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PARALLEL NOISE BARRIER PREDICTION PROCEDURE

REPORT 2
User's Manual

Rev.1,Nov. 1987

Prepared for

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Prepared by

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16. Abstract

This report defines the parameters which are used to input the data required to run Programs Barrier and BarrierX on a micro-computer such as an IBM PC or compatible. Directions for setting up and operating a working disk are presented. Examples of input, output and running time are presented.

The input template adopted allows for considerable flexibility in barrier configuration, such as barrier length, tilt, ground and atmospheric absorption, barrier absorption in strips, finite lane length including stationary point source, etc.

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PARALLEL NOISE BARRIER PREDICTION PROCEDURE

REPORT 2 USER'S MANUAL

TABLE OF CONTENTS

LIST OF FIGURES

PARALLEL NOISE BARRIER PREDICTION PROCEDURE

REPORT 2 USER'S MANUAL

1. Introduction

The purpose of this report is to define and discuss the input parameters used in Programs Barrier and BarrierX and to describe the manipulation of the programs to obtain output.We will proceed by defining first the input parameters in the order of their appearance in the input file BF1 (Barrier File 1) and then the additional parameters that appear in the input file BFILX in Program BarrierX. Samples of the relevent files appear in the text below.

It is assumed that the user will have at his disposal a PC or compatible microcomputer (with math coprocessor) and a compiled program diskette for one program or the other (or both). A text editor will also be required in order to make entries in the input files. (The authors used IBM Personal Editor; Edlin was not convenient.) Computer array sizes have been kept small so that machine requirements to run the compiled programs are minimal; only a single disk drive and 512K of RAM are needed. However, if the user wishes to modify the programs (which are compiled in IBM-Ryan MacFarland Professional Fortran) then a hard disk and 640K of RAM is desirable. Listings are provided in Volume 3 of this report.

It is strongly recommended that backups of the program and especially of the input file be prepared, and that the "current" version of file BF1.DAT (which must incorporate each data change) be printed out immediately after each run. The time and date of the run is printed automatically on the run output, so that a complete record may always be kept.

2. Input Parameters, Program Barrier

2.1 Parameter Limits Used In Program The parameters listed below are inputs in file BF1 which serve as maximum values of corresponding indices, defined in comments immediately following each parameter. Specifying these maximum values thereby limits the number of computation cycles in a given program loop. It is readily seen that indiscriminate use of the maximum size of each of the parameters accomodated by the program can result in correspondingly long running computations.

NNR ; The total number of receivers input at one time on one side of the highway. Note on the input file under "RECEIVER PARAMETERS" that NR (the receiver number) can take on all values from 1 to NNR. NNR, in turn can range from 1 to a maximum of 20. The program carries out a complete analysis and prints out results for each value of NR before proceeding with the next. Consequently the running time will be proportional to

NNR (as well as to other parameters,as discussed below).

<u>NNLAN</u> ; The total number of traffic lanes (lane number NR) on the road in both directions. Provision is made in the input format for a maximum of 10 lanes as will be noted on the input file under VEHICLES/HOUR and VEHICLE SPEED.

<u>NNST</u> ; The total number of source types (source type number NST) on a given vehicle. Provision is made for a maximum value of 3 to accomodate tire, drive train and exhaust sources. When discrete source data are unavailable, then merged data may be used. Unused table entries need not be blanked, but used entry rows must be arranged among the first NST rows.

<u>NNV</u> ; The total number of vehicle types (vehicle type number NV) on the highway. A maximum value of 5 is accomodated.

<u>NNZ</u> ; The total number of zones (zone number NZ). A maximum value of 6 may be input. In the case of tilted barriers it will be found that the higher order reflections represented by the larger values of NZ do not exist and so make no contribution to the final levels. But the program does have to test for existence and so the running time may be increased. In the case that both barriers are vertical, the reflections will generally exist, but the higher order reflections may still become small in the case of large roadway to receiver distance ratio, as well as for very absorptive walls. When no rear barrier is active in the case of a particular receiver, then NNZ = 1 can be specified. If no front barrier is in effect, then NNZ = 2 can be specified.

<u>SHFLAG</u> ; An integer, either 0 or 1, depending on whether the shoulder should be treated as soft or hard, respectively. If soft, then the pavement-wayside impedance discontinuity will be at the pavement-shoulder junction. If hard, then the discontinuity will be at the shoulder-terrain strip junction. (Any of these strips can have zero width.) Only one pavement to wayside discontinuity can be accomodated.

<u>2.2 Highway Lane Dimensions</u>

<u>LANW</u> ; Width of each lane
<u>MEDW</u> ; Median width
<u>SHWL</u> ; Width of left shoulder (closest to receiver)
<u>SHWR</u> ; Width of right shoulder (furthest from receiver)
<u>TSWL</u> ; Width of left terrain strip
<u>TSWR</u> ; Width of right terrain strip

YL1,2; Y-coordinates of lane endpoints (YL1 > YL2) These parameters fix the length of the lane segment, which can take on any finite value. It should be noted that the LEQ will decrease with subtended segment angle.

2.3 A-Weight Corrections in dB It is assumed that this entry will not be changed. The values are standard.

2.4 Highway Lane Surface Flow Resistance This parameter has a typical range of 100000 Ns/m^4 to 400000 Ns/m^4 for grassy terrain, and up to several orders of magnitude greater for PCC. A value of 150000 is suggested as a reasonable default value for grass on the terrain strip, median and wayside. A default of 1,000,000 is suggested for a soft,porous asphalt shoulder. The user is referred to the Bazley and Delaney paper (ref. 6) of Report 1 for further discussion.

SIGT ; Terrain strip flow resistance
SIGS ; Shoulder flow resistance
SIGM ; Median strip flow resistance
SIGP ; Pavement flow resistance

2.5 Barrier X-Locations Refer to Figure 3.1 of Report 1. It will be noted that the program geometry is so oriented that XP1= XP2 = 0.0, XP3 = XP4 = the total width between barriers.

2.6 Barrier Y-Locations Refer to Figure 3.1 of Report 1 These parameters fix the plan location of the barrier bases. If it is desired to investigate a case where either the near barrier or the far barrier or both are absent, then it is only necessary to choose very large values of the Y's (compared to the receiver to roadway distance), and small barrier lengths.

2.7 Barrier Angle Refer to the elevation section of Figure 3.1, Report 1.

PHILD ; The tilt angle of the left (near) barrier, assumed to be tilted outward away from the road.

PHIRD ; The tilt angle of the right (far) barrier, assumed to be tilted outward away from the road.

2.8 Left Barrier Panel Width It is assumed that each barrier reflection surface is divided into 3 panels. Each panel is identified by an index, JFLAG, which is an integer 1,2 or 3. JFLAG equal to 1 identifies the lowest panel, and 3 identifies the top.

WPL(JFLAG) ; The width of panel JFLAG on the left barrier; JFLAG = 1,2,3

2.9 Right Barrier Panel Width Same discussion as above.

WPR(JFLAG) ; The width of panel JFLAG on the right barrier.

2.10 Barrier Reflection Coefficients These coefficients, BRFLL (Barrier RefLection Left) for the left barrier and BRFLR for the right barrier, are dependent on the octave band index, JOCT, and the panel index JFLAG. The input format therefore consists of two 3 x 8 arrays, one for each barrier ; JOCT going from 1 to 8 and JFLAG going from 1 to 3. In Program Barrier it is assumed that the absorptive material will be tested using a random incidence method to obtain absorption which is randomly averaged over incidence angle. The manufacturers data for barrier test panels (3" fiberglass with 1.5 mil poly facing) was measured using a normal incidence procedure. Although they do not entirely satisfy assumptions, the data should give reasonable results, so they are reproduced in BF1 as default entries.

2.11 Vehicles/Hour, VOL(NLAN,NV),(Volume), is an array with arguments NLAN (lane number) and NV (vehicle type number). There is room in the input table of BF1 for 10 x 5 elements, but if not all elements are used, this should be reflected in the values of the limiting indices NNLAN and NNV. A reminder to this effect is noted on the input format as NOTE A.

2.12 Vehicle Speed, SPD(NLAN,NV), is entirely analogous to VOL and the same comments apply.

2.13 Source Height, SH(NV,NST), is an array which depends on the vehicle type index NV, and the source type index NST. NOTE A, referring to limits on array size, applies.

2.14 Source Strength, LS(JOCT,NV,NST), is an array which depends on vehicle type index NV, source type index NST and the octave band index JOCT representing the 8 octave bands from 63 Hz to 8000 Hz. The default values presented on the input file BF1 are estimates for vehicles travelling at 55 mph and can in no sense be considered as "standard". The user will have to have available data for his or her special conditions of traffic. No attempt was made in this input to separate exhaust from drive train noise.

2.15 Receiver Parameters ; A maximum value of 20 receivers can be accomodated.

AXR(NR) ; X coordinate of receiver NR

AYR(NR) ; Y coordinate of receiver NR

AZR(NR) ; Z coordinate of receiver NR

AZRG(NR) ; Z coordinate of the ground surface under receiver NR

ASIGG(NR) ; Flow resistance of the ground under receiver NR

ATMOSPHERIC ABSORPTION ;dB per 1000 feet

TABLE OF ATMOSPHERIC ABSORPTION : This table is not part of the input template. It is merely located here to facilitate entry of data for the correct humidity.

3 Operating Program Barrier

o Format a diskette and copy the program diskette to it. This should be your working disk.

o Install a text editor program on the working disk. This editor should not take up more than 75 Kb if it is to reside on that disk without exceeding capacity. An alternative is to install the text editor and any backup file records on a second disk, and copy the worked up data file to BF1 on the working disk.

o Modify input file BF1 as required, using the text editor as noted above.

o Place disk in any drive. Type GO (ENTER). The program title will appear followed by the prompt:

o Type TRIAL(ENTER). After some short activity of the disk drive, there will be no apparent activity until the output is printed to the screen. If several (NNR) receivers are specified the compute-print cycle will repeat until all computations are complete. This will be indicated by the statement "Execution Terminated: 0" The "0" indicates no errors or exceptions encountered.

o If the output extends over more than on screen, set the printer to "echo" the monitor.

o In order to halt the computation press (simultaneously) CTRL-BREAK. This will result in a break message. Then press F6 (ENTER) to get back to the DOS prompt.

o The computation cycle time between printouts noted above is about 8 sec x NNR x NNLAN x NNST x NNV x NNZ on an AT. It is suggested that short runs be tried before any really long ones.

o A combined output-input run for PROGRAM BARRIER is seen on figure 1 as an example of a simple case. As noted from the time markers, this run took 11 seconds for the third receiver and only 7 for the second.

4 Program BarrierX Modifications And Effects

The only important differences between this program and the one discussed above are the name of the input file, BFILX.DAT, and the barrier absorption treatment; that is, the tables of reflection coefficients are replaced by tables of complex impedance, and the panel widths (WPL,WPR) are replaced by the distances of the panel discontinuities from the bottom edge (HBDL,HBDR).It will be noted on BFILX that both real and imaginary parts are required. The default values presented in BFILX correspond to the same material sample as that in BF1.DAT .

Running the program is the same as for BARRIER; the key word for startup is TRIAL.

Imbedded in BarrierX is a means for recording the octave band LEQ values and the LEQAWT for each receiver in a run, on an output file called OUTX. If outputs from a series of runs are to be collected, then each output must be copied over to a different named file immediately after each run and file OUTX then erased. If OUTX is not erased before executing a run, an error message will be displayed to the screen. (A convenient way to remember to erase OUTX is to write a small macro to the text editor which will first erase OUTX and then immediately call up BFILX.DAT for the next modification.) This output device is inactive on Version 2.1 but can be activated by removal of the comment symbols C in column 1, lines 70 and 209 of subroutine BARIERX.FOR and line 149 of COMPUTX.FOR . Those subroutines will then have to be recompiled and linked. The file writing capability is very useful when much data is to be collected and stored or when tables of output are to be created. Other file saving procedures are also undoubtedly to be found in the microcomputer literature. Note that the file erase procedure is necessary using the IBM Professional Fortran Compiler, but can be circumvented with Microsoft Fortran.

An example of a run for parameters corresponding to the BARRIER case is seen in figure 2. The outputs are very similar to those for the BARRIER case, (consistent with the discussion in Section C of Report 1), with differences that could be either positive or negative. The running time of the two programs is seen to be about the same .

```
'Bar7H.DAT version 2.0 - absorptive barrier)'
' '
' '
'PARAMETER LIMITS USED IN PROGRAM; INPUT ARRAYS MAY EXCEED THESE'
'NNR    NNLAN   NNST    NNV     NNZ     SHFLAG'
 3      1       1       1       6       1
' '
'HIGHWAY LANE DIMENSIONS'
'LANW   MEDW    SHWL    SHWR    TSWL    TSWR    YL1     YL2='
 10.    0.0     70.     60.      0.0     0.0    10000   -10000
' '
'A-WEIGHT CORRECTIONS IN dB'
'AWT(OCT)='     -26.2  -16.1  -8.6   -3.2   0.0   1.2   1.0  -1.1
' '
'HIGHWAY LANE SURFACE FLOW RESISTANCE'
'SIGT    SIGS    SIGM    SIGP='
1.E+10  1.E+10  1.E+10  1.E+10
' '
'BARRIER X-LOCATIONS ;NOTE XP1=XP2,XP3=XP4'
'XP1 =   XP2  ;  XP3 =   XP4='
0.0     0.0     150.    150.
' '
'BARRIER Y-LOCATIONS'
'YP1     YP2     YP3     YP4='
10000.  -10000.  10000. -10000.
' '
'BARRIER ANGLE (OUTWARD), IN DEGREES'
'PHILD  PHIRD='
 5.     5.
' '
'LEFT BARRIER PANEL WIDTH ;JFLAG=PANEL NUMBER FROM BOTTOM'
'WPL(JFLAG)='   5.0     5.0     5.0
' '
'RIGHT BARRIER PANEL WIDTH'
'WPR(JFLAG)='   5.0     5.0     5.0
' '
'LEFT BARRIER REFLECTION COEFFICIENTS'
'BRFLL(JOCT,JFLAG)='
'JOCT=          1       2       3       4       5       6       7       8'
'JFLAG=1'       .75     .68     .55     .24     .22     .25     .45     .70
'JFLAG=2'       .75     .68     .55     .24     .22     .25     .45     .70
'JFLAG=3'       .75     .68     .55     .24     .22     .25     .45     .70
' '
'RIGHT BARRIER REFLECTION COEFFICIENTS'
'BRFLR(JOCT,JFLAG)='
'JOCT=          1       2       3       4       5       6       7       8'
'JFLAG=1'       .75     .68     .55     .24     .22     .25     .45     .70
'JFLAG=2'       .75     .68     .55     .24     .22     .25     .45     .70
'JFLAG=3'       .75     .68     .55     .24     .22     .25     .45     .70
' '
```

Figure 1. Input Template For Barrier

```
'VEHICLES/HOUR IN LANE NLAN AND FOR VEHICLE TYPE NV. NOTE A;ENTER VALUES-- '
'--LIMITS OF INDICES (NNLAN,NNV) '
'VOL(NLAN,NV)='
'NLAN=        1     2     3     4     5     6     7     8     9     10'
'NV=1'      601.  602.  0.    0.    0.    0.    0.    0.    0.    0.
'NV=2'      603.  604.  0.    0.    0.    0.    0.    0.    0.    0.
'NV=3'      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
'NV=4'      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
'NV=5'      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
' '
'VEHICLE SPEED,MPH IN LANE NLAN AND VEHICLE TYPE NV. SEE NOTE A '
'SPD(NLAN,NV)='
'NLAN         1     2     3     4     5     6     7     8'    9     10'
'NV=1'       55.   55.   0.    0.    0.    0.    0.    0.    0.    0.
'NV=2'       55.   55.   0.    0.    0.    0.    0.    0.    0.    0.
'NV=3'       0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
'NV=4'       0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
'NV=5'       0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
' '
'SOURCE HEIGHT,FOR VEHICLE TYPE NV AND SOURCE TYPE NST. SEE NOTE A'
'SH(NV,NST)='
'NV=          1       2       3       4       5'
'NST=1'      5.0     0.25    0.3     0.0     0.0
'NST=2'      2.0     3.0     4.0     0.0     0.0
'NST=3'      1.0     2.0     8.0     0.0     0.0
' '
'SOURCE STRENGTH, IN dB (UNCORRECTED FOR A-WT) AT 50 FT. IN FREE SPACE--'
'--WITH DEPENDENCE ON SOURCE TYPE NST, VEHICLE TYPE NV. SEE NOTE A'
'LS(JOCT,NV,NST)='
'JOCT=          1      2      3      4      5      6      7      8'
'NV=1 NST=1'   65.7   60.9   62.5   62.6   67.3   62.7   55.9   49.0
'NV=2 NST=1'   67.7   62.9   64.5   64.6   69.3   64.7   57.9   51.0
'NV=3 NST=1'   69.7   64.9   66.5   66.6   71.3   66.7   59.9   53.0
'NV=4 NST=1'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=1'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=1 NST=2'   56.1   56.2   56.3   56.4   56.5   56.6   56.7   56.8
'NV=2 NST=2'   58.1   58.2   59.3   59.4   59.5   59.6   59.7   59.8
'NV=3 NST=2'   71.3   62.8   66.0   70.6   78.8   75.0   70.0   64.0
'NV=4 NST=2'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=2'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=1 NST=3'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=2 NST=3'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=3 NST=3'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=4 NST=3'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=3'   0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
' '
```

Figure 1 Continued

```
'RECEIVER PARAMETERS. '
'         AXR(NR) AYR(NR) AZR(NR) AZRG(NR) ASIGG(NR) '
'NR=1'    -75.     0.      5.0     0.       1.E+10
'NR=2'    -150.    0.      5.0     0.       1.E+10
'NR=3'    -300.    0.0     5.0     0.0      1.E+10
'NR=4'    -160.    0.0     5.0     0.0      1.E+10
'NR=5'    -200.    0.0     5.0     0.0      1.E+10
'NR=6'    -250.    0.0     5.0     0.0      1.E+10
'NR=7'    -320.    0.0     5.0     0.0      1.E+10
'NR=8'    -400.    0.0     5.0     0.0      1.E+10
'NR=9'    -500.    0.0     5.0     0.0      1.E+10
'NR=10'   -640.    0.0     5.0     0.0      1.E+10
'NR=11'   -800.    0.0     5.0     0.0      1.E+10
'NR=12'   -1000.   0.0     5.0     0.0      1.E+10
'NR=13'   -1250.   0.0     5.0     0.0      1.E+10
'NR=14'   -1600.   0.0     5.0     0.0      1.E+10
'NR=15'   -2000.   0.0     5.0     0.0      1.E+10
'NR=16'   -2500.   0.0     5.0     0.0      1.E+10
'NR=17'   -3200.   0.0     5.0     0.0      1.E+10
'NR=18'   -4000.   0.0     5.0     0.0      1.E+10
'NR=19'   -6400.   0.0     0.0     0.0      1.E+10
'NR=20'   -8000.   0.0     0.0     0.0      1.E+10
' '
'ATMOSPHERIC ABSORPTION; dB PER THOUSAND FEET'
'JOCT=            1      2      3      4      5      6      7      8'
'ATMOS(JOCT)='  .061   .183   .388   .597   1.02   2.54   8.52   31.26
```

****

TABLE OF ATMOSPHERIC ABSORPTION, dB/1000 ft.
(placed here for easy transfer to data block above)

JOCT=	1	2	3	4	5	6	7	8
REL. HUM.,%								
10	.107	.193	.369	1.01	3.45	11.70	31.00	55.30
20	.092	.202	.331	.597	1.56	5.31	19.00	58.75
30	.074	.197	.365	.563	1.14	3.33	11.90	42.25
40	.061	.183	.388	.597	1.02	2.54	8.52	31.26
50	.051	.165	.395	.643	1.00	2.18	6.75	24.50
60	.043	.150	.391	.686	1.03	2.00	5.71	20.91
80	.033	.123	.365	.746	1.13	1.89	4.63	15.44

Figure 1 Continued

Output For Above Case

```
C:\IBMFOR>trial

DATE :    6/ 1/1987
TIME :   11:35:20
NR=       1
OCT=       1        2        3        4        5        6        7        8
LEQ=     57.68    50.91    48.90    46.82    48.10    39.55    31.33    18.38
LEQA=    31.48    34.81    40.30    43.62    48.10    40.75    32.33    17.28
LEQAWT=       50.66
DATE :    6/ 1/1987
TIME :   11:35:27
NR=       2
OCT=       1        2        3        4        5        6        7        8
LEQ=     56.34    50.13    49.38    45.53    47.41    38.32    26.37    14.43
LEQA=    30.14    34.03    40.78    42.33    47.41    39.52    27.37    13.33
LEQAWT=       49.88
DATE :    6/ 1/1987
TIME :   11:35:38
NR=       3
OCT=       1        2        3        4        5        6        7        8
LEQ=     54.22    48.15    47.83    45.10    44.91    36.01    22.86     3.49
LEQA=    28.02    32.05    39.23    41.90    44.91    37.21    23.86     2.39
LEQAWT=       47.96
Execution terminated : 0
```

.78

1.92

Figure 1 Completed

```
'BARRIERX DATA INPUT TEMPLATE BFILX.DAT-SAMPLE CASE'
' '
' '
'PARAMETER LIMITS USED IN PROGRAM; INPUT ARRAYS MAY EXCEED THESE'
'NNR     NNLAN    NNST     NNV      NNZ      SHFLAG'
 3       1        1        1        6        1
' '
'HIGHWAY LANE DIMENSIONS'
'LANW    MEDW     SHWL     SHWR     TSWL     TSWR     YL1      YL2='
 10.     0.0      70.      70.       0.0      0.0     10000    -10000
' '
'A-WEIGHT CORRECTIONS IN dB'
'AWT(OCT)='       -26.2   -16.1   -8.6    -3.2    0.0    1.2    1.0   -1.1
' '
'HIGHWAY LANE SURFACE FLOW RESISTANCE'
'SIGT    SIGS     SIGM     SIGP='
1.5E+6   1.0E+7   1.5E+6   1.0E+8
' '
'BARRIER X-LOCATIONS ;NOTE XP1=XP2,XP3=XP4'
'XP1 =   XP2  ;   XP3 =    XP4='
0.0      0.0      100.     100.
' '
'BARRIER Y-LOCATIONS'
'YP1     YP2      YP3      YP4='
10000.   -10000.  10000.   -10000.
' '
'BARRIER ANGLE (OUTWARD), IN DEGREES'
'PHILD   PHIRD='
 5.      5.
' '
'HEIGHT OF LEFT BARRIER IMPED. DISCONT.;JFLAG=PANEL NUMBER FROM BOTTOM'
'HBDL(JFLAG)='  5.0      10.0     15.0
' '
'HEIGHT OF LEFT BARRIER IMPED. DISCONT.'
'HBDR(JFLAG)='  5.0      10.0     15.0
' '
'LEFT BARRIER IMPEDANCE (NORMALIZED)'
'JOCT=           1        2        3        4        5        6        7        8'
'JFLAG=1'
'REAL IMPED'     3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'    -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
'JFLAG=2'
'REAL IMPED'     3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'    -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
'JFLAG=3'
'REAL IMPED'     3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'    -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
' '
```

Figure 2 Input Template for BarrierX

```
'RIGHT BARRIER IMPEDANCE (NORMALIZED)'
'JOCT=          1        2        3        4        5        6        7        8'
'JFLAG=1'
'REAL IMPED'    3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'   -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
'JFLAG=2'
'REAL IMPED'    3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'   -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
'JFLAG=3'
'REAL IMPED'    3.51     3.51     2.01     2.53     2.50     2.77     4.24     4.24
'IMAG IMPED'   -4.85    -4.85    -3.09    -0.69    -0.32     0.63     1.45     1.45
' '
'VEHICLES/HOUR IN LANE NLAN AND FOR VEHICLE TYPE NV. NOTE A;ENTER VALUES-- '
'--LIMITS OF INDICES (NNLAN,NNV) '
'VOL(NLAN,NV)='
'NLAN=          1      2      3      4      5      6      7      8      9      10'
'NV=1'          601.   602.   0.     0.     0.     0.     0.     0.     0.     0.
'NV=2'          603.   604.   0.     0.     0.     0.     0.     0.     0.     0.
'NV=3'          0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
'NV=4'          0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
'NV=5'          0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
' '
'VEHICLE SPEED,MPH IN LANE NLAN AND VEHICLE TYPE NV. SEE NOTE A '
'SPD(NLAN,NV)='
'NLAN             1      2      3      4      5      6      7      8'     9      10'
'NV=1'            55.    55.    0.     0.     0.     0.     0.     0.     0.     0.
'NV=2'            55.    55.    0.     0.     0.     0.     0.     0.     0.     0.
'NV=3'            0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
'NV=4'            0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
'NV=5'            0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
' '
'SOURCE HEIGHT,FOR VEHICLE TYPE NV AND SOURCE TYPE NST. SEE NOTE A'
'SH(NV,NST)='
'NV=              1        2        3        4        5'
'NST=1'           5.0      0.25     0.3      0.0      0.0
'NST=2'           2.0      3.0      4.0      0.0      0.0
'NST=3'           1.0      2.0      8.0      0.0      0.0
' '
```

Figure 2 Continued

```
'SOURCE STRENGTH, IN dB (UNCORRECTED FOR A-WT) AT 50 FT. IN FREE SPACE--'
'--WITH DEPENDENCE ON SOURCE TYPE NST, VEHICLE TYPE NV. SEE NOTE A'
'LS(JOCT,NV,NST)='
'JOCT=           1      2      3      4      5      6      7      8'
'NV=1 NST=1'    65.7   60.9   62.5   62.6   67.3   62.7   55.9   49.0
'NV=2 NST=1'    67.7   62.9   64.5   64.6   69.3   64.7   57.9   51.0
'NV=3 NST=1'    69.7   64.9   66.5   66.6   71.3   66.7   59.9   53.0
'NV=4 NST=1'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=1'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=1 NST=2'    56.1   56.2   56.3   56.4   56.5   56.6   56.7   56.8
'NV=2 NST=2'    58.1   58.2   59.3   59.4   59.5   59.6   59.7   59.8
'NV=3 NST=2'    71.3   62.8   66.0   70.6   78.8   75.0   70.0   64.0
'NV=4 NST=2'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=2'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=1 NST=3'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=2 NST=3'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=3 NST=3'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=4 NST=3'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
'NV=5 NST=3'    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
' '
'RECEIVER PARAMETERS. '
'        AXR(NR) AYR(NR) AZR(NR) AZRG(NR) ASIGG(NR) '
'NR=1'   -75.    0.      5.0     0.       1.0E+10
'NR=2'   -150.   0.      5.0     0.       1.0E+10
'NR=3'   -300.   0.0     5.0     0.0      1.0E+10
'NR=4'   0.0     0.0     0.0     0.0      0.0
'NR=5'   0.0     0.0     0.0     0.0      0.0
'NR=6'   0.0     0.0     0.0     0.0      0.0
'NR=7'   0.0     0.0     0.0     0.0      0.0
'NR=8'   0.0     0.0     0.0     0.0      0.0
'NR=9'   0.0     0.0     0.0     0.0      0.0
'NR=10'  0.0     0.0     0.0     0.0      0.0
'NR=11'  0.0     0.0     0.0     0.0      0.0
'NR=12'  0.0     0.0     0.0     0.0      0.0
'NR=13'  0.0     0.0     0.0     0.0      0.0
'NR=14'  0.0     0.0     0.0     0.0      0.0
'NR=15'  0.0     0.0     0.0     0.0      0.0
'NR=16'  0.0     0.0     0.0     0.0      0.0
'NR=17'  0.0     0.0     0.0     0.0      0.0
'NR=18'  0.0     0.0     0.0     0.0      0.0
'NR=19'  0.0     0.0     0.0     0.0      0.0
'NR=20'  0.0     0.0     0.0     0.0      0.0
' '
'ATMOSPHERIC ABSORPTION; dB PER THOUSAND FEET'
'JOCT=             1      2      3      4      5      6      7      8'
'ATMOS(JOCT)='    .061   .183   .388   .597   1.02   2.54   8.52   31.26
```

Figure 2 Continued

****

TABLE OF ATMOSPHERIC ABSORPTION, dB/1000 ft.
(placed here for easy transfer to data block above)

JOCT=	1	2	3	4	5	6	7	8
REL. HUM.,%								
10	.107	.193	.369	1.01	3.45	11.70	31.00	55.30
20	.092	.202	.331	.597	1.56	5.31	19.00	58.75
30	.074	.197	.365	.563	1.14	3.33	11.90	42.25
40	.061	.183	.388	.597	1.02	2.54	8.52	31.26
50	.051	.165	.395	.643	1.00	2.18	6.75	24.50
60	.043	.150	.391	.686	1.03	2.00	5.71	20.91
80	.033	.123	.365	.746	1.13	1.89	4.63	15.44

Figure 2 Continued

output For Above Case

```
C:\BARRIERX>trial

DATE :  12/16/1987
TIME :  14:47:22
NR=       1
OCT=        1         2         3         4         5         6         7         8
LEQ=     57.58     50.73     48.51     46.29     47.46     38.92     30.45     17.25
LEQA=    31.38     34.63     39.91     43.09     47.46     40.12     31.45     16.15
LEQAWT=       50.08
DATE :  12/16/1987
TIME :  14:47:31
NR=       2
OCT=        1         2         3         4         5         6         7         8
LEQ=     56.25     49.98     49.13     45.03     46.84     37.75     25.53     13.27
LEQA=    30.05     33.88     40.53     41.83     46.84     38.95     26.53     12.17
LEQAWT=       49.38
DATE :  12/16/1987
TIME :  14:47:42
NR=       3
OCT=        1         2         3         4         5         6         7         8
LEQ=     54.14     48.03     47.64     44.80     44.37     35.52     22.10      2.28
LEQA=    27.94     31.93     39.04     41.60     44.37     36.72     23.10      1.18
LEQAWT=       47.55
Execution terminated : 0

C:\BARRIERX>
```

Figure 2 Completed