / IN.
LINE      0.50    3.00            0.50   33.00
LINE      0.50   33.00           60.50   33.00
LINE     60.50   33.00           60.50    3.00
LINE     60.50    3.00            0.50    3.00
END
STOP
```