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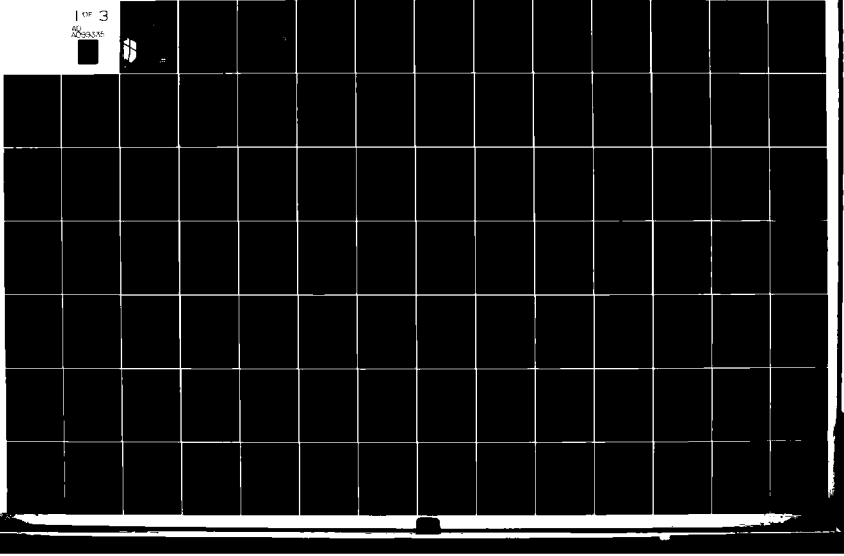

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TECHNICAL REPORT N-98
March 1981
Refined and Validated Noise Contour System

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BLAST NOISE PREDICTION VOLUME II: BNOISE 3.2 COMPUTER PROGRAM DESCRIPTION AND PROGRAM LISTING

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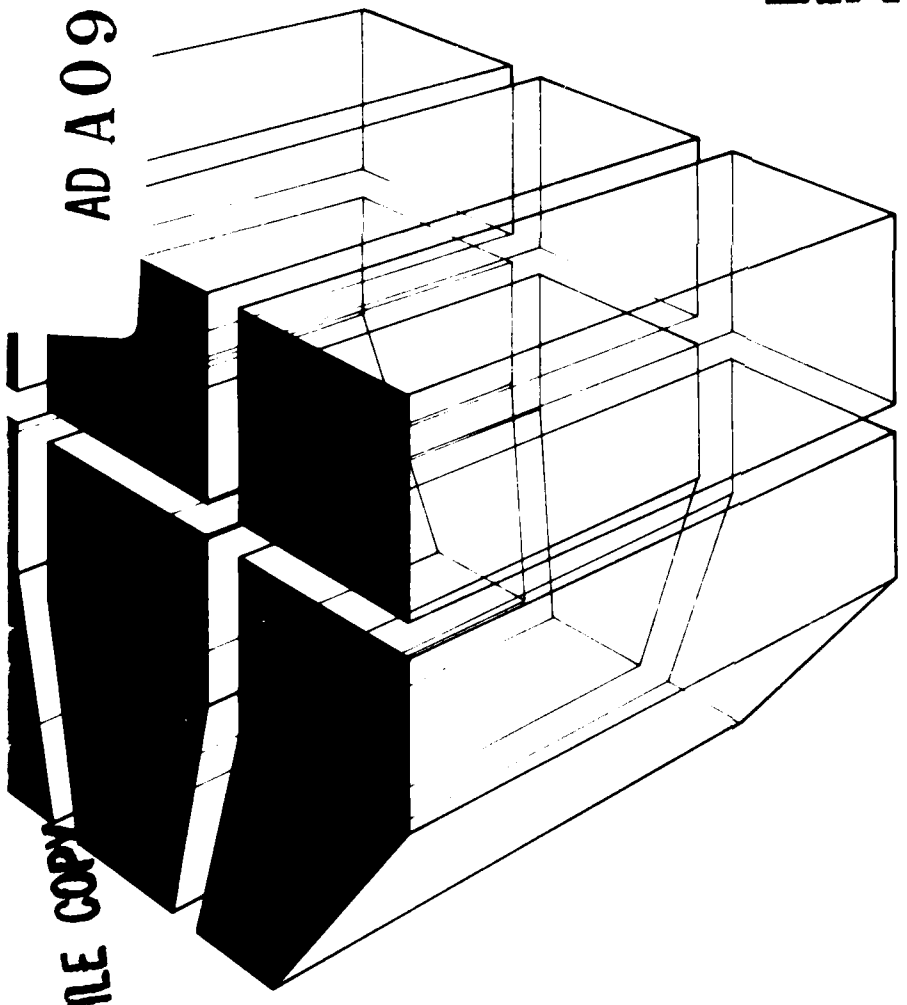

by
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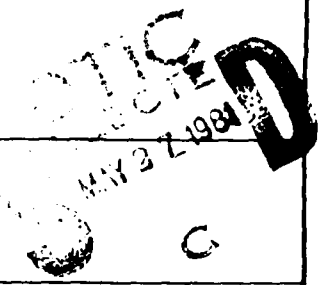

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Over the past several years, the Construction Engineering Research Laboratory has gathered data from various sources dealing with blast noise generation and propagation and has performed several sets of field measurements designed to enhance this data base. These studies have been performed as a part of efforts aimed at improving methods of predicting the noise impact of military installations. Specifically included are measurements of the directivity pattern of major Army weapons and the statistical propagation of blast noise in the atmosphere. Volume I of this report develops and explains the relations

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among the various data bases which have been developed to predict blast noise impact of Army facilities. From these studies, data bases and computational procedures which are used within the Blast Noise Prediction computer program (BNOISE 3.2) are developed.

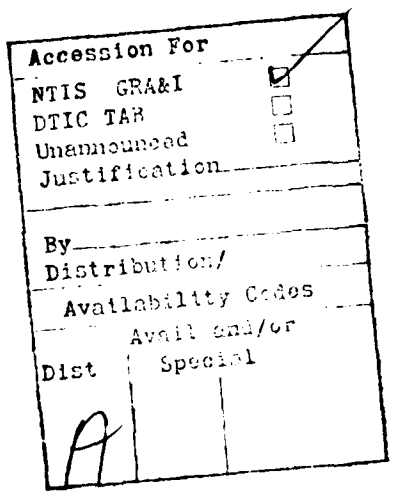
User instructions and a system description for the Blast Noise Prediction computer program, BNOISE 3.2, are given in Volume II. Also included is the procedure for using the program to obtain a noise contour for a specific set of data; how subroutines are invoked in a modular fashion; a description of module functions; module calling procedure; algorithms used by the program; and a summary of error messages.

FOREWORD

This research was conducted for the Directorate of Military Programs, Office of the Chief of Engineers (OCE), under Project 4A76270A896, "Environmental Quality for Construction and Operation of Military Facilities"; Task A, "Environmental Impact Monitoring Management Assessment and Planning"; Work Unit 012, "Refined and Validated Noise Contour System." The QCR number is 3.01.006. Mr. F. P. Beck, DAEN-MPE-I, is the OCE Technical Monitor.

The work was performed by the Environmental Division (EN), U.S. Army Construction Engineering Research Laboratory (CERL). Dr. R. K. Jain is Chief of EN.

COL Louis J. Circeo is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.



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BLAST NOISE PREDICTION
VOLUME II: BNOISE 3.2 COMPUTER PROGRAM DESCRIPTION AND PROGRAM LISTING

1 INTRODUCTION

Background

Over the past several years, the U.S. Army Construction Engineering Research Laboratory (CERL) has gathered data from various sources dealing with blast noise generation and propagation and has performed several sets of field exercises designed to further develop information regarding blast noise sources and the propagation of blast noise in the atmosphere. These CERL studies include measurements of the propagation of 735 five-pound charges set off at a central location at Fort Leonard Wood, MO,[1] measurements at Fort Sill on the directivity pattern of all of the Army's major weapons,[2] and small-scale studies at Fort Sill, OK and Fort Leonard Wood (Appendices A and B) designed to examine the weight relation between blast charge size and blast amplitude and duration. These studies were performed as a part of efforts aimed at developing approved methods of predicting the impact of blast noise at military installations. Data generated by these studies are used in the CERL-developed Blast Noise Prediction computer program (BNOISE 3.2), designed to predict the noise impact of military installations resulting from the blast-producing operations of armor, artillery, and demolition.

Purpose

The purpose of this report is to develop and explain the relations between and among various data developed to predict the blast noise impact of Army facilities, and from these data bases, to develop the computational procedures used within the Blast Noise Prediction computer program.

This volume contains the BNOISE 3.2 program description and program listing.

Mode of Technology Transfer

The program and documentation for the Blast Noise Prediction computer system will be available from the Department of the Army Assigned Responsible Agency (1981).

[1] P. D. Schomer, R. J. Goff, and E. M. Little, *The Statistics of Amplitude and Spectrum of Blasts Propagated in the Atmosphere*, Volumes I and II, Technical Report (TR) N-13, ADA033361 and ADA033646 (U.S. Army Construction Engineering Research Laboratory [CERL], November 1976).

[2] P. D. Schomer, E. M. Little, and A. B. Hunt, *Acoustic Directivity Patterns for Army Weapons*, Interim Report (IR) N-60, ADA066223 (CERL, October 1978).

2 PROGRAM DESCRIPTION

The Blast Noise Prediction computer program (BNOISE 3.2) was developed to allow faster computation of noise values in terms of C-weighted day/night average sound level (CDNL).* It also provides generalized and uniform noise-impact predictions when given a specific set of input data.* The output of the Blast Noise Prediction computer program is a set of CDNL contours which can be overlaid on a land-use map of military facility and its environs to allow rapid identification of noise-sensitive land areas.

This volume is written for those persons familiar with computer programming who require documentation and background for the Blast Noise Prediction computer program. It can also be used as a program reference manual.

System Overview

The Blast Noise Prediction program is a digital computer program which can produce CDNL contours for military facilities with impulsive noise sources (e.g., artillery, explosions or demolitions, and weapon blasts).

The program is written in Fortran IV and used on a Control Data Corporation (CDC) 6600 computer. It consists of a main controlling program, called CDNL, which invokes a series of subroutines when given a set of modules chosen by the user. There are also several supporting programs which aid CDNL.

Each subroutine contributes either directly or indirectly to the goal of producing CDNL contours for a facility. The data base for the program is a description of the facility and its noise sources; i.e., the location of firing points, targets, blast sites, and materials involved in producing the noise. Program modules which are to be used require instructions in the form of card input, headed by the module call card and followed by pertinent information chosen or provided by the user. In addition, input files such as the data base file or a file containing intermediate results from another module are necessary. Each module produces a printed report consisting of:

1. Module name
2. Input values supplied by the user, and/or default values supplied by the program
3. Module-specific output
4. Module execution time.

Some modules also produce output files on auxiliary storage (Figure 1 is a system flowchart). Table 1 summarizes the input/output (I/O) files used by the contouring program. This table lists the I/O files by number, a description of the files, the routines which use them for input, and the routines which produce them as output. If the programmer wishes to modify the program, he** should avoid changing these file identifiers (TAPE NUMBERS) as they already appear elsewhere in the program. TAPE5 is the input file used by all routines having card input. TAPE6 is the output file used by all routines which produce a printout (see Figure 1).

P. D. Schomer, R. J. Gelfi, and J. M. Little, *Data Statistics of Impulsive and Spectrum of Blast Propagation at the Yuma Proving Ground, Part II*, IRN 15, AD A035641 and AD A035642 (CERL, 1976).

* The CDNL is the noise measurement criterion in Army Technical Manual (TM) 5-803-7, *Environmental Noise Assessment Procedures for Army Facilities*, Department of the Army (DA), 15 June 1978.

**The male pronoun is used throughout this report to refer to both genders.

USER'S RUN

When the user has a set of data for which he wishes to receive output from the Blast Noise Prediction program, he must put together a deck of cards called the USER'S RUN. This deck is composed of

1. Job Control Language (JCL) cards
2. Input data cards
3. Module cards

Figure 2 presents the order of these sections within the deck. The user's main interest lies in providing the Blast Noise Prediction program with data in the proper form, knowing what the modules do, and understanding what type of output can be expected from them. The programmer should familiarize himself with the connection between the USER'S RUN deck and the corresponding code in the subroutines.

The programmer should know what input must be provided to the Blast Noise Prediction program by the user so he can relate items in the deck to the internal variables and subroutines within the program; it is also helpful to know how these data are acquired. Figure 3 shows the general composition of input data of the user's deck.

JCL Cards

The user must provide a set of system-specific JCL cards at the beginning of the USER'S RUN deck. These cards inform the computer that someone wants to use the stored Blast Noise Prediction program. The JCL cards do not change from run to run for the average user, and he should not concern himself with them beyond knowing that they must precede the cards of his actual data items and module calls.

Input Data

The Blast Noise Prediction program considers noise from two types of sources: firing points and target points. The firing point is the spot from which a projectile is being launched or the site of a demolition charge, the target point is the site of a projectile's impact; if data are to be useful to the Blast Noise Prediction program, a projectile's launching weapon must produce a sharp blast and not a drawnout, "whoosh-type" sound such as that emitted by most rockets.*

The data required on input cards are (1) the X and Y coordinates of the firing range for both the target and firing points, and (2) the amount of propellant and projectile charge, in TNT equivalents, producing the noise at both the firing or target point. In the case of sound occurring only at a firing point, the user must determine whether the sound is caused by an explosion at that point (e.g., a demolition charge) or if it is an instance of a weapon propelling a projectile which makes no noise upon impact at its target point (e.g., an illumination round). In the first case, only the firing point coordinate is needed, while in the second, both firing and target point coordinates are required, even though there is no sound at the target. This is because noise produced by a weapon has a directivity pattern associated with it that varies the amount of sound pressure around the weapon. The degree of variance depends, in great part, on the physical characteristics of the weapon itself. A projectile or demolition, however, produces noise omnidirectionally from its source.[4]

It is up to the user to differentiate between the amount of propelling charge at the firing point and the amount of projectile charge exploding at the target point. These values vary for different weapons and ammunition. Table 2 gives the weapon codes used for a certain set of standard weapons. The weight of propellant and projectile charges for these weapons, in TNT equivalents, and directivity information are given in Tables 3 and 4.

It can be seen from Table 3 that various amounts of propellant can be used to fire one size of projectile. The user is not restricted to the weapon types listed in Tables 2, 3, and 4. He may create data to suit his needs as long as they are put into proper format and labeled with a new gun-type code.

[4] P. D. Schomer, E. M. Little, and A. B. Hans, *Development of Prediction Procedures for Army Weapons Impulse Noise*, IR N-60/AD A066223 (CERL, Champaign, 1978).

*A very small charge is used to simulate the sound of rockets.

("New" means that the code number differs from all of the codes already provided.) This prevents the computer and/or other users from confusing it with an already listed code. At no time can two different weapons have the same code within one deck. The user must also specify the number of rounds fired by each weapon at each point during the day (0700 to 2200 hours) and during the night (2200 to 0700 hours).

The input data portion of the USER'S RUN deck is divided into:

1. Gun-type cards
2. Target point definition cards
3. Firing point definition cards.

The gun-type cards describe the weapons by specifying (1) the weight of explosive in the projectile, (2) the weight of the different propellant charges, (3) the name of the weapon, (4) the weight parameters A and B, and (5) the directivity pattern. Table 5 outlines the required format. The target point definition cards list the X and Y coordinates of the target area. The firing point definition cards, in addition to listing the X and Y coordinates of the firing point, specify (1) what types of weapons are the noise-producing sources, (2) how often each specified weapon is fired during the day and at night, (3) if the projectile impacts at the target, and (4) the height of impact. Tables 6 and 7 give the card format for target and firing point data, respectively.

Modules

A sequence of individual sections, called modules, informs the Blast Noise Prediction program what the user wants done to the input data he has provided. These modules correspond to major subroutines in the Blast Noise Prediction program. There are, however, more subroutines which are necessary for program operation than there are modules available to the user.

To identify and run a Blast Noise Prediction program module, the user must (1) input a card identifying the module to be run followed by (2) a card (or cards) specifying the parameters which that module requires to function correctly. The user varies the parameters to account for the input data and to produce the desired output. Output can be either a set of printed tables of CDNL values or an actual paper plot of CDNL contours, depending on which modules are invoked. There is some freedom in the ordering of the modules, however, certain modules use the output generated by other Blast Noise Prediction program modules. If the user chooses one of these "dependent" modules, he must be sure it is preceded by the modules which will provide the data it needs. Figure 1, a flowchart for Blast Noise Prediction program modules, shows which inputs they require and the output they produce.

The following modules are currently available from the Blast Noise Prediction program.

NEF-1 specifies whether the data base coordinates are in meters or feet. There is only one of these cards per USER'S RUN and it is always the first card in the module section. It is also used for specific options which might be available.

BASE generates line segments which can be drawn by the PLOT routine on the paper plot output. It can be used to create an outline of the facility for which the user is providing data. It can also be used to draw lines on the PLOT output to be used as a visual reference for lining up the paper plot with the actual map. BASE causes PLOT to draw line segments from coordinate to coordinate, as specified.

BOUNDS uses map coordinates to set the limits of the total area encompassed by CDNL calculations and to be enclosed by the PLOT drawing. It is used to define the area in which the user is interested.

FORMA tabulates target and firing point information from the input data. It compresses data into the form required by PUDDLE GRID.

LOCATOR labels target and firing points on the plot.

MAP does elementary error checking and is a preprocessor for the input data. It also produces a listing of input data and generates cross-reference tables.

The procedures for collecting and coding data are given in T. McBryan, *Compilation of Operational Noise Data*, TR N-82/AD A080429 (CERL, January 1980).

PLOT combines output from appropriate modules for use by the NASAPLOT* program to create actual plots of contours of CDNL levels.

POINT calculates CDNL for specific locations.

PUDDLE GRID creates a rectangular grid of CDNL values in the area specified by the user in the BOUNDS module.

SCATTER allows the PLOT routine to create [illegible] (dots) of noise sources; the number of dots is proportional to the blasting activity at that point.

STOP signals the Blast Noise Prediction program that the module section of the USER'S RUN deck has been terminated.

A multipunch 6789 card must be the last card in the USER'S RUN; the multipunch informs the computer that all input for the USER'S RUN has been submitted and that the system does not need to look for more cards in order to execute the run.

Figure 4 represents a possible sequence in which the modules of the Blast Noise Prediction program could be ordered by the user in the USER'S RUN. Tables 8 through 17 summarize the input required by each module of the Blast Noise Prediction program. These tables describe the instruction cards for the modules and list, in tabular format, the specifications for all the parameters required by each module. Tables 8 through 17 have the following column headings:

CARD ID: gives each card of a module a name as a reference; e.g., the first card in MAP is called MAP-1.

COLUMNS: the card columns in which data must appear.

VARIABLE NAME: the name given to these data within the program.

FORMAT: Fortran description of how that data item must look. There are three basic formats used by the Blast Noise Prediction program; each corresponds to a particular type of data.

1. A -- alphanumeric data such as module names; i.e., items combining the letters A through Z and the numbers 0 through 9. For example, A10 or a field of up to 10 characters (letters and numbers) must be left justified.

2. I -- integer number, e.g., I2 or a 2-column (digit) number with no decimal point (must be right justified in the columns in which it appears).

3. F -- all other data and normal decimal numbers for real arithmetic operations; e.g., F10.1 or a 10-digit real number at maximum (can be smaller as long as a decimal point is put in, e.g., 32.5 or 56.3). The 10 means the number is a total of 10 columns; one column is a decimal point and there is one digit after the decimal point. A shorter number simply means that the leading digits are zeros. *A letter character cannot appear in a field specified as an "I" or "F" format. The user must make sure data items are in proper format on the cards in order for the Blast Noise Prediction program to interpret the input correctly.*

DESCRIPTION: tells what parameter is being referred to and includes any special codes and/or notes about required data and their units, if any. *Any characters between quote marks (" ") are the actual items written in the specified columns of that module card.*

COMMENTS/DEFAULTS: default values are the quantities the Blast Noise Prediction program will use if certain items are left blank by the user. If there is no default value given for it, that data item must be specified by the user. Special instructions regarding that card are included under this heading.

PREVIOUS CALLS REQUIRED: a module whose output is required as input to the current module and therefore must be called *before* the current module.

*See Volume I

Additional Module Input

Most of the data required by Blast Noise Prediction program modules are self-explanatory and are listed, by module, in Tables 8 through 17. However, some parameters for PUDDLE GRID, POINT, FORMA, and MAP require more detailed explanations.

PUDDLE GRID

The "grid size" specification in the PUDDLE GRID module specifies how often, in terms of X and Y coordinates, the CDNL values are to be computed (e.g., every 1000 m or 2000 ft are reasonable values if the overall land area included in the contour is fairly large). The smaller the values used, the finer the grid size, and the smoother the contour that is produced. This is because the program has a greater number of actual points to plot from and fewer to approximate. Cutting the grid size in half will cause four times as many points to be computed and will cost about four times as much to run, since run cost is proportional to the number of points computed. The user must consider cost when choosing grid size, because if the program has to compute a greater number of values it will run longer, and therefore will cost more.

PUDDLE GRID and POINT

The "inversion factors" specification in the PUDDLE GRID and POINT modules provides a set of meteorological data to the program. Weather conditions, especially temperature, have an effect on the way sound propagates through the atmosphere (see Volume I). Currently, the Blast Noise Prediction program does not take into consideration the effects of wind. However, it does take into account temperature inversions. Therefore, the user must provide appropriate inversion data for the location of his noise study. Inversion data tables available from the National Weather Service summarize radiosonde observations made at selected weather stations. A summary of this temperature data is presented in Table 18. This table is used to determine the temperature inversion factors required by PUDDLE GRID and POINT. The user should locate the city closest geographically and meteorologically. The number in that row under the column labeled "SURFACE" is the value used for inversion factor 1. The second factor is obtained under the "1-500 m" column; the third factor is found under the column labeled "1-3000 m."

FORMA

The "charge averaging technique" specification in the FORMA module allows the user to choose the range of charge sizes the program will use from among those given for the propelling charges for a specific weapon in the gun-type cards. This range is chosen in the firing point definition cards. For example, if the user states that weapon 1 normally uses charges from zones 1 through 5 (the range), the options yield the following results:

1. If MAX is chosen, the program will use the largest charge size in the given fields for its calculations.

2. If CAVE is chosen, the program will average the actual TNT equivalents of all the fields and use that average for computations.

3. If IAVE is chosen, the program will integer average the zone numbers and use the value of charge size found in that zone, i.e., 1 and 5 yield charge 3, 1 and 4 also yield charge 3. If upper and lower boundaries of the charge zones are the same number, then all three options will arrive at the same charge size. For example, if 3 and 3 are specified on the firing-point definition card as the charge range, then the program will use whatever charge value is in zone 3 of the propelling charges for that weapon, no matter which averaging technique is chosen.

MAP

If a user wishes to determine how many points will be generated by PUDDLE GRID for a specific grid size, he may request this information from the MAP module instead of calculating it himself. The user must specify the number of various grid sizes he wishes to try on the MAP-4 card, and then list these with as many MAP-5 cards as necessary. The output from MAP will list the number of points that will be generated by the chosen grid sizes. The MAP module can be used by the user to indicate the cost of producing a grid (see PUDDLE GRID, above). These MAP module cards must be

included even if the user does not wish to use this feature. The values commonly used are 01 for MAP 4 and 280 for MAP 5. If, for example, the area of interest is 10 000 x 10 000 m, a grid size of 1000 m would produce 10 times 10 or 100 grid points.

Module Output

All Blast Noise Prediction program modules produce printed reports which are tables of intermediate or final results and, if necessary, error messages. In addition, some of the information produced by particular modules is stored temporarily, to be used as input to other modules at a later point in the program. The printouts provide a hard copy record of information supplied to the Blast Noise Prediction program via module cards and allow easy verification of the accuracy of module facts and data items input to the main program.

Obtaining Results from Module Output

Module outputs of primary interest to the user are those produced by the PUDDLE GRID and PLOT modules. The paper contour produced by PLOT is often the end result sought by the person creating a USER'S RUN. Since the user can control the amount of area enclosed by the plot, he can specify the plot's scale to agree with the maps he is working with, or he can scale down the plot to obtain a smaller version of his results for future or intermediate reference.

If the user does not wish to incur the cost of an actual plot, then PUDDLE GRID output can be used as a source of intermediate results. PUDDLE GRID generates a list of CDNL values by coordinates in increments specified by the GRID SIZE. The user can approximate the noise levels in any given area by using this table; it can also be compared against the expected CDNL levels in a given area, thus checking the data. For example, if PUDDLE GRID output indicates that the region around a firing point has the lowest values of the entire table, the user should go back and recheck his data for errors.

If the user wants only the PUDDLE GRID values and not the actual plot, he must modify the JCL section of his USER'S RUN by excluding from the deck all cards which are used for plotting. (And, of course, the PLOT module is left out of the module input cards.)

All Blast Noise Prediction program modules also produce statistics giving the amount of system time spent by the computer in a given module. This information can be used to approximate run cost. This is done by multiplying system time by cost per time unit. For example, if a module ran for 300 ms and the cost is one third of a penny/ms, then that module's cost is approximately $1.00.

Module Error Messages

Because the Blast Noise Prediction program has no way of knowing whether the data it uses are correct, it will use incorrect data that are reasonable and in proper format. The program can only indicate errors in format and point out unreasonable data items (e.g., negative charge sizes); if there are enough errors and/or unreasonable items, the program will halt execution. Therefore, it is important that the user check the statistics produced by the modules to make sure the Blast Noise Prediction program is performing operations on the correct data.

Error messages tell the user that there is something wrong with the data provided to the Blast Noise Prediction program. Warning messages indicate that there is something out of the ordinary in the data, but not necessarily wrong. For example, a charge size input by the user that is appreciably larger than other charge sizes specified by the user would trigger a warning message, alerting the user to the probability of a misplaced decimal point.

Table 1
I/O File Summary

Fortran File Name	Description	Characteristics	Device	Output By Module Call: (Subroutine/Entry)	Input To Module Call: (Subroutine/Entry Name)
TAPE5 (Input)	Module instructions	Card image	Card reader		
TAPE6 (Output)	Module reports	Print line	Printer		
TAPE7	Data base	Card image	Auxiliary storage tape/disk		LOCATOR (LOCATR) MAP (MAP) FORM-A (FORMA) SCATTER (SCATTR)
TAPE8	Intermediate results noise source tabulation	Internal format	Auxiliary storage	FORM-A (FORMA)	PUDDLE GRID (PGRID)
TAPE1	PUDDLE GRID output	Card image (PHS2 NASAPLOT)	Auxiliary storage	PUDDLE GRID (PGRID)	PLOT (PLOT)
TAPE2	Base outline	Card image (PHS4 NASAPLOT)	Auxiliary storage	BASE (BASE)	PLOT (PLOT)
TAPE3	Target and firing point locations	Card image (PHS3 NASAPLOT)	Auxiliary storage	LOCATOR (LOCATR)	PLOT (PLOT)
TAPE4	Scattergram	Card image (PHS4 NASAPLOT)	Auxiliary storage	SCATTER (SCATTR)	PLOT (PLOT)
TAPE20	Acoustical data base	Internal format	Auxiliary storage	TABGEN	READ TABLE (READTB)
TAPE55	NASAPLOT input	Card image	Auxiliary storage	PLOT (PLOT)	NASAPLOT

OTHER TAPES: TAPE51, TAPE70, TAPE72, TAPE75, TAPE90, TAPE91, TAPE99

Table 2
Weapon Codes

Weapon	Code
105-mm howitzer (M102)	1
155-mm howitzer (M109)	2
8-in. howitzer (M110)	3
175-mm gun	4
155-mm howitzer (M109A1)	5
155-mm howitzer (M114)	6
8-in. howitzer (M110A1)	7
155-mm howitzer (M198)	8
Small charge TNT (0.25–90 lb)	10
Large charge TNT (110–500 lb)	11
60-mm mortar	20
81-mm mortar	22
107-mm mortar (4.2 in.)	23
57-mm recoilless rifle	30
90-mm recoilless rifle (M67)	31
106-mm recoilless rifle (M40A1)	32
20-mm gun	40
40-mm gun	41
57-mm gun	42
90-mm gun	43
2.75-in. rocket	50
3.5-in. rocket	51
66-mm rocket	52
LAW missile (M72)	53
TOW missile	54
Dragon missile	55
Shillelagh missile (from 152-mm gun)	56
40-mm grenade launcher (M203)	60
Rifle grenade (M79)	61
Hand grenade (M67)	62
M60 tank (105-mm) regular shell	90
M60 tank (105-mm) high velocity shell	91
152-mm tank gun (Sheridan) (M551) regular shell	92
152-mm tank gun (Sheridan) (M551) HEAT-T shell	93
165-mm cannon (M135)	94

Table 3
Projectile and Propellant Weights for Table 2 Weapon Codes
(TNT equivalent in pounds)

Weapon Code	Projectile Weight	Propellant Weight Charge Zones 1	2	3	4	5	6	7	8	9	10
1	4.6	0.5175	0.605	0.7731	1.004	1.3275	1.8656	2.7456			
2	15.4	1.7687	2.2875	3.0875	4.025	7.05	9.8375	13.275	38.0		
3	36.3	5.3188	6.2688	7.5125	9.5188	16.85	22.0125	28.1375		43.6	
4	31.3	23.56	39.7	57.24							
5	15.4	1.7687	2.2875	3.0875	4.025	7.05	9.8375	13.275			
6	15.4	1.7687	2.2875	3.08757	4.025	7.05	9.8375	13.275			
7	36.3	5.3188	6.2688	7.5125	9.5188	16.85	22.0125	28.1375	38.0	43.6	
8	15.4	2.0	2.8	3.3	5.6	8.5	14.2	17.3	26.0		
10		0.25	1.0	5.0	10.0	15.0	25.0	35.0	50.0	70.0	90.0
11		110.0	140.0	170.0	200.0	240.0	290.0	340.0	380.0	440.0	500.0
20	0.42	0.021	0.042	0.063	0.084						
21	0.6	0.22	0.25	0.28	0.31						
22	2.25	0.042	0.0653	0.0886	0.1119	1.352	0.1585	0.1818	0.1941	0.2284	
23	8.5	0.0803	0.1132	0.1642	0.3369	0.6717					
30	0.55	1.0									
31	1.72	1.31									
32	2.79	8.0									
40	0.05	0.2									
41	0.14	0.718									
42	0.44	2.28									
43	1.9	7.31									
50	5.0	0.01									
51	1.88	0.01									
52	0.13	0.85									
53	0.66	0.01									
54	5.3	0.01									
55	3.5	0.01									
56	8.0	14.0									
60	0.6	0.01									
61	0.6	0.0001									
62	0.6	0.01									
90	6.6	5.9									
91	2.14	11.5									
92	9.5	6.0									
93	6.3	6.0									
94	20.0	2.12									

Table 4
Directivity Information for Table 2 Weapon Codes

Weapon Code	A	B	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	Avg.
1	83.78	13.91	17.80	13.91	10.02	6.46	2.97	0.53	0.0	0.53	2.97	6.46	10.02	13.91	10.84
2	75.74	18.51	0.63	0.46	0.29	1.00	1.45	0.39	0.0	0.39	1.45	1.00	0.29	0.46	0.67
3	83.64	14.13	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36
4	73.29	17.50	16.33	13.08	9.84	5.41	3.03	0.50	0.0	0.50	3.03	5.41	9.84	13.08	9.90
5	72.08	18.11	-1.88	-1.71	-1.53	-0.49	0.94	-0.52	0.0	-0.52	0.94	-0.49	-1.53	-1.71	-0.60
6	80.86	15.59	14.93	12.55	10.18	6.87	3.20	1.56	0.0	1.56	3.20	6.87	10.18	12.55	9.45
7	76.99	15.87	16.33	13.08	9.84	5.41	3.03	0.50	0.0	0.50	3.03	5.41	9.84	13.08	9.90
8	72.08	18.11	-1.88	-1.71	-1.53	-0.49	0.94	-0.52	0.0	-0.52	0.94	-0.49	-1.53	-1.71	-0.60
10															
11															
20	95.00	20.00	8.29	6.39	4.48	5.75	2.20	2.88	0.0	2.88	2.20	5.75	4.48	6.39	4.86
22	90.27	19.57	8.29	6.39	4.48	5.75	2.20	2.88	0.0	2.88	2.20	5.75	4.48	6.39	4.86
23	85.17	18.85	8.45	6.61	4.78	5.17	1.89	1.58	0.0	1.58	1.89	5.17	4.78	6.61	4.74
30	106.00	0.0	2.28	-0.87	-4.02	-4.77	-2.40	-0.07	0.0	-0.07	-2.40	-4.77	-4.02	-0.87	-1.29
31	107.10	0.0	-9.51	-9.75	-9.98	-7.18	-3.17	-0.49	0.0	-0.49	-3.17	-7.18	-9.98	-9.75	-4.11
32	111.80	0.0	2.28	-0.87	-4.02	-4.77	-2.40	-0.07	0.0	-0.07	-2.40	-4.77	-4.02	-0.87	-1.29
40	90.00	15.00	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36
41	85.00	15.00	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36
42	85.00	15.00	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36
43	85.00	15.00	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36
50	88.75	13.85													
51	88.75	13.85													
52	88.75	13.85													
53	88.75	13.85													
54	88.75	13.85													
55	88.75	13.85													
56	88.75	13.85													
60	85.00	0.0													
61	65.00	0.0													
62	65.00	0.0													
90	111.40	0.0	15.35	14.04	12.73	7.61	4.81	1.09	0.0	1.09	4.81	7.61	12.73	14.04	10.78
91	115.80	0.0	15.35	14.04	12.73	7.61	4.81	1.09	0.0	1.09	4.81	7.61	12.73	14.04	10.78
92	115.80	0.0	7.56	7.38	7.19	2.73	1.05	-0.39	0.0	-0.39	1.05	2.73	7.19	7.38	4.80
93	115.80	0.0	7.56	7.38	7.19	2.73	1.05	-0.39	0.0	-0.39	1.05	2.73	7.19	7.38	4.80
94	60.91	14.49	13.77	10.29	6.82	4.01	1.42	-0.64	0.0	-0.64	1.42	4.01	6.82	10.29	7.36

Table 5
Input Data Format Description -Gun-Type Cards

Card ID	Columns	Format	Description	Comments/Defaults
GUN-1	2-3	A2	Weapon code	2-digit number giving the code for a specific weapon name
	4-10	F7.0	Projectile weight	In TNT equivalent pounds of explosive
	11-17	F7.0	Propellant weight (zone 1)	In TNT equivalent pounds of explosive
	18-24	F7.0	Propellant weight (zone 2)	10 charge zones allowed (values as specified in Table 4)
	25-31	F7.0	Propellant weight (zone 3)	
	32-38	F7.0	Propellant weight (zone 4)	
	39-45	F7.0	Propellant weight (zone 5)	
	46-52	F7.0	Propellant weight (zone 6)	
	53-59	F7.0	Propellant weight (zone 7)	
	60-66	F7.0	Propellant weight (zone 8)	
	67-73	F7.0	Propellant weight (zone 9)	
	74-80	F7.0	Propellant weight (zone 10)	
GUN-2	4-23	2A10	Name of weapon	
GUN-3	1	A1	"*" to flag end of gun-type cards	
	4-9	F6.2	Parameter A	
	10-14	F5.2	Parameter B	
	15-19	F5.2	Decibel difference from rear of gun at 0° (0° is front of gun)	Values as specified in Table 4
	20-24	F5.2	30° decibel difference	Values as specified in Table 4
	25-29	F5.2	60° decibel difference	Values as specified in Table 4
	30-34	F5.2	90° decibel difference	Values as specified in Table 4
	35-39	F5.2	120° decibel difference	Values as specified in Table 4
	40-44	F5.2	150° decibel difference	Values as specified in Table 4
	45-49	F5.2	180° "0.0"	Rear of gun
	50-54	F5.2	210° decibel difference	Values as specified in Table 4
	55-59	F5.2	240° decibel difference	Values as specified in Table 4
	60-64	F5.2	270° decibel difference	Values as specified in Table 4
	65-69	F5.2	300° decibel difference	Values as specified in Table 4
	70-74	F5.2	330° decibel difference	Values as specified in Table 4
	75-79	F5.2	Average difference from rear of gun	Values as specified in Table 4

Table 6
Input Data Format Description–Target Cards

Card ID	Columns	Format	Description	Comments/Defaults
*One TRG-1 Card Per Target Point**				
TRG-1	1	A1	"*" if last target card	
	3-5	A3	1-3 character target ID	
	7-12	F6.0	Location, x-coordinate	
	13-18	F6.0	Location, y-coordinate	
	19-24	F6.0	Ground correction factor (dB)	1.5 dB

*Maximum 50 targets.

Table 7
Input Data Format Description –Firing Point Cards

Card ID	Columns	Format	Description	Comments/Defaults
One FP-1 card and associated FP-2 cards per firing point				
FP-1	3-5	A3	Firing point ID	
	7-12	F6.0	Location, x-coordinate	
	13-18	F6.0	Location, y-coordinate	
	19-24	F6.0	Ground correction factor (dB)	1.5 dB
FP-2	1	A1	"*" if last definition card for a particular firing point	
	19-20	A2	Gun type (code)	See Tables 3 and 4
	21-24	F4.0	Number of day firings	0.0
	25-28	F4.0	Number of night firings	0.0
	29-30	I2	Min charge zone	See Tables 3 and 4
	31-32	I2	Max charge zone	See Tables 3 and 4
	33-35	A3	Corresponding target ID	Must be blank if firing point sound is omnidirectional (i.e., demolition or explosion)
	36	I1	"1" = no noise at target	If target is blank, this must be set to "1"
	37-41	F5.0	Height, in feet (if applicable)	"-" below ground "+" above ground

Table 8
BASE Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEF-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
. . . . . CALLS TO OTHER MODULES					
BASE-1	1-4	HDR	A10	"BASE"	
BASE-2 CARD REPEATED AS NECESSARY TO DESCRIBE BASE OUTLINE					
BASE-2	1-10	XCOORD	F10.0	Coordinates of point in set describing one line segment	
	11-20	YCOORD	F10.0		
	21	STAR	A 1	"*" indicates end of continuous line, following point starts new line	
BASE-3[+]	21	STAR	A 1	"*" indicates end of data for "BASE"	

PREVIOUS CALLS REQUIRED: BOUNDS

REQUIRED FILES: None

OUTPUT: Printed report
TAPE2 PHS4 input to NASAPLOT, input to PLOT routine

[+]There must be one BASE-3 card. It will have an "*" in column 21.

Table 9
BOUNDS Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEF-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
. . . . . CALLS TO OTHER MODULES					
BDS-1	1-6	HDR	A10	"BOUNDS"	
BDS-2	1-10	XMIN	F10.0	Minimum X coordinate	Boundary values used by PUDDLE GRID, PLOT, SCATTER and LOCATOR must be set before calls to these routines.
	11-20	YMIN	F10.0	Minimum Y coordinate	
BDS-3	1-10	XMAX	F10.0	Maximum X coordinate	
	11-20	YMAX	F10.0	Maximum Y coordinate	

PREVIOUS CALLS REQUIRED: None

REQUIRED FILES: None

OUTPUT: Printed report

Table 10
FORMA Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEF-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
. . . . . CALLS TO OTHER MODULES					
FRMA-1	1-6	HDR	A10	"FORMA"	
FRMA-2	1-4	IFUNC	A10	Charge averaging technique ("MAX"/ "IAVE"/"CAVE")	"MAX" - Use maximum charge zone "IAVE" - Use average of charge zones "CAVE" - Use average of actual TNT equivalents
	11-20	GHCORR	F10.0	Ground correction	Default = 1.5 dB
	21	NOWIND	I1	When nonzero, prevents rewinding TAPE7	Default is rewind
FRMA-3	1-10	DAYS	F10.0	Number of days of information in data base	Default = 1 Day

PREVIOUS CALLS REQUIRED: None

REQUIRED FILES: TAPE7 data base

OUTPUT: Printed report
TAPE8 intermediate results

Table 11
LOCATOR Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEE-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
..... CALLS TO OTHER MODULES					
LOC-1	1-7	HDR	A10	"LOCATOR"	
LOC-2	1-10	CHOICE	A10	"ALL", "TARGET", or "FIRING"	Type of points to be marked on plot
	11-20	NAME	A10	"NAME" prints ID on plot	
	21-30	LOCATE	A10	"LOCATION" prints coordinates	
	31-40	SIZE	F10.0	Size of letters	Default = 0.14; best results are obtained if multiple of 0.035
	41-50	ANGLE	F10.0	Rotation of letters	Default = 0°

PREVIOUS CALLS REQUIRED: BOUNDS

REQUIRED FILES: TAPE7 data base

OUTPUT: Printed report
TAPE3 PHS3 input to NASAPLOT, input to PLOT routine.

Table 12
MAP Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEE-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
..... CALLS TO OTHER MODULES					
MAP-1	1-3	HDR	A10	"MAP"	
MAP-2	1	IFLAG	I1	Print data base information if ≠ 0	
	2	IFT	I1	Print target vs firing point table (if ≠ 0)	
	3	IFG	I1	Print target vs gun type table (if ≠ 0)	
	4	IGT	I1	Print gun type vs target table (if ≠ 0)	
	5	IGF	I1	Print gun type vs firing point table (if ≠ 0)	
	6	I01	I1	Do not print "Extraneous Data" message if ≠ 0	
MAP-3	1-10	DAYS	F10.0	Number of days of information in data base	
MAP-4*	1-2	N	I2	Number of grid sizes to be tested	Card should be repeated N times as specified by MAP-4
MAP-5	1-10	GRDSZ	F10.0	Grid size	

PREVIOUS CALLS REQUIRED: None

REQUIRED FILES: TAPE7 data base

OUTPUT: Printed report

*There must be one MAP-4 card and at least one MAP-5 card.

Table 13
PLOT Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments, Defaults
NEF-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
		. . . CALLS TO OTHER MODULES			
PLT-1	1-4	BDR	A10	"PLOT"	
PLT-2	1	PUDG	I1	"1" if PUDDLE GRID output (TAPE1) to be used	"0"
	2	LOC	I1	"1" if LOCATOR output (TAPE3) to be used	"0"
	3	SCAT	I1	"1" if SCATTER output (TAPE4) to be used	"0"
	4	BAS	I1	"1" if BASE output (TAPE2) to be used	"0"
PLT-3	1-7	SCALE	F7.0	Scale	5000 ($1000 \leq x \leq 99999$)
	8-11	PERCX	F4.0	%X	1.0 ($0.01 \leq x \leq 9.0$)
	12-15	PERCY	F4.0	%Y	1.0 ($0.01 \leq x \leq 9.0$)
	16-19	MAG	F4.0	Magnification	1.0 ($0.01 \leq x \leq 9.0$)
	20-23	PERCSM	F4.0	% smoothing	0.333 ($0.01 \leq x \leq 9.0$)
	24-26	START	I3	First contour level to be plotted	55 ($1 \leq x \leq 999$)
	27-29	STOP	I3	Last contour level to be plotted	75 ($1 \leq x \leq 999$)
	30-32	LSTART	I3	First contour level to be labeled	55 ($1 \leq x \leq 999$)
	33-35	LSTOP	I3	Last contour level to be labeled	75 ($1 \leq x \leq 999$)
	36-37	LABEL	I2	Label	1 ("1" = Labels, "-1" = No Labels)
	38-39	INC	I2	Contour increment	5 ($0 \leq x \leq 99$)
	40-41	LINC	I2	Label increment	5 ($0 \leq x \leq 99$)
Repeat PLT-4 and PLT-5 cards as much as needed					
PLT-4	1-10	X	F10.0	X-coordinate starting location of text	
	11-20	Y	F10.0	Y-coordinate starting location of text	
	21-30	HT	F10.0	Height	
	31-40	ANGLE	F10.0	Angle	0°
	41	IC	I1	0-plotter coordinates (inches) 1-MAP coordinates	Default = 0
	42-79	TEXT(I) (I=1,38)	38A1	Text (terminated by $)	
	80	STAR	A1	"*" indicates last text card	
PLT-5	1-10	HT1	F10.0	Height (if different from preceding)	
	11-79	TEXT(I)	69A1	Text continued (terminated by $)	Additional text for labeling
	80	STAR	A1	"*" if last card	
PLT-6	80	STAR	A1	"*" if last card, follows PLT-3 if PLT-4 and PLT-5 are not included	This card must be included

PREVIOUS CALLS REQUIRED: BOUNDS, PUDDLE GRID, BASE, LOCATOR, SCATTER (if they are used)

REQUIRED FILE: TAPE1, TAPE2, TAPE3, TAPE4 (if they are used)

OUTPUT: Printed report
TAPE55 NASAPLOT input file

Table 14
POINT Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEE-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
		CALLS TO OTHER MODULES			
PNT-1	1-10	HDR	A10	"POINT"	
PNT-2	1-10	RINV1	F10.0	Inversion factor 1	SURFACE
	11-20	RINV2	F10.0	Inversion factor 2	1-500 m
	21-30	RINV3	F10.0	Inversion factor 3	1-3000 m
	31-40	IBOTH	A10	"DAY", day noise only; "NIGHT," night only; "BOTH," both.	
		PNT-3 is to be repeated as much as needed			
PNT-3	1	IFLAG	A1	"*" indicates last PNT-3 card	
	2-10	Name	A9	Name of location X, Y	
	11-20	X	F10.0	X-coordinates	
	21-30	Y	F10.0	Y-coordinates	

PREVIOUS CALLS REQUIRED: BOUNDS

REQUIRED FILES: TAPE8 intermediate results from FORMA

OUTPUT: Printed report

Table 15
PUDDLE GRID Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NEE-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
		CALLS TO OTHER MODULES			
PGRD-1	1-10	HDR	A10	"PUDDLE GRID"	
PGRD-2	1-10	RINV1	F10.0	Inversion factor 1	SURFACE
	11-20	RINV2	F10.0	Inversion factor 2	1-500 m
	21-30	RINV3	F10.0	Inversion factor 3	1-3000 m
	31-40	GRDSZ	F10.0	Grid size in meters or feet	
	41-50	IBOTH	A10	"DAY," day noise only; "NIGHT," night only; "BOTH," both	
	51-60	GRDNAME	A10	Name to be assigned to TAPE1 PUDDLE GRID	

PREVIOUS CALLS REQUIRED: BOUNDS

REQUIRED FILES: TAPE8 intermediate results from FORMA

OUTPUT: Printed report

TAPE1 PHS2 input to NASAPLOT to be processed by PLOT routine

Table 16
SCATTER Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NET-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
	CALLS TO OTHER MODULES				
SCT-1	1-7	IHDR	A10	"SCATTER"	
SCT-2	1-4	IK(X) (X=1,4)	4A1	Combination (in any order) of the letters "T" = SCATTER information collected for *targets* "F" = SCATTER information collected for *firing points* "B", "D", "N" = *both day and night data, day only, night only*, respectively "G" = only specified gun types (from columns 5-60)	Default = "TFB"
	5-6	IDGUN(1)	A2	If "G" selected, these are the specified gun types	There should be no blank fields interspersed among IDs as scanning stops at first blank field encountered
	7-8	IDGUN(2)	A2		
	9-10	IDGUN(3)	A2		
	59-60	IDGUN(28)	A2		
	61-70	FACT	F10.0	Multiplier = SCATTER points will be multiplied by the factor before dividing by days	1
	71-80	SD	F10.0	Standard deviation (meters/feet)	(300.)
SCT-3	1-10	DAYS	F10.0	Number of days in data base	1

PREVIOUS CALLS REQUIRED: BOUNDS

OUTPUT: Printed report
TAPE4: PHS4 input to NASAPLOT, input to PLOT routine

Table 17
STOP Input Summary

CARD INPUT:

Card ID	Columns	Variable Name	Format	Description	Comments/Defaults
NET-1	1-6	IMETER	A10	Distance Units "METERS"/"FEET"	
	CALLS TO OTHER MODULES				
STP-1	1-4	IHDR	A10	"STOP"	Closes NASAPLOT input file

PREVIOUS CALLS REQUIRED: All modules for given USER'S RUN

REQUIRED FILES: None

OUTPUT: Printed report
TAPE55 = input to NASAPLOT

Table 18
Temperature Inversion Factors

Location	Surface	1-500 m	1-3000 m	Location	Surface	1-500 m	1-3000 m
Albany, NY	45.1	20.1	45.0	Little Rock, AR	64.0	13.4	29.8
Albuquerque, NM	71.9	6.0	11.4	Medford, OR	76.7	5.1	13.9
Amarillo, TX	73.2	14.2	21.9	Miami, FL	60.6	6.7	24.3
Anchorage, AK	55.2	13.3	25.1	Midland, TX	65.8	15.5	27.9
Annetle, AK	30.9	3.0	26.2	Montgomery, AL	66.5	12.1	27.0
Athens, GA	70.1	13.3	23.5	Nantucket, MA	46.6	18.3	46.5
Barter Island, AK	48.1	34.3	48.7	Nashville, TN	66.0	10.5	27.8
Bismark, ND	64.3	18.0	32.0	New York, NY	27.8	22.0	56.8
Boise, ID	79.7	4.5	8.5	Nome, AK	65.7	8.4	26.2
Brownsville, TX	61.0	9.5	30.4	North Platte, NE	65.7	16.5	29.9
Buffalo, NY	44.9	10.5	39.4	Oakland, CA	43.4	21.3	49.0
Burwood, LA	17.1	5.6	28.9	Oklahoma City, OK	63.4	17.0	30.9
Cape Hatheras, NC	44.7	9.8	36.6	Omaha, NB	64.1	19.6	32.6
Caribou, ME	44.2	20.6	45.6	Peoria, IL	68.2	14.4	27.6
Charleston, SC	69.7	14.2	23.0	Pittsburgh, PA	58.2	10.5	32.9
Columbus, MO	65.2	14.5	29.2	Point Barrow, AK	46.7	34.3	49.9
Dayton, OH	60.7	11.6	29.6	Portland, ME	55.0	17.6	36.6
Denver, CO	82.8	4.3	12.3	Rapid City, SD	74.8	7.7	19.3
Dodge City, KS	72.6	15.4	24.1	St. Cloud, MN	55.3	21.4	39.9
El Paso, TX	65.6	4.7	14.1	Salem, OR	63.6	7.3	22.3
Ely, NV	91.6	.6	2.8	Salt Lake City, UT	83.4	3.7	6.4
Fairbanks, AK	71.5	6.8	17.6	San Antonio, TX	34.6	14.0	51.1
Flint, MI	53.2	15.2	36.5	San Diego, CA	47.3	26.8	50.0
Fort Worth, TX	45.8	25.0	48.0	San Juan, PR	44.7	1.3	24.5
Glasgow, MT	73.9	10.9	20.1	Santa Monica, CA	42.2	26.6	53.0
Grand Junction, CO	84.0	1.3	3.7	Sault Sainte Marie, MI	53.9	15.4	36.5
Great Falls, WI	59.0	13.7	33.6	Seattle, WA	52.2	5.2	25.0
Green Bay, WI	59.0	13.7	33.6	Shreveport, LA	55.9	17.5	36.0
Greensboro, NC	65.9	12.4	25.1	Spokane, WA	70.0	14.1	19.0
Hilo, HI	85.1	.3	8.1	Tampa, FL	67.7	7.6	18.0
Huntington, WV	60.0	7.3	30.6	Tatoosh Island, WA	23.1	12.1	43.7
International Falls, MN	59.6	14.4	33.7	Topeka, KS	53.5	23.6	40.9
Jackson, MS	64.2	15.8	29.8	Tucson, AR	89.6	1.4	4.0
Jacksonville, FL	63.7	11.2	22.8	Wallops Island, VA	57.9	13.8	34.2
Lake Charles, LA	79.2	9.1	18.5	Washington, DC	67.0	7.7	26.9
Lander, WY	84.6	1.2	6.1	Winnemicca, NV	88.3	1.5	3.7
Las Vegas, NV	84.2	1.1	5.8	Winslow, AR	88.0	2.1	4.9
Lihue, HI	24.0	.1	62.6	Yukatat, AK	57.1	2.1	14.8

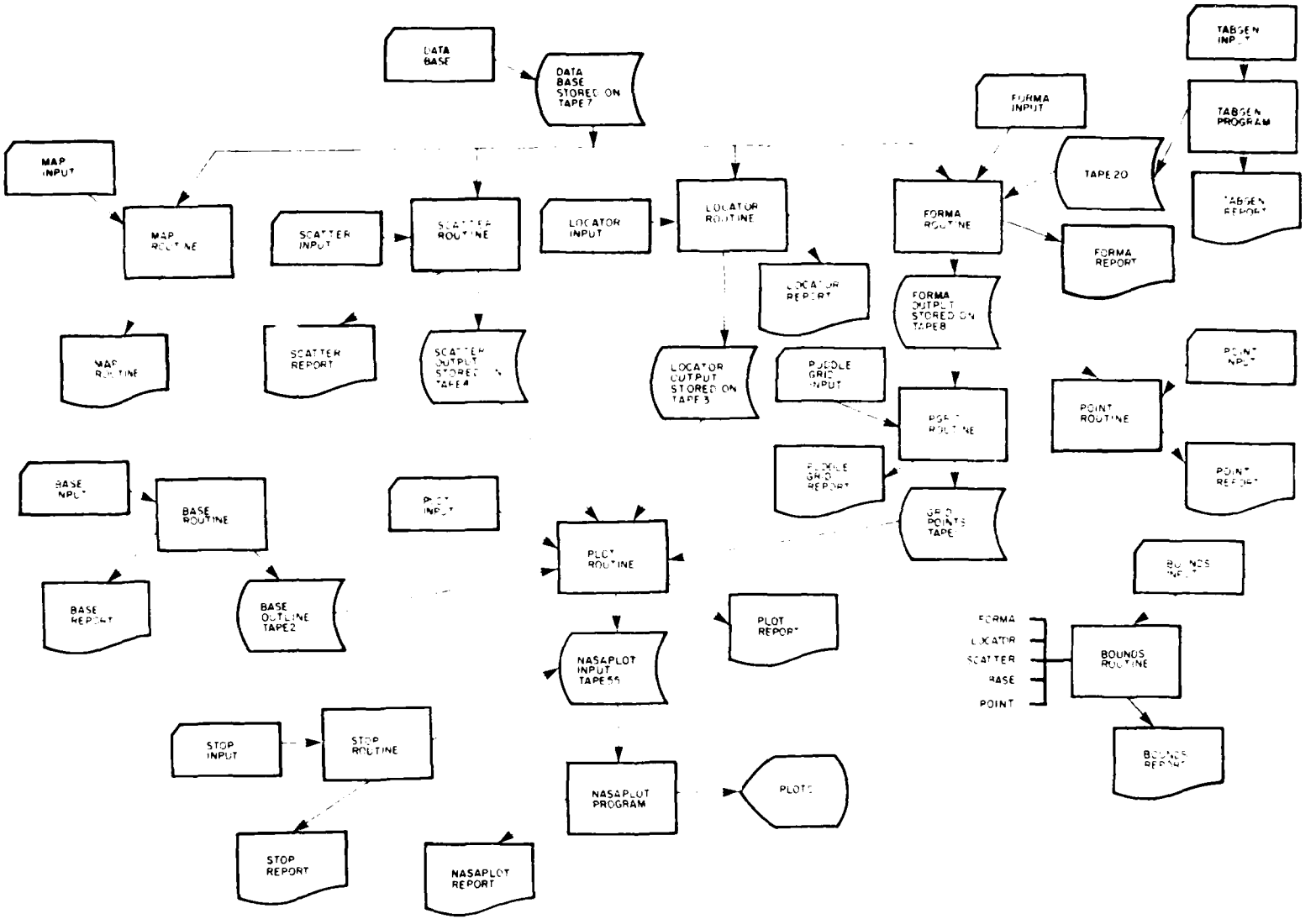

Figure 1. System flowchart.

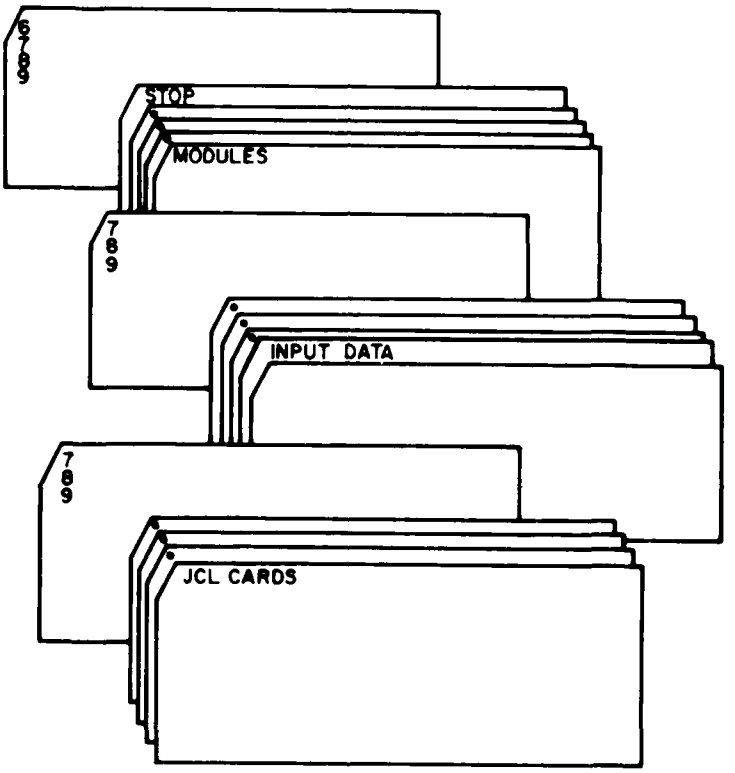

Figure 2 Order of sections within the deck

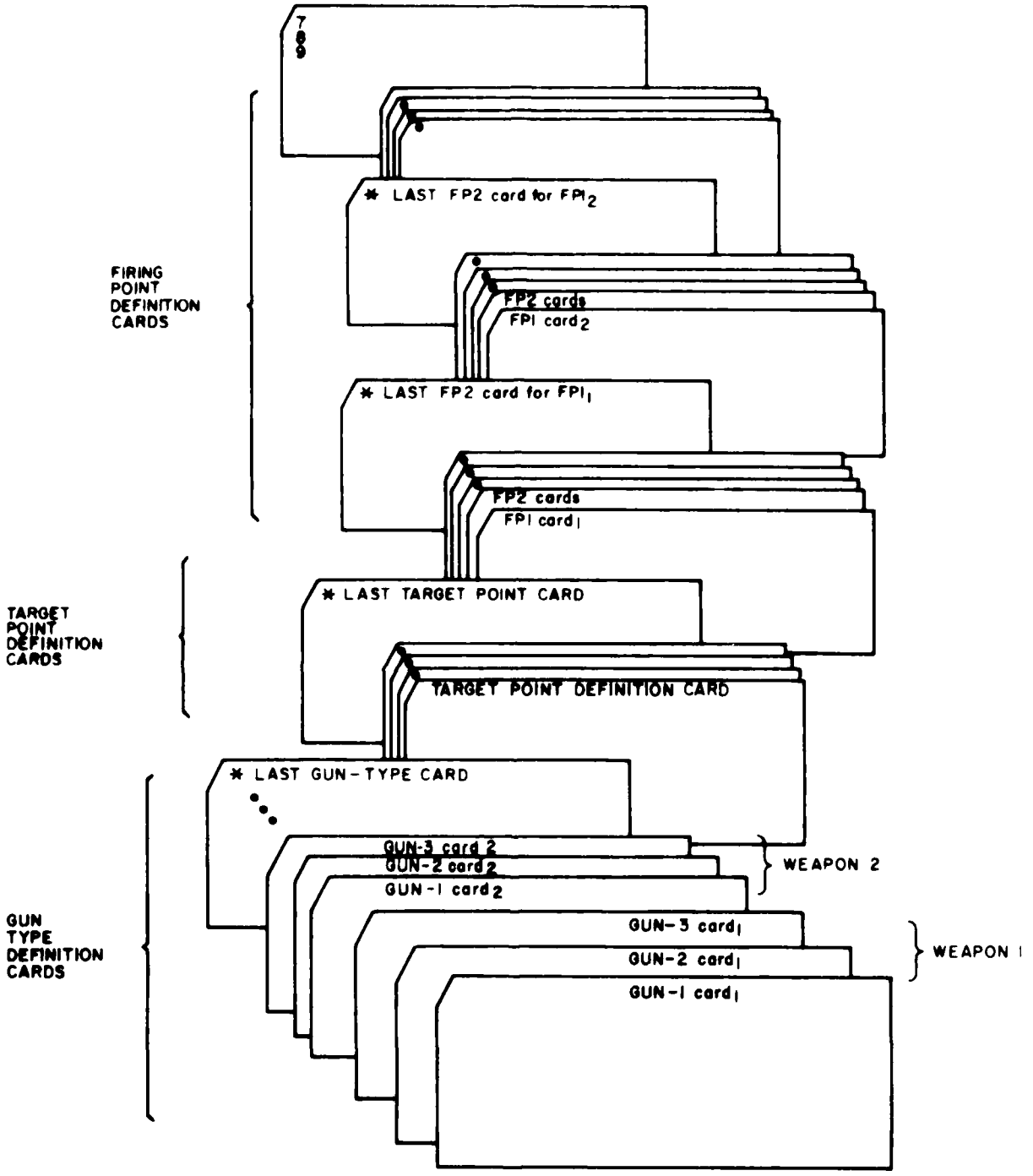

Figure 3. General composition of input data of the user's deck.

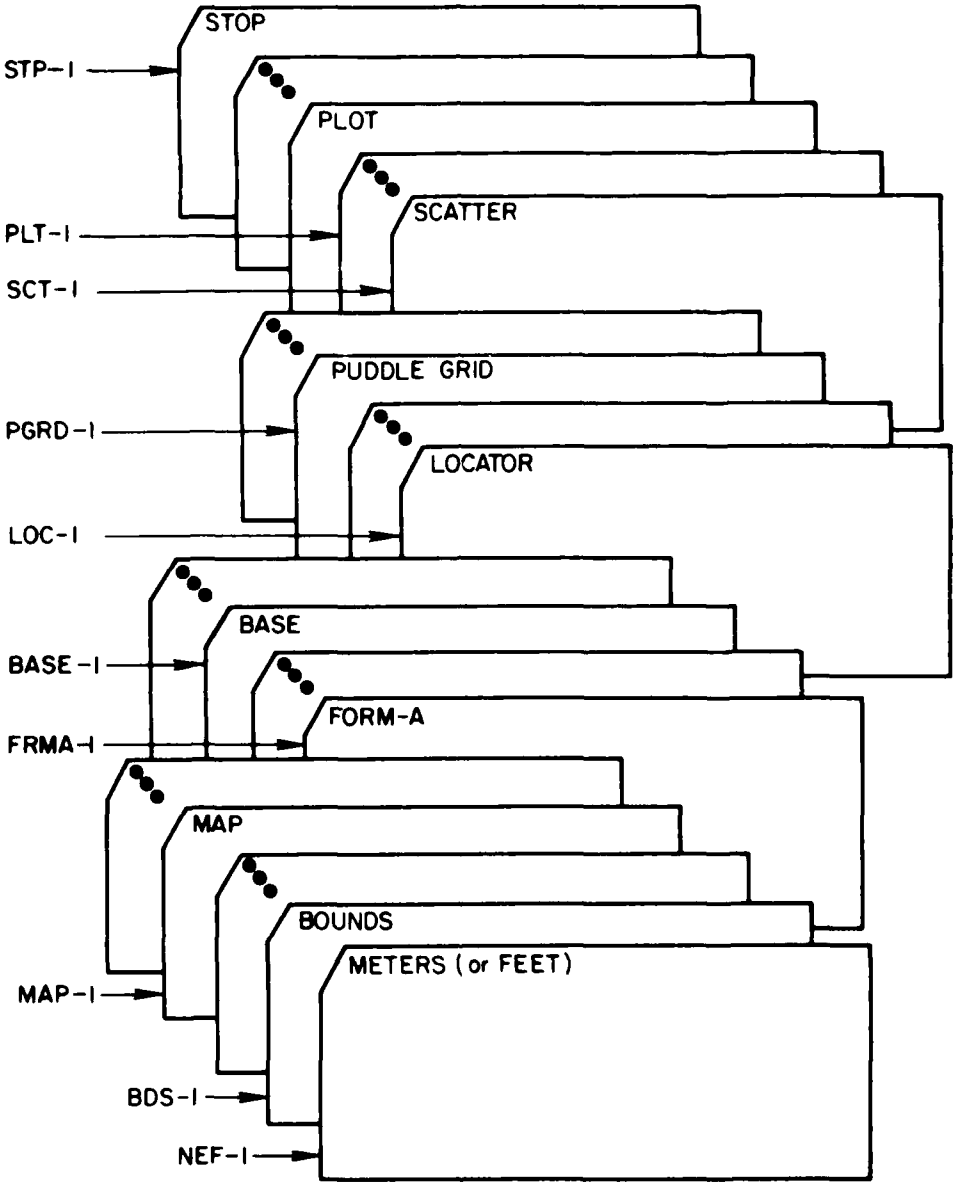

Figure 4. Sample composition of module.

3 PROGRAM AND SUBPROGRAM DESCRIPTIONS

This chapter describes the Fortran routines used by the Blast Noise Prediction program. The control program (CDNL) is described first, followed by descriptions of the subroutines and functions in alphabetical order. Flowcharts are included for some of the routines. Table 19 lists the common blocks used by the Blast Noise Prediction program.

The Blast Noise Prediction program uses a number of standard Fortran functions as well as the CDC routines:

ENCODE - memory-to-memory I/O

SECOND -- CPU time

EOF -- end of file test

EXIT -- program termination

DATE -- get date

TIME -- time of day

GETJN -- get job name

Any subprogram references are noted in the "subprograms/routines called" entries in the following sections.

Program CDNL

CDNL is the control program for the Blast Noise Prediction program. It calls the appropriate subroutines to perform the function(s) requested by the user.

Input: "NEF-1" card; module instruction cards.

Function/method: CDNL does program initialization, establishes certain program-wide default values, and sets the distance units (meters or feet) to be used for the execution according to the user's first input card (NEF-1). This should be followed by the first module call card. If this contains a valid module call -- MAP, FORMA, BASE, and so on -- CDNL branches to the corresponding calling sequence. Following execution of the requested module, control returns to CDNL which then processes the next module call card.

Subprograms/routines called: BASE, BOUNDS, FORMA, LOCATR, MAP, PGRID, PLOT, POINT, SCATTR, STOPP; CDC routine EOF.

Output: printed report.

Error diagnostic: "INVALID MODULE NAME". Read a module card and could not find it as an acceptable module name. Program halts.

Flowchart: Figure 5.

Subroutine BASE

Input: module instruction cards.

Function/method: creates the outline of the installation or region the user is working with on the PLOT output by drawing line segments from (X,Y) coordinate to (X,Y) coordinate of the specified region. The coordinates are read one at a time and checked for validity to ensure that they are within the boundaries specified in the BOUNDS module. The first (X,Y) coordinate is read and temporarily saved until the second (X,Y) coordinate is read and saved, at which time both coordinates are output to the NASAPLOT file as a pair of endpoints for a line segment. This pair of endpoints is also listed in the printed report to help the user verify that his input data are producing the intended output. The

next (X,Y) coordinate is then read and saved, and the second pair of endpoints is output to the NASAPLOT file and the printed report. This continues as long as the user requests a continuous line. When a break occurs (indicated by a "*" in column 21 -- see Table 8), two new coordinates are read, and the pairing starts again.

Subprograms/routines called: Fortran function SIGN, CDC routines EOF, SECOND.

Output: TAPE2 (NASAPLOT, PHS4, line cards), printed report.

Error diagnostics:

1. "***NEXT CARD NOT WITHIN BOUNDARIES***" indicates an X or Y coordinate of a line segment instruction in BASE extends beyond the minimum or maximum values specified in BOUNDS.

2. "ERROR - NO EOF CARD (* IN CC 21)
JOB ABORTED" indicates that the user forgot to include a BASE-3 card with a "*" in column 21 to indicate that the input for the BASE module has been completed.

3. "***DUE TO BOUNDARY ERRORS NO OUTPUT***
TAPE WAS CREATED THIS RUN" indicates that a type 1 or 2 error has occurred. The BASE module will have no output that can be used by the rest of the program.

Subroutine BOUNDS

Input: module instruction cards.

Function/method: sets the limits of the system in terms of map coordinates ("system" refers to the total area encompassed for CDNL calculations and for creation of the PLOT. It is used to define the overall area of interest), tests for valid coordinates and terminates execution if they are not found.

Subprogram/routines called: CDC routines EOF, SECOND.

Output: printed report.

Error diagnostics:

1. "*INCORRECT BOUNDARIES*
NO BOUNDS SET" indicates a mistake in specifying the boundaries -- the maximum values are less than the minimum ones.

2. "*ERROR -- MISSING INPUT CARD, JOB ABORTED*" indicates that a BOUNDS card is missing, the module has not been supplied all of its data.

Subroutine BDSET

This routine is used to set the BOUNDS. It calls Fortran routines ABS, INT. There is no error diagnostic.

Subroutine CALCNR (X,Y)

CALCNR calculates the CDNL value at a grid point (X,Y). It is used by the PGRID routine. For theoretical background, see CERL TR E-17 *Predicting Community Response to Blast Noise* and Volume I.

Input: TAPE8, via COMMON.

Function/method: the calculations proceed in the manner outlined in Chapter 5 involving the equations presented there. The CDNL value has the name CNR in the program. The height and weight factors are calculated in FORMA and found as SDBWH from TAPE8.

Subprograms/routines called: Fortran functions ALOG10, SQRT, ATAN2, IFIX.

Output: CDNL value for point specified.

Error diagnostics:

1. If both day and night cumulative noise sum = 0, CNR set to -99.0.
2. If (X,Y) is closer than 100 m to a noise source, it is limited to 100 m.
3. If (X,Y) is further away than 100 000 m, it is limited to 100 000 m.

Flowchart: Figure 6

Subroutine CFOUR

Calculates the C-weighted noise level for an explosion in the air. Calls Fortran function ALOG10. There is no error diagnostic.

Subroutine FORMA

FORMA tabulates the target and firing point information from the data base (TAPE7) in the form required by PUDDLE GRID.

Input: module instruction cards, TAPE7 (data base).

Function/method: the data base consists of an ID number and location for each target, and location coordinates for each firing point followed by the definition cards for all the noise sources at that site. These cards give (1) the gun type, (2) number of day and night firings, (3) maximum and minimum charge zones, (4) target ID or an indication that the source is omnidirectional, (5) an indication of whether the noise is produced at the target, and (6) how high or low the explosion is at the target.

For each data entry, FORMA calculates the sine (ANGSIN) and cosine (ANGCOS) of the noise direction, using value 999.0 to flag omnidirectional sources (including targets). It also calculates the decibel charge correction factors for TNT weight (DBWT) and height (DBHT). The last two are combined in array SDBWH. From this information, FORMA compiles a table with an entry for each given noise source, i.e., each given firing-point-target/height charge or target-charge combination (a target also being a source of omnidirectional noise when hit). For each entry, FORMA accumulates the number of day and night firings with that charge from (firing point) or toward (target point) that location. Charge is expressed in equivalent weight of TNT derived from the gun type and maximum and minimum charge zones, using the averaging techniques specified by the user.

The array CHARGE contains the equivalent TNT weights, one column is allowed per gun type, with rows corresponding to charge zones. Depending on the technique specified, the charge figure used in calculations may be the weight corresponding to the maximum charge zone (MAX), the weight corresponding to the average of maximum and minimum zones rounded to the next highest integer (AVE), or may be the average of the two weights corresponding to maximum and minimum charge zones (CAVE).

A header record of basic information (number of unique noise sources, number of days of data in the data base, coordinates of grid origin) is written to TAPE8, followed by the arrays:

XLOC	= X coordinates of sources
YLOC	= Y coordinates
SDBWH	= weight and height correction factors
ANGSIN	= sines of noise direction
ANGCOS	= cosines of noise direction
DAYNO	= number of day firings
DARKNO	= number of night firings

Subprograms/routines called: READTB, CFOUR; Fortran functions ALOG10, SQRT, ABS, MAXO, IABS, AMINI; CDC routines EXIT, SECOND, EOF.

Output: printed report, TAPE8.

Error diagnostics:

1. "...WARNING GUN IS POINTING AT SELF. LOCATION _____" indicates that the firing and target points have been defined to be the same spot at the specified location. Not the proper way to code a demolition.

2. "...ERROR... ALL SOURCES ARE TARGETS NUMBER OF SOURCES COUNTED ARE ____" indicates that no firing points have been specified. The user/programmer can have all firing points if all rounds are demolitions without targets, but not the other way around. If there are no target point cards, a blank card with an "*" is still required to indicate the end of the target data.

3. "...ERROR...NUMBER OF SOURCES WILL EXCEED SPACE NUMBER OF SOURCES NOW IS ____" indicates that too much data have been provided. Current limit is 2000 unique noise types.

4. "...ERROR... UNDEFINED TARGET ID FOR FIRING PT ____" indicates that a firing point is shown to have a target point which has not been defined in the target-point definition cards. Often caused by typing error or table overflow.

5. "...ERROR...UNDEFINED GUN ID, FOR FIRING PT ____" indicates that a firing point is shown to have a gun code which has not been defined in the gun-type cards. Could be caused by a typing error.

6. "...ERROR...EOF ENCOUNTERED WHILE PROCESSING GUN TYPE TABLE DATA" indicates that a "789", signaling end of input, has been found in the middle of the gun-type cards.

7. "...ERROR...GUN TYPES EXCEED TABLE LIMIT" indicates that too much data have been input. Current limit is 50.

8. "...ERROR...BLANK TARGET ID, OMNI FLAG NOT SET FOR SOURCE AT FIRING POINT ____" indicates that the demolition flag for a firing point has not been set and that no target has been specified for it. One of the preceding **must** be included.

Flowchart: Figure 7.

Subroutine LOCATR

Input: module instruction cards, TAPE7.

Function/method: labels target and firing points on the plot.

Subprograms/routines called: CDC routines EOF, SECOND.

Output: printed report, TAPE3 (PHS3 text cards).

Error diagnostic:

"*PREMATURE EOF ON DATA BASE FILE* *TAPE 3 NOT CREATED*" indicates that a "789" has been encountered in the wrong place.

Subroutine MAP

This routine is a checker for the data base.

Input: module instruction cards, TAPE7 (data base).

Function/method:

1. Reads and optionally prints target card images from TAPE7, checking for maximum and minimum coordinate values.

2 Reads and optionally prints firing point location and definition card images, continuing search for maximum and minimum coordinate values, and checking that target IDs are valid (i.e., previously encountered in No. 1 above)

3 Builds cross-reference tables and prints basic statistics.

4 If user inputs trial grid sizes, calculates size in grid units

Subprograms/routines called PUTXR, Fortran functions, ABS, MINO, CDC routines EOF, SECOND, SHIFT

Output printed report. Note: MAP will print a series of stars ("*****") if a number exceeds output format, but is within the limit of the input format.

Error diagnostics

1 "ERROR--EOF ENCOUNTERED WHILE READING TARGET CARDS" indicates that a "789", signaling end of input data, has been found in the middle of the target-point cards.

2 "ERROR--SOURCE DEFINITION CARDS ENDS IMPROPERLY (WITH A EOF)..." indicates that a "789" was encountered at the end of a set of definition cards instead of a star (*) to indicate the last of such cards

3 "ERROR--UNDEFINED TARGET ID" indicates that a target-point name entered on a firing-point card had no equivalent defining data in the target cards.

4 "ERROR--GUN TYPES EXCEED TABLE LIMIT IN MAP; ONLY FIRST x TYPES USED FOR SUBSEQUENT CROSS-CHECKING" indicates that not enough space is allowed for all cross-reference checking and that there are too many gun-type cards.

5 "ERROR--UNDEFINED GUN ID" indicates that a gun code entered on a firing-point card had no equivalent defining data among the gun-type cards. Often caused by typing errors or table overflow

6 "ERROR--BLANK TARGET ID, HIT FLAG NOT SET. FIRING PT. __" indicates that the demolition flag for a firing point has not been set and that no target has been specified for it. One of the preceding **must** be included

7 "ERROR"--EOF ENCOUNTERED WHILE READING GUN TYPE DEFINITION CARDS" indicates that an error was encountered while reading the gun-type cards instead of at the end of the data set

8 "ERROR--NO POSITIVE CHARGE FOR GUN TYPE x" indicates that a gun with code x has been defined with all zero or negative charge sizes. Improper definition.

9 "ERROR--x NEG. CHARGES ENCOUNTERED" indicates that x number of negative charge sizes were found among the gun-type cards

10 "WARNING--x CHARGES LARGER THAN ___ LBS" indicates that x number of charge sizes were greater than a given size. Currently the message is for 50 lb (23 kg).

11 "ERROR--DUPLICATE ID; FIRST OCCURRENCE USED FOR TABLE" indicates that the same firing point ID occurs in two (or more) places in the input data. Information from only the first appearance is used by MAP in the cross-reference tables. In this case, a new ID (such as "jj") will be generated and used in the cross-reference table for this firing point.

12 "WARNING--EXTRANEOUS DATA STARTING IN CARD COL., x,, CHECK ALL FIELDS" indicates that characters for this definition card are found in columns where they are not supposed to occur. This error is sometimes caused by an overturned card or a missing FP1 card. This message can be suppressed

13 "ERROR--HEIGHT CORRECTION DATA OUT OF RANGE" indicates that the specified height correction factor is too big. Sometimes caused by typing the height correction factor in the wrong column, causing a shift in the decimal point.

14 "WARNING--DUP-POINT IDENTICAL COORDINATES" indicates that the same point has occurred a second time in the input data. Caused by different IDs for the same coordinates.

15. "ERROR--TARGETS EXCEED TABLE LIMIT IN MAP, ONLY FIRST x USED FOR SUBSEQUENT CROSS-CHECKING" indicates too much input data; only the first x is allowed in the table.

16. "ERROR--FIRINGS DATA NEGATIVE OR BOTH ZERO ON DEF CARD FOR FIRING POINT x" indicates that no rounds or negative number of rounds have been specified for the amount fired per day and night for firing point x. Caused by blanks in both the day and night columns on a FP2 card, or entry of a negative number.

17. "ERROR--INVALID CHARGE NO., NONPOSITIVE OR NO GUN TABLE ENTRY, DEF CARD FOR FIRING PT."x indicates that a gun for firing point x has been improperly defined with a negative or zero charge size for the specified range, or that the charge range is wrong for the specified gun type.

18. "WARNING--LARGE HEIGHT IN DEF CARD FOR FIRING POINT x" indicates that the specified height correction factor is very big. User should check accuracy of input data.

19. "ERROR--FIRING POINTS EXCEED TABLE LIMIT IN MAP; ONLY FIRST x USED FOR SUBSEQUENT CROSS-CHECKING" indicates that too much input data are given. Current limit is x.

20. "WARNING--DUE TO PREVIOUS TABLE OVERFLOW, THE FOLLOWING CROSS-REFERENCE TABLE IS INCOMPLETE" indicates that one set of definition cards was too big, so MAP used only part of it in making the given table.

21. "ERROR--DUPLICATE ID, COORDINATES; DEF CARDS CHECKED FOR ERRORS, BUT OTHERWISE IGNORED" indicates that the same firing point has been specified more than once. MAP ignores data for uses in cross-reference tables, but checks data for validity.

22. "ERROR--DUPLICATE ID, DIFFERENT COORDINATES; TREATED AS SEPARATE ENTRY" indicates that the same firing-point ID is defined with different coordinates and is considered as two points. A new firing point ID (such as "j*") has been created and will be used in the cross-reference tables.

23. "ERROR--NONPOSITIVE CHARGE NOS. ENCOUNTERED FOR FIRING PT.__" indicates that the specified charge ranges are negative.

24. "ERROR--NONPOSITIVE TARGET CHARGE IN TABLE FOR GUN x; DEF CARD FOR FIRING POINT y" indicates that the projectile charge size for a given gun x specified for a firing point y is negative or zero.

25. "ERROR--MISSING DATA BASE FILE; EXECUTION ABORTED" indicates that a USER'S RUN program was created without an input data section being provided.

Subroutine PGRID

This routine outputs a rectangular printed grid of CDNL values as specified by the user in BOUNDS.

Input - module instruction cards, TAPE8 (read in by READIN), TAPE20 (read in by READTB).

Function/method

1. Reads from the module instruction cards the grid size, percent inversion values, choice of day or night calculations, or sets the defaults. Outputs the values read in and the limits of the grid area as set by BOUNDS.

2. Superimposes a grid on the specified area by dividing it into squares according to the size specified by GRIDSIZE.

3. CALCNR is called for each integral grid point within the specified area. The CDNL values are printed out in matrix form and output to TAPE1 for use by PLOT.

Subprograms/routines called - READIN, CALCNR, BDSET, READTB; Fortran functions AMOD, MOD; CDC routines EOF, SECOND.

Output - printed report, TAPE1

Error diagnostics

1. "***WARNING SPECIFIED BOUNDS x,y, x,y DO NOT CORRESPOND TO INTEGRAL GRID BOUNDS. MODIFIED BOUNDS WILL BE USED TO PRODUCE THE GRID AND TO DEFINE ANY PLOT UTILIZING THIS GRID" indicates that the grid size specified by the user does not divide the bounds evenly. PUDDLE GRID extends the bounds, so grid size will divide evenly. (See PLOT errors.)

2. "***WARNING--GRID SIZE NOT MULTIPLE OF " indicates that a possible inappropriate grid size was chosen by the user.

3. "***ERROR--MISSING INPUT DIRECTIVE JOB ABORTED" indicates that one of the module cards is missing.

Subroutine PLOT

This routine combines all of the output from other modules into one tape for use by NASAPLOT.

Input - module instruction cards, TAPE1 (from PUDDLE GRID), TAPE2 (from BASE), TAPE3 (from LOCATOR), TAPE4 (from SCATTER).

Function/method

1. Reads which module output to use from instruction cards.
2. Reads plot parameters for use by NASAPLOT.
3. Reads appropriate files and outputs all to TAPE55 for use by NASAPLOT.

Subprograms/routines called - Fortran functions, ATAN, COS, SIN, SQRT; CDC routines EOF, DATE, SECOND, TIME, GETJN.

Output - printed report, plot.

Error diagnostics

1. "THE FOLLOWING FILES WERE REQUESTED BUT NOT AVAILABLE. JOB ABORTED." indicates that output from BASE, SCATTER, LOCATOR, or PUDDLE GRID was requested in the PLOT module without having been produced previously by one of these modules.

2. "WARNING - PUDDLE GRID BOUNDS DO NOT MATCH SPECIFIED BOUNDS.

PGRID VALUES USED	SPECIFIED BOUNDS
A	A2
B	B2
C	C2
D	D2

This message indicates that the user specified one set of bounds while PUDDLE GRID used some other values, usually as a result of the specified grid size. For example, if the x values of bounds were 20,000 and 43,000 and if the grid size was 2000, then the new bounds are 20,000 and 44,000 since the difference between the two must be a multiple of 2000. This error can also occur if PUDDLE GRID was saved on disk and the program later run again.

Subroutine POINT

This routine will output [illegible] CONC values at individual points as specified by the module instruction cards.

Input - Module instruction cards, Tape8 (read in by READIN), Tape20 (read in by READTB).

Function/method

1. Reads [illegible] outputs from the module instruction cards the percent inversion values, choice of day, or night calculations.

2. Reads the coordinates and names of the desired points. Reads each point as it calculates the CDNL and outputs it.

Subprograms/routines called: CALCNR, READIN, READTB; CDC routines SECOND, EOF.

Error diagnostic: none.

Subroutine READIN

This routine reads the data on TAPE8 into arrays in COMMON for use by other modules.

Input: TAPE8.

Subprograms/routines called: none.

Error diagnostic: none.

Subroutine READTB

Input: TAPE20.

Function/method: reads TAPE20 (TABGEN) tables; corrects it to new inversion factors.

Subprograms/routines called: Fortran function ALOG; CDC routine EOF.

Error diagnostic: none.

Subroutine SCATTR

Input: module instruction cards, TAPE7 (data base).

Function/method: this routine will write text cards out to tape so that the PLOT routine can plot them out as a scattergram. There will be one dot for each noise source that occurs per day for the data which are allowed by the specification cards. The dots of the scattergram will have a normal distribution with a standard deviation equal to the distribution value (found on specification card). The center of the normal distribution will be at the target or firing point location. No dots will be allowed outside of the limits established by the routine BOUNDS.

Subprograms/routines called: SCATPL; Fortran function SQRT, FLOAT; CDC routines EOF, SECOND.

Output: printed report, TAPE4.

Error diagnostics:

1. "***ERROR--TARGET TABLE OVERFLOW. EXECUTION ABORTED" indicates too much input data. Current limit is.

2. "***ERROR--ERROR IN DATA BASE. UNDEFINED TARGET ID--, EXECUTION ABORTED" indicates that a target point ID is given with no following defining information.

3. "***WARNING--EITHER TARGETS OR FIRING PTS MUST BE REQUESTED; EXECUTION CONTINUES WITH DEFAULT = BOTH"

4. "***ERROR--PREMATURE EOF ON TAPE 7, EXECUTION ABORTED" indicates that a "789" specification is encountered in the wrong spot.

5. "***ERROR-GUN OPTION SELECTED BUT NO GUN TYPES SPECIFIED. EXECUTION ABORTED"

Subroutine SCATPL

Generates the scattergram dots.

Subprogram/routines called: CDC routine RAND.

Output: TAPE4.

Error diagnostic

1 "***WARNING--GENERATED SCATTER POINT FOR LOCATION X, Y OUT OF BOUNDS AFTER N TRIES PT IGNORED." The computer could not generate a scatter point for location X, Y without it going outside of the limits set by BOUNDS. The point has not been plotted. A target or firing point may be too close to the limits set by BOUNDS.

Subroutine STOPP

Stops the program.

Subprograms/routines called none

Output Tape55, printed report

Error diagnostic none

Program TABGEN

TABGEN creates the tables of decibel values at given distances which are used in the calculation of CDNL by CALCNR. The tables are stored on TAPE20 and listed in Table 20.

Program NASAPLOT*

This section presents the control cards involved in the NASAPLOT contour program used by the Blast Noise Prediction program. It describes some of the aspects involved in the creation of the plot by computer methods. The NASAPLOT contour program operates in four distinct phases which can occur in or out of sequence. Program control can be initialized, transferred from one phase to another, and terminated by means of certain control cards. A description of these cards and their formats follow.

Job Card

cc 1

JOB Format (A4)

The JOB card must precede all data cards of a job. It is the initialization card for each job.

PHS1 Card

cc 1

PHS1 Format (A4)

The PHS1 card transfers control to Phase 1 of the program. Phase 1 introduces dimensions of the plot size, requests for a new plot page, angles of skew and rotation, map size, scale and position of origin, map scale factor, and parallax parameters. Phase 1 control cards are as follows:

CSYS Card

cc 1	7 14	15 22	
CSYS	SKEW	ROTATE	Format (A4,2X,2G8.3)

where

SKEW (col 7-14) is the rotation of the Y-axis in degrees; default angle is 0^{0}

* Source: National Aeronautics and Space Administration (NASA) Langley Research Center, Hampton, VA.

ROTATE (col 15-22) is the rotation of the X-axis in degrees; default angle is 0°.

The CSYS card allows the user to use and specify a skewed and/or rotated coordinate system for the data control point. SKEW is the angle of skew, measured clockwise, and ROTATE is the angle of rotation measured counterclockwise, as illustrated in Figure 8. The shaded area in Figure 8 corresponds to values of X between XMIN and XMAX, and values of Y between YMIN and YMAX. The point (X,Y) will be plotted as plotter position (XP,YP).

where

```
XP = XOR + ((X - XMIN)/SCALE + SIN(SKEW) * (Y - YMIN)/
     YSCALE) * COS(ROTATE) - ((COS(SKEW) * (Y - YMIN)/
     YSCALE) * SIN(ROTATE)

YP = YOR + ((X - XMIN)/XSCALE + SIN(SKEW) * (Y - YMIN)/
     YSCALE) * SIN(ROTATE) - ((COS(SKEW) * (Y - YMIN)/
     YSCALE * COS(ROTATE)
```

PRLX Card.

```
cc 1    4    7    14   15   22    23  30
 PRLX    XPRLX  YPRLX  ZREF
```

Format (A4,2X,3G8.3)

where:

XPRLX (col 7-14) is the offset in X direction

YPRLX (col 15-22) is the offset in Y direction

ZREF (col 23-30) is the altitude to be used as the reference plane; default value is 0°.

The PRLX card allows the user to introduce angles of parallax. This feature can be used to produce pairs of contour diagrams of the same data for stereo viewing. A stereo pair is produced by using the following procedure.

1. Use the MAPS card and the PRLX card for the first stereo view
2. Plot the first view by means of the PLOT card
3. If the two views are not to overlap, but are to be plotted side by side, use the MAPS card again to move the second view to a different position on the plotter page
4. Use the PRLX card for the second view
5. Use the PLOT card to plot the second view.

MAPS Card.

Format (A4,2X,8G8.3)

```
cc 1      7       15      23      31      39      47      55      63
 MAPS   XSCALE  YSCALE  XMIN    XMAX    YMIN    YMAX    XOR     YOR
```

where

XSCALE (col 7-14) is the scale factor in the X direction; default value is 1.0 units per inch of plot

YSCALE (col 15-22) is the scale factor in the Y direction, default value is 1.0 units per inch of plot

XMIN (col 23-30) is the minimum X value to be plotted

XMAX (col 31-38) the maximum X value to be plotted

YMIN (col 39-46) the minimum Y value to be plotted

YMAX (col 47-54) is the maximum Y value to be plotted

XOR (col 55-62) is the position on the plotter of the X origin, default value is 0.0 in.

YOR (col 63-70) is the position on the plotter of the Y origin; default value is 0.0

The MAPS card allows the user to specify the map size, map scale factor, and map origin parameters. The map will be determined for values of X between XMIN and XMAX and values of Y between YMIN and YMAX. The user may select the position on the plotter, (XOR,YOR), to which the point (XMIN,YMIN) will correspond.

SCLE Card

cc 1 7

SCLE PSCALE Format (A4,2X,G8.3)

where:

PSCALE (col 7-14) is the plotter scale factor; default value is 1.0.

The SCLE card allows the user to specify a scale factor, PSCALE, by which the map scale is multiplied before plotting. This scale factor is often used (in addition to XSCALE and YSCALE) to produce intermediate smaller size versions of a map, for consideration before a final full-scale version is attempted. The introduction of this scale factor does not change the position (XOR,YOR) on the plotter to which the point (XMIN,YMIN) will correspond.

DIMT Card

cc 1 7 15

DIMT XTABLE YTABLE Format (A4,2X,2G8.3)

where:

XTABLE (col 7-14) is the plot length in X direction in inches

YTABLE (col 15-22) is the plot length in Y direction in inches.

The DIMT card introduces plot size parameters, and can be used only once per job.

PAGE Card

cc 1

PAGE Format (A4)

The PAGE card allows the user to split the map into matching sections and to plot each section on a separate plotter page.

PHS2 Card

cc 1

PHS2 Format (A4)

The PHS2 card transfers control to Phase 2 of the program. Phase 2 accepts control points and computes the grid. Input unit, format, order for control points to be read, and grid mesh point insertion values are introduced. Phase 2 control cards are as follows:

CNPT Card. Format (A4, 2X, I3, 4I2, 5A10)

For control points being read from tape:

cc 1	7	10	12	14
CNPT	IPT	IX	IY	IZ

For control points being read from cards:

cc 1	7	10	12	14	16	18	67
CNPT	IPT	IX	IY	IZ	IL	KFMT	

where:

IPT	(col 7-9)	is the logical input device number (right justified)
IX	(col 10-11)	is the position of X values; normally 1 (right justified)
IY	(col 12-13)	is the position of Y values; normally 2 (right justified)
IZ	(col 14-15)	is the position of Z values; normally 3 (right justified)
IL	(col 16-17)	is the position of the end file flag; normally 4 (right justified); a value greater than or equal to .0001 terminates input
KFMT	(col 18-67)	is the format for the data to be read; it must include the parentheses.

The CNPT card allows the user to specify the format and the order of the X, Y, and Z coordinates of control points, as well as the input device used. NOTE: If control points are to be read from a RECIN tape, the data must be requested as TAPE9 on the tape request card. Input is terminated by an EOF on TAPE9.

GRID Card.

cc 1	7	15	23	
GRID	NROWS	MCOLS	NGH	Format (A4,2X,2I8,I3)

where

NROWS	(col 7-14)	is the number of rows (maximum 99, right justified)

MCOLS (col 15-22) is the number of columns (maximum 99, right justified)

NGH (col 23-25) is the number of neighboring points to use in determining the values at the grid points (maximum 10, right justified)

The GRID card causes a rectangular grid (parallelograms, if the coordinates are skewed) to be defined. NROWS and MCOLS are specified by the user -- there are NROWS times MCOLS grid cells, and (NROWS + 1) times (MCOLS + 1) mesh points in the grid. The grid mesh point values can be determined from control point input data, in which case NGH (on the GRID card) is used to specify the number of nearest control point neighbors to be used in calculating each grid mesh point value.

GRDI Card

cc 1	7	15	23	
GRDI	KROW	KCOL	VAL	Format (A4,2X,2I8,G8.3)

where

KROW (col 7-14) is the row requested (right justified)

KCOL (col 15-22) is the column requested (right justified)

VAL (col 23-30) is the value to be inserted.

The GRDI card is used to insert a value at a grid mesh point. The GRDI card must be used first to define the grid (the value of NGH is irrelevant in this case, and should be left blank), and then the GRDI cards may follow. NOTE: A combination of computed and inserted values at the grid mesh points is also allowed, in which case inserted values take precedence over computed values.

CPST Card

cc 1	7	15	23	25	
CPST	HCEN	HNUM	ND	IC	Format (A4,2X,2G8.3,2I2)

where

HCEN (col 7-14) is the height of the center mark

HNUM (col 15-22) is the height of the numbers

ND (col 23-24) is the number of digits (right justified)

IC (col 25-26) = 0 for center marks only
1 for center marks and numbers (right justified)

The CPST card allows the user to cause control points and altitudes to be posted on the map. Either the center marks (+) may be posted alone, or both the center marks and the values may be posted. The size of the center marks and the height of the numbers can both be selected by the user. NOTE: The CPST card must follow the GRID card.

GPST Card

cc 1	7	15	23	25	
GPST	HCEN	HNUM	ND	IC	Format (A4,2X,2G8.3,2I2)

where:

HCEN (col 7-14)	is the height of the center mark
HNUM (col 15-22)	is the height of the numbers
ND (col 23-24)	is the number of digits (right justified)
IC (col 25-26)	= 0 for the center marks only = 1 for center marks and numbers (right justified).

The GPST card allows the user to cause the grid mesh point values to be posted on the map. Either the center marks (+) may be posted alone, or both the center marks and the values may be posted. The size of the center marks and the height of the numbers can both be selected by the user. NOTE: The GPST card must follow the GRID card.

PHS3 Card

cc 1

PHS3 Format (A4)

The PHS3 card transfers control to Phase 3 of the program. Phase 3 plots contour lines and performs masking. Phase 3 control cards are as follows:

MASK Card

cc 1 7

MASK NPTS Format (A4,2X,I8)

where:

NPTS (col 7-14) is the number of points used to define the mask boundary.

The MASK card, used in conjunction with the MSKB card, allows the user to mask out areas within the rectangular boundary of the plot where contours are not to be plotted. This feature can be used to blank out portions of the map where the data are inaccurate or incomplete or to save certain areas for later contouring with different data. The boundary can define several independent regions, with or without holes, by choosing a boundary path appropriately. The boundary path can consist of line segments alone which the boundary path traverses in both directions. Figure 9 is an example of a boundary defining two independent regions, one of which contains a hole. The contours will be plotted in the area defined by grid cells whose centers are within the masking boundary (Figure 10). The MASK card specifies the number of boundary points contained by the MSKB cards.

MSKB Card Format (A4,2X,8G8.3)

cc 1	7	15	23	31	39	47	55	63
MSKB	XVAL(1)	YVAL(1)	XVAL(2)	YVAL(2)	XVAL(3)	YVAL(3)	XVAL(4)	YVAL(4)

where:

XVAL are the X coordinates of the masked area.

YVAL are the Y coordinates of the masked area.

The MSKB cards specify the coordinates of the boundary points. The boundary points must be introduced sequentially, such that the boundary is defined by the line starting from the first point and passing through each successive boundary point, and ending with a line between the last boundary point and the first. The boundary will thus form a closed curve within which contours will be plotted.

PLOT Card. Format (A4,2X,2G7.0,2G6.0,I5,I4,3I2,5G4.3,I1,G4.3)

cc	1	7	14	21	27	33	38	42	44	46
	PLOT	ZMIN	ZLMIN	DZ	DZL	NLEVS	KLEV	L1	L2	ID
		48	52	56	60	64	68	69		
		DISL	HGIL	DIST	TLNG	TLER	I	SKIP		

where:

ZMIN (col 7-13) is the minimum contour level requested

ZLMIN (col 14-20) is the minimum contour level to be labeled

DZ (col 21-26) is the increment to be used for plotting contour levels

DZL (col 27-32) is the increment to be used for plotting labeled contour lines

NLEVS (col 33-37) is the number of contour levels to be plotted (right justified)

KLEV (col 38-41) is the number of contour levels to be skipped before plotting a line of type L2 (right justified); KLEV-1 levels are skipped

L1 (col 42-43) is the line format for every contour line other than the KLEV contour line, values and line format are as follows (right justified):

± 1 = a solid light line
± 2 = a solid light line with tick marks on one side
± 3 = a solid light line with tick marks across the line

± 4 = a solid bold line
± 5 = a solid bold line with tick marks on one side
± 6 = a solid bold line with tick marks across the line
± 7 = a dashed line

Positive values include a label; negative values do not

L2 (col 44-45) is the line format for the KLEW contour line; values and line formats are the same as for L1

ID	(col 46-47)	is the number of digits after the decimal point in the label. If ID = -1, the decimal point will be omitted, values are right justified
DIST	(col 48-51)	is the distance (in inches) along a contour line from its beginning to its label
HGHT	(col 52-55)	is the height (in inches) of the characters in the label
DIST	(col 56-59)	is the distance (in inches) between dashes, for dashed lines, or between tick marks, for lines with tick marks
TLNG	(col 60-63)	is the length (in inches) of tick marks, if TLNG is positive, the tick marks will be on the uphill side of the line, if it is negative, the tick marks will be on the downhill side
TLER	(col 64-67)	is the tolerance distance (in inches) used in straight line or circular arc smoothing, one-third grid size recommended
I	(col 68)	0 for no smoothing, 1 for straight line smoothing, 2 for circular arc smoothing
SKIP	(col 69-72)	is the tolerance for skipping where contour lines are so close as to be indistinguishable, a positive value for SKIP will cause light line or dashed lines to be skipped if the distance between them is not greater than the SKIP value (in inches)

The PLOT card defines the type of contour line to be plotted, as well as the levels (altitudes) for which it will be plotted. A numerical label can be plotted for those contour lines which are sufficiently long. Each successive contour line plotted will be at level ZMIN + I times DZ, and each corresponding numerical label will be ZMIN + I times DZI, where I assumes integer values from 1 to NLEV - 1. Line formats and the distance between dashes, for dashed lines, can be selected by the user, and is specified by the PLOT card. The distance between tick marks, the length of the tick marks, and whether they are on the uphill or downhill side of the line (for lines with tick marks), can be selected by the user, and are specified by the PLOT card. The PLOT card also permits the user to request that light contours be skipped whenever the distance between them does not exceed a distance specified by the user. This feature is useful in improving the intelligibility of the map.

The PLOT card also allows the user to choose a smoothing option. A contour line originally is composed of a sequence of straight line segments. It will be plotted as such, unless the smoothing option is used. Smoothing will effect either a rounding or cutting of the corner between successive straight line segments. Smoothing is accomplished such that the deviation of the smoothed contour line from the original contour line is always less than or equal to a tolerance distance specified by the user on the PLOT card. Either of two types of smoothing can be specified by the PLOT card: (1) straight line smoothing, which effects a cutting of the corner between contour segments; or (2) circular arc smoothing, which effects a rounding of the corner between contour segments. (In Figure 11, a pair of contour segments, A and B, adjoin at point P.)

Straight line smoothing (Figure 11) replaces the corner at P with a straight line segment from point P1 (on A) to point P2 (on B) such that P1 and P2 are each a distance C from P. C is determined such that the distance from P to the line from P1 to P2 is less than or equal to the tolerance distance specified by the user. C must also be less than or equal to one third of A and less than or equal to one third of B (Figure 12).

Circular arc smoothing replaces the corner at P with a circular arc tangent to both A and B at points P1 and P2, respectively. The circular arc from point P1 to P2 is determined such that the distance from P to the arc is less than or equal to the tolerance distance specified by the user. Furthermore, the distance from P to P1 must be less than or equal to one-half A, and the distance from P to P2 must be less than or equal to one-half B (Figure 13).

PHS4 Card

cc 1

PHS4 Format (A4)

The PHS4 card transfers control to Phase 4 of the program. Phase 4 plots special lines and text on the map and draws a border on the map. Phase 4 control cards are as follows:

LINE Card Format (A4,2X,6G8.3,I2)

cc 1	7	15	23	31	39	47	55
LINE	X1	Y1	Z1	X2	Y2	Z2	IC

where

X1,Y1,Z1 are the coordinates of the starting point

X2,Y2,Z2 are the coordinates of the ending point

IC (col 55-56) = 0 use plotter coordinates
= 1 use map coordinates (right justified)

The LINE card is used to draw a line on the contour map. Z is needed only for parallax drawing.

TEXT Card Format (A4,2X,5G8.3,I2,2A10,A4)

cc 1	7	15	23	31	39	47	49
TEXT	X1	Y1	Z1	HEIGHT	ANGLE	IC	ITEXT

where

X1,Y1,Z1 the coordinates of the first character of the text string

HEIGHT (col 31-38) is the height of the characters

ANGLE (col 39-46) is the angle for text string to be plotted

IC (col 47-48) = 0 use plotter coordinates
= 1 use map coordinates (right justified)

ITEXT (col 49-72) the character text string (left justified)

The TEXT card is used to draw annotation on the contour map; orientation and character size can be selected by the user.

CTEX Card

cc 1

CTEX TTEXT Format (A4,2X,6A10,A8)

where

TTEXT (cols. 7-72) is the character text string to be continued (left justified)

The CTEX card is used whenever the text string overflows either a TTEXT card or another CTEX card.

BRDR Card

cc 1

BRDR Format (A4)

The BRDR card is used to draw a border around the rectangular (parallelogram if the coordinates are skewed) containing the map.

END Card

cc 1

END Format (A4)

The end card ends phase control of a job.

STOP Card

cc 1

STOP Format (A4)

The STOP card stops all processing.

The NASAPLOT contour program allows certain options, such as map splitting and exploded views, and has the capability to process multiple jobs and to produce multiple outputs and plots within a single job.

If the user wants a map size that is too large to fit on one plotter page, then he may specify that the map into matching sections and plot each section on a separate plotter page. The following procedure is required to split a map.

1. The DIMT card is used to specify the plotter table size and to initiate the first page.
2. The MAPS card is used to specify the map section.
3. The GRID card is used to grid the map section.
4. The PLOT card is used to plot the map section.
5. Control is transferred to Phase 1 to start the next section, and the PAGE card is used to request a new plotter page.
6. Steps 2, 3, and 4 are repeated.
7. If an additional section is required, steps 5 and 6 are repeated.

Note that for a perfect match between sections, it is necessary to grid the sections such that the X distance and the Y distance between grid mesh points is unchanged in each successive section.

The user may produce, in the form of a separate map, an exploded view of any rectangular (parallelogram, if the coordinates are skewed) area of the map. The following procedure is required to produce an exploded view.

1. If a border is to be drawn around the area of interest on the original map, the LINE card is used to do so.

2. After the original map has been plotted, the MAPS card is used to specify the area of interest and the new (XOR, YOR) for plotting the exploded view.

3. The SCLE card is used to specify the factor by which the area will be exploded.

4. The PLOT card is used to plot the exploded view.

5. If a border is to be drawn around the exploded view, the BRDR card is used to do so.

The NASAPLOT contour program can process several jobs in one computer run. The program control cards corresponding to each job are stacked, with a JOB card at the beginning and an END card at the end of each job. A STOP card is required at the end of the deck (after the last END card). This program has been implemented such that the user can effect any number of manipulations and obtain any number of outputs and plots within a single job. The stereo, map splitting, and exploded view capabilities are examples of ways to obtain more than one plot within a single job. The program accepts any number of its control cards in any sequence within the logical constraints described in the PROGRAM CONTROL CARD section of this chapter. Control can be transferred from any phase to any other phase, and the map, grid, and control point parameters can be manipulated and plotted as many times as is desired within a single job.

Table 19
Common Blocks

Subprograms Routines	Block Names
LCDN	ANGLE BOUND CALC DEBUG FT GRID IO METRIC PARM PLOTCM SRCS
BASE	BOUND IO
BOUNDS	BOUND IO
FORMA	DEBUG FT GRID GUN IO SRCS TABLE CONTR
LOCATR	IO BOUND
MAP	DEBUG FT GRID IO
PGRID	BOUND CALC DEBUG FACTL FT IO METRIC SRCS
PLOT	BOUND IO METRIC PLOTCM
SCATTR	BOUND IO
STOPP	IO
CALCNR	CALC DEBUG FACTL FT GRID GUN IO METRIC PARM SRCS TABLE CONTR BDSET
JBRET	JOBBLK
PUTNR	IO
READIN	DEBUG FT GRID IO SRCS
READTB	DEBUG FACTL IO PARM TABLE
SCATPT	BOUND IO
POINT	BOUND CALC DEBUG FACTL FT IO METRIC SRCS

Table 20
TABGEN Output

```
TABLE GENERATION PROGRAM -- 74.20  8.60 18.67 PERCENT INVERSION


DAY FOCUS MAX                                                  1
          9        301     100.00    -199.00     DAY FOCUS MAX
    141.10     100.00METER                          100.00       1.00
    132.50    1000.00FEET                           304.80      49.40
    126.60    2000.00FEET                           609.60      79.50
    117.30       1.00MILE                          1609.34     121.66
    107.50       2.00MILE                          3218.69     151.77
     99.10       5.00MILE                          8046.72     191.56
     92.50      10.00MILE                         16093.44     221.66
     89.70      15.00MILE                         24140.16     239.27
     80.60  100000.00METER                        100000.00     301.00


141.1 140.8 140.7 140.5 140.3 140.1 139.9 139.8 139.6 139.4 139.2 139.1 138.9 138.7 138.5 138.3 138.2 138.0 137.8 137.6
137.5 137.3 137.1 136.9 136.7 136.6 136.4 136.2 136.0 135.9 135.7 135.5 135.3 135.1 135.0 134.8 134.6 134.4 134.3 134.1
133.9 133.7 133.5 133.4 133.2 133.0 132.8 132.7 132.5 132.3 132.1 131.9 131.7 131.5 131.3 131.1 130.9 130.7 130.5 130.3
130.1 129.9 129.7 129.5 129.3 129.1 129.0 128.8 128.6 128.4 128.2 128.0 127.8 127.6 127.4 127.2 127.[illegible] 126.8 126.6 126.4
126.2 125.9 125.7 125.5 125.3 125.1 124.8 124.6 124.4 124.2 124.0 123.7 123.5 123.3 123.1 122.9 122.6 122.4 122.2 122.0
121.7 121.5 121.3 121.1 120.9 120.6 120.4 120.2 120.0 119.8 119.5 119.3 119.1 118.9 118.7 118.4 118.2 118.0 117.8 117.6
117.3 117.0 116.7 116.4 116.1 115.7 115.4 115.1 114.7 114.4 114.1 113.8 113.4 113.1 112.8 112.5 112.1 111.8 111.5 111.2
[illegible].8 110.5 110.2 109.9 109.5 109.2 108.9 108.6 108.2 107.9 107.6 107.3 107.1 106.9 106.7 106.5 106.3 106.1 105.9 105.7
[illegible].4 105.2 105.0 104.8 104.6 104.4 104.2 104.0 103.8 103.5 103.3 103.1 102.9 102.7 102.5 102.3 102.1 101.9 101.6 101.4
101.2 101.0 100.8 100.6 100.4 100.2 100.0 99.7 99.5 99.3 99.1 98.9 98.7 98.5 98.2 98.[illegible] 97.8 97.6 97.4 97.1
 96.9 96.7 96.5 96.3 96.0 95.8 95.6 95.4 95.2 94.9 94.7 94.5 94.3 94.1 93.9 93.6 93.4 93.2 93.[illegible] 92.8
 92.5 92.4 92.2 92.0 91.9 91.7 91.6 91.4 91.3 91.1 90.9 90.8 90.6 90.5 90.3 90.1 9[illegible] 89.8 89.7 89.5
 89.4 89.2 89.1 88.9 88.8 88.6 88.5 88.3 88.2 88.0 87.9 87.8 87.6 87.5 87.3 87.2 87.0 86.9 86.7 86.6
 86.4 86.3 86.1 86.0 85.8 85.7 85.5 85.4 85.2 85.1 84.9 84.8 84.7 84.5 84.4 84.2 84.1 83.9 83.8 83.6
 83.5 83.3 83.2 83.0 82.9 82.7 82.6 82.4 82.3 82.1 82.0 81.9 81.7 81.6 81.4 81.3 81.1 81.[illegible] 80.8 80.[illegible]
 80.6
```

Table 20 (Cont'd)

DAY FOCUS MEAN						2	
9	301	100.00	-199.00	DAY FOCUS MEAN			
140.60	100.00METER				100.00		1.00
132.10	1000.00FEET				304.80		49.40
124.00	2000.00FEET				609.60		79.50
113.30	1.00MILE				1609.34		121.66
102.50	2.00MILE				3218.69		151.77
94.10	5.00MILE				8046.72		191.56
87.50	10.00MILE				16093.44		221.66
84.70	15.00MILE				24140.16		239.27
75.60	100000.00METER				100000.00		301.00

140.6	140.3	140.2	140.0	139.8	139.6	139.5	139.3	139.1	138.9	138.8	138.6	138.4	138.2	138.1	137.9	137.7	137.5	137.4	137.2
137.0	136.8	136.6	136.5	136.3	136.1	135.9	135.8	135.6	135.4	135.2	135.1	134.9	134.7	134.5	134.4	134.2	134.0	133.8	133.7
133.5	133.3	133.1	133.0	132.8	132.6	132.4	132.3	132.1	131.8	131.5	131.3	131.0	130.7	130.5	130.2	129.9	129.7	129.4	129.1
128.8	128.6	128.3	128.0	127.8	127.5	127.2	127.0	126.7	126.4	126.2	125.9	125.6	125.3	125.1	124.8	124.5	124.3	124.0	123.7
123.5	123.2	123.0	122.7	122.5	122.2	122.0	121.7	121.5	121.2	121.0	120.7	120.4	120.2	119.9	119.7	119.4	119.2	118.9	118.7
118.4	118.2	117.9	117.7	117.4	117.1	116.9	116.6	116.4	116.1	115.9	115.6	115.4	115.1	114.9	114.6	114.4	114.1	113.8	113.6
113.3	113.0	112.6	112.3	111.9	111.6	111.2	110.8	110.5	110.1	109.8	109.4	109.1	108.7	108.3	108.0	107.6	107.3	106.9	106.5
106.2	105.8	105.5	105.1	104.7	104.4	104.0	103.7	103.3	103.0	102.6	102.3	102.1	101.9	101.7	101.5	101.3	101.1	100.9	100.7
100.4	100.2	100.0	99.8	99.6	99.4	99.2	99.0	98.8	98.5	98.3	98.1	97.9	97.7	97.5	97.3	97.1	96.9	96.6	96.4
96.2	96.0	95.8	95.6	95.4	95.2	95.0	94.7	94.5	94.3	94.1	93.9	93.7	93.5	93.2	93.0	92.8	92.6	92.4	92.1
91.9	91.7	91.5	91.3	91.0	90.8	90.6	90.4	90.2	89.9	89.7	89.5	89.3	89.1	88.9	88.6	88.4	88.2	88.0	87.8
87.5	87.4	87.2	87.0	86.9	86.7	86.6	86.4	86.3	86.1	85.9	85.8	85.6	85.5	85.3	85.1	85.0	84.8	84.7	84.5
84.4	84.2	84.1	83.9	83.8	83.6	83.5	83.3	83.2	83.0	82.9	82.8	82.6	82.5	82.3	82.2	82.0	81.9	81.7	81.6
81.4	81.3	81.1	81.0	80.8	80.7	80.5	80.4	80.2	80.1	79.9	79.8	79.7	79.5	79.4	79.2	79.1	78.9	78.8	78.6
78.5	78.3	78.2	78.0	77.9	77.7	77.6	77.4	77.3	77.1	77.0	76.9	76.7	76.6	76.4	76.3	76.1	76.0	75.8	75.7
75.6																			

Table 20 (Cont'd)

DAY	BASE	MAX					DAY	BASE	MAX	
	9		301	100.00	-199.00			3		
	140.10		100.00METER					100.00		1.00
	131.60		1000.00FEET					304.80		49.40
	123.60		2000.00FEET					609.60		79.50
	111.60		1.00MILE					1609.34		121.66
	99.30		2.00MILE					3218.69		151.77
	89.00		5.00MILE					8046.72		191.56
	84.00		10.00MILE					16093.44		221.66
	80.80		15.00MILE					24140.16		239.27
	68.60	100000.00METER						100000.00		301.00

140.1	139.8	139.7	139.5	139.3	139.1	139.0	138.8	138.6	138.4	138.3	138.1	137.9	137.7	137.6	137.4	137.2	137.0	136.9	136.7
136.5	136.3	136.1	136.0	135.8	135.6	135.4	135.3	135.1	134.9	134.7	134.6	134.4	134.2	134.0	133.9	133.7	133.5	133.3	133.2
133.0	132.8	132.6	132.5	132.3	132.1	131.9	131.8	131.6	131.3	131.0	130.8	130.5	130.2	130.0	129.7	129.4	129.2	128.9	128.7
128.4	128.1	127.9	127.6	127.3	127.1	126.8	126.5	126.3	126.0	125.7	125.5	125.2	124.9	124.7	124.4	124.1	123.9	123.6	123.3
123.0	122.7	122.5	122.2	121.9	121.6	121.3	121.0	120.8	120.5	120.2	119.9	119.6	119.3	119.0	118.8	118.5	118.2	117.9	117.6
117.3	117.1	116.8	116.5	116.2	115.9	115.6	115.3	115.1	114.8	114.5	114.2	113.9	113.6	113.4	113.1	112.8	112.5	112.2	111.9
111.6	111.3	110.9	110.4	110.0	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.8	106.4	105.9	105.5	105.1	104.7	104.3	103.9
103.5	103.1	102.7	102.3	101.9	101.5	101.0	100.6	100.2	99.8	99.4	99.1	98.9	98.6	98.3	98.1	97.8	97.6	97.3	97.0
96.8	96.5	96.3	96.0	95.7	95.5	95.2	95.0	94.7	94.5	94.2	93.9	93.7	93.4	93.2	92.9	92.6	92.4	92.1	91.9
91.6	91.3	91.1	90.8	90.6	90.3	90.1	89.8	89.5	89.3	89.0	88.8	88.7	88.5	88.3	88.2	88.0	87.8	87.7	87.5
87.3	87.2	87.0	86.9	86.7	86.5	86.4	86.2	86.0	85.9	85.7	85.5	85.4	85.2	85.0	84.9	84.7	84.5	84.4	84.2
84.0	83.8	83.7	83.5	83.3	83.1	82.9	82.8	82.6	82.4	82.2	82.0	81.8	81.7	81.5	81.3	81.1	80.9	80.8	80.6
80.4	80.2	80.0	79.8	79.6	79.4	79.2	79.0	78.8	78.6	78.4	78.2	78.0	77.8	77.6	77.4	77.2	77.0	76.8	76.6
76.4	76.2	76.0	75.8	75.6	75.4	75.2	75.0	74.8	74.6	74.4	74.2	74.0	73.8	73.6	73.4	73.2	73.0	72.8	72.7
72.5	72.3	72.1	71.9	71.7	71.5	71.3	71.1	70.9	70.7	70.5	70.3	70.1	69.9	69.7	69.5	69.3	69.1	68.9	68.7
68.6																			

Table 20 (Cont'd)

DAY	BASE	MEAN																			
	9		301		100.00		-199.00														
	137.60		100.00METER																		
	125.00		1000.00FEET																		
	116.70		2000.00FEET																		
	105.80		1.00MILE																		
	94.40		2.00MILE																		
	85.10		5.00MILE																		
	79.70		10.00MILE																		
	75.80		15.00MILE																		
	60.60		100000.00METER																		

DAY	BASE	MEAN		
	4			
	100.00		1.00	
	304.80		49.40	
	609.60		79.50	
	1609.34		121.66	
	3218.69		151.77	
	8046.72		191.56	
	16093.44		221.66	
	24140.16		239.27	
	100000.00		301.00	

137.6	137.2	136.9	136.7	136.4	136.2	135.9	135.6	135.4	135.1	134.9	134.6	134.3	134.1	133.8	133.6	133.3	133.0	132.8	132.5
132.3	132.0	131.7	131.5	131.2	131.0	130.7	130.4	130.2	129.9	129.7	129.4	129.1	128.9	128.6	128.4	128.1	127.8	127.6	127.3
127.1	126.8	126.5	126.3	126.0	125.8	125.5	125.2	125.0	124.7	124.4	124.1	123.9	123.6	123.3	123.0	122.8	122.5	122.2	121.9
121.7	121.4	121.1	120.8	120.6	120.3	120.0	119.7	119.5	119.2	118.9	118.6	118.4	118.1	117.8	117.5	117.3	117.0	116.7	116.4
116.2	115.9	115.7	115.4	115.1	114.9	114.6	114.4	114.1	113.9	113.6	113.3	113.1	112.8	112.6	112.3	112.0	111.8	111.5	111.3
111.0	110.8	110.5	110.2	110.0	109.7	109.5	109.2	108.9	108.7	108.4	108.2	107.9	107.7	107.4	107.1	106.9	106.6	106.4	106.1
105.8	105.5	105.1	104.7	104.3	104.0	103.6	103.2	102.8	102.5	102.1	101.7	101.3	100.9	100.6	100.2	99.8	99.4	99.0	98.7
98.3	97.9	97.5	97.2	96.8	96.4	96.0	95.6	95.3	94.9	94.5	94.2	94.0	93.8	93.5	93.3	93.1	92.8	92.6	92.4
92.1	91.9	91.7	91.4	91.2	91.0	90.7	90.5	90.3	90.0	89.8	89.6	89.3	89.1	88.9	88.6	88.4	88.2	87.9	87.7
87.5	87.2	87.0	86.8	86.5	86.3	86.0	85.8	85.6	85.3	85.1	84.9	84.8	84.6	84.4	84.2	84.0	83.9	83.7	83.5
83.3	83.1	83.0	82.8	82.6	82.4	82.2	82.1	81.9	81.7	81.5	81.3	81.2	81.0	80.8	80.6	80.4	80.3	80.1	79.9
79.7	79.5	79.3	79.1	78.9	78.6	78.4	78.2	78.0	77.7	77.5	77.3	77.1	76.9	76.6	76.4	76.2	76.0	75.7	75.5
75.3	75.0	74.8	74.5	74.3	74.0	73.8	73.5	73.3	73.0	72.8	72.5	72.3	72.1	71.8	71.6	71.3	71.1	70.8	70.6
70.3	70.1	69.8	69.6	69.3	69.1	68.8	68.6	68.4	68.1	67.9	67.6	67.4	67.1	66.9	66.6	66.4	66.1	65.9	65.6
65.4	65.2	64.9	64.7	64.4	64.2	63.9	63.7	63.4	63.2	62.9	62.7	62.4	62.2	62.0	61.7	61.5	61.2	61.0	60.7
60.6																			

Table 20 (Cont'd)

DAY NEG MAX

9	301	100.00	-199.00
135.10	100.00METER		
121.60	1000.00FEET		
112.60	2000.00FEET		
101.60	1.00MILE		
89.60	2.00MILE		
79.00	5.00MILE		
73.00	10.00MILE		
68.60	15.00MILE		
55.60	100000.00METER		

5

DAY NEG MAX	
100.00	1.00
304.80	49.40
609.60	79.50
1609.34	121.66
3218.69	151.77
8046.72	191.56
16093.44	221.66
24140.16	239.27
100000.00	301.00

135.1	134.7	134.4	134.1	133.8	133.6	133.3	133.0	132.7	132.5	132.2	131.9	131.6	131.3	131.1	130.8	130.5	130.2	129.9	129.7
129.4	129.1	128.8	128.5	128.3	128.0	127.7	127.4	127.2	126.9	126.6	126.3	126.0	125.8	125.5	125.2	124.9	124.6	124.4	124.1
123.8	123.5	123.2	123.0	122.7	122.4	122.1	121.9	121.6	121.3	121.0	120.7	120.4	120.1	119.8	119.5	119.2	118.9	118.6	118.3
118.0	117.7	117.4	117.1	116.8	116.5	116.2	115.9	115.6	115.3	115.0	114.7	114.4	114.1	113.8	113.5	113.2	112.9	112.6	112.3
112.1	111.8	111.6	111.3	111.0	110.8	110.5	110.3	110.0	109.7	109.5	109.2	108.9	108.7	108.4	108.2	107.9	107.6	107.4	107.1
106.9	106.6	106.3	106.1	105.8	105.6	105.3	105.0	104.8	104.5	104.3	104.0	103.7	103.5	103.2	102.9	102.7	102.4	102.2	101.9
101.6	101.3	100.9	100.5	100.1	99.7	99.3	98.9	98.5	98.1	97.7	97.3	96.9	96.5	96.1	95.7	95.3	94.9	94.5	94.1
93.7	93.3	92.9	92.5	92.1	91.7	91.3	90.9	90.5	90.1	89.7	89.4	89.1	88.9	88.6	88.3	88.1	87.8	87.5	87.3
87.0	86.7	86.5	86.2	85.9	85.7	85.4	85.1	84.9	84.6	84.3	84.1	83.8	83.5	83.3	83.0	82.7	82.5	82.2	81.9
81.7	81.4	81.1	80.9	80.6	80.3	80.1	79.8	79.5	79.3	79.0	78.8	78.6	78.4	78.2	78.0	77.8	77.6	77.4	77.2
77.0	76.8	76.6	76.4	76.2	76.0	75.8	75.6	75.4	75.2	75.0	74.8	74.6	74.4	74.2	74.0	73.8	73.6	73.4	73.2
73.0	72.8	72.5	72.3	72.0	71.8	71.5	71.3	71.0	70.8	70.5	70.3	70.0	69.8	69.5	69.3	69.0	68.8	68.6	68.3
68.1	67.9	67.7	67.5	67.3	67.1	66.9	66.7	66.4	66.2	66.0	65.8	65.6	65.4	65.2	65.0	64.8	64.6	64.3	64.1
63.9	63.7	63.5	63.3	63.1	62.9	62.7	62.4	62.2	62.0	61.8	61.6	61.4	61.2	61.0	60.8	60.5	60.3	60.1	59.9
59.7	59.5	59.3	59.1	58.9	58.7	58.4	58.2	58.0	57.8	57.6	57.4	57.2	57.0	56.8	56.5	56.3	56.1	55.9	55.7
55.6																			

Table 20 (Cont'd)

DAY NEG MEAN					DAY NEG MEAN	
9	301	100.00	-199.00	6		
131.10	100.00METER				100.00	1.00
117.20	1000.00FEET				304.80	49.40
106.40	2000.00FEET				609.60	79.50
97.30	1.00MILE				1609.34	121.66
85.90	2.00MILE				3218.69	151.77
73.80	5.00MILE				8046.72	191.56
69.40	10.00MILE				16093.44	221.66
65.80	15.00MILE				24140.16	239.27
52.60	100000.00METER				100000.00	301.00

131.1	130.7	130.4	130.1	129.8	129.5	129.2	128.9	128.7	128.4	128.1	127.8	127.5	127.2	126.9	126.6	126.4	126.1	125.8	125.5
125.2	124.9	124.6	124.4	124.1	123.8	123.5	123.2	122.9	122.6	122.3	122.1	121.8	121.5	121.2	120.9	120.6	120.3	120.0	119.8
119.5	119.2	118.9	118.6	118.3	118.0	117.7	117.5	117.2	116.8	116.4	116.1	115.7	115.4	115.0	114.7	114.3	113.9	113.6	113.2
112.9	112.5	112.1	111.8	111.4	111.1	110.7	110.3	110.0	109.6	109.3	108.9	108.6	108.2	107.8	107.5	107.1	106.8	106.4	106.2
106.0	105.8	105.5	105.3	105.1	104.9	104.7	104.5	104.2	104.0	103.8	103.6	103.4	103.2	102.9	102.7	102.5	102.3	102.1	101.9
101.7	101.4	101.2	101.0	100.8	100.6	100.4	100.1	99.9	99.7	99.5	99.3	99.1	98.8	98.6	98.4	98.2	98.0	97.8	97.6
97.3	97.0	96.8	96.2	95.8	95.5	95.1	94.7	94.3	94.0	93.6	93.2	92.8	92.4	92.1	91.7	91.3	90.9	90.5	90.2
89.8	89.4	89.0	88.7	88.3	87.9	87.5	87.1	86.8	86.4	86.0	85.7	85.4	85.1	84.8	84.5	84.2	83.9	83.5	83.2
82.9	82.6	82.3	82.0	81.7	81.4	81.1	80.8	80.5	80.2	79.9	79.6	79.3	79.0	78.7	78.4	78.1	77.8	77.5	77.2
76.9	76.6	76.3	75.9	75.6	75.3	75.0	74.7	74.4	74.1	73.8	73.7	73.5	73.4	73.2	73.1	72.9	72.8	72.6	72.5
72.3	72.2	72.1	71.9	71.8	71.6	71.5	71.3	71.2	71.0	70.9	70.7	70.6	70.4	70.3	70.2	70.0	69.9	69.7	69.6
69.4	69.2	69.0	68.8	68.6	68.4	68.2	68.0	67.8	67.6	67.4	67.2	67.0	66.8	66.6	66.4	66.2	66.0	65.8	65.5
65.3	65.1	64.9	64.7	64.5	64.3	64.0	63.8	63.6	63.4	63.2	63.0	62.8	62.5	62.3	62.1	61.9	61.7	61.5	61.3
61.0	60.8	60.6	60.4	60.2	60.0	59.8	59.6	59.3	59.1	58.9	58.7	58.5	58.3	58.1	57.8	57.6	57.4	57.2	57.0
56.8	56.6	56.3	56.1	55.9	55.7	55.5	55.3	55.1	54.8	54.6	54.4	54.2	54.0	53.8	53.6	53.3	53.1	52.9	52.7
52.6																			

Table 20 (Cont'd)

```
DAY EX NEG MAX                                          7
        9        301     100.00    -199.00     DAY EX NEG MAX
   120.10     100.00METER                          100.00      1.00
   107.60    1000.00FEET                           304.80     49.40
    99.60    2000.00FEET                           609.60     79.50
    90.60       1.00MILE                          1609.34    121.66
    81.20       2.00MILE                          3218.69    151.77
    64.70       5.00MILE                          8046.72    191.56
    59.60      10.00MILE                         16093.44    221.66
    57.00      15.00MILE                         24140.16    239.27
    46.60  100000.00METER                        100000.00    301.00
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120.1	119.7	119.5	119.2	118.9	118.7	118.4	118.2	117.9	117.6	117.4	117.1	116.9	116.6	116.4	116.1	115.8	115.6	115.3	115.1
114.8	114.5	114.3	114.0	113.8	113.5	113.3	113.0	112.7	112.5	112.2	112.0	111.7	111.4	111.2	110.9	110.7	110.4	110.2	109.9
109.6	109.4	109.1	108.9	108.6	108.3	108.1	107.8	107.6	107.3	107.0	106.8	106.5	106.2	106.0	105.7	105.4	105.2	104.9	104.7
104.4	104.1	103.9	103.6	103.3	103.1	102.8	102.5	102.3	102.0	101.7	101.5	101.2	100.9	100.7	100.4	100.1	99.9	99.6	99.4
99.2	99.0	98.7	98.5	98.3	98.1	97.9	97.7	97.5	97.3	97.0	96.8	96.6	96.4	96.2	96.0	95.8	95.5	95.3	95.1
94.9	94.7	94.5	94.3	94.1	93.8	93.6	93.4	93.2	93.0	92.8	92.6	92.3	92.1	91.9	91.7	91.5	91.3	91.1	90.8
90.6	90.3	90.0	89.7	89.4	89.1	88.8	88.5	88.2	87.8	87.5	87.2	86.9	86.6	86.3	86.0	85.7	85.3	85.0	84.7
84.4	84.1	83.8	83.5	83.2	82.8	82.5	82.2	81.9	81.6	81.3	80.9	80.5	80.1	79.7	79.2	78.8	78.4	78.0	77.6
77.2	76.8	76.3	75.9	75.5	75.1	74.7	74.3	73.8	73.4	73.0	72.6	72.2	71.8	71.4	70.9	70.5	70.1	69.7	69.3
68.9	68.5	68.0	67.6	67.2	66.8	66.4	66.0	65.6	65.1	64.7	64.5	64.4	64.2	64.0	63.9	63.7	63.5	63.4	63.2
63.0	62.8	62.7	62.5	62.3	62.2	62.0	61.8	61.7	61.5	61.3	61.2	61.0	60.8	60.6	60.5	60.3	60.1	60.0	59.8
59.6	59.5	59.3	59.2	59.0	58.9	58.7	58.6	58.4	58.3	58.1	58.0	57.9	57.7	57.6	57.4	57.3	57.1	57.0	56.8
56.6	56.5	56.3	56.1	56.0	55.8	55.6	55.4	55.3	55.1	54.9	54.8	54.6	54.4	54.3	54.1	53.9	53.8	53.6	53.4
53.3	53.1	52.9	52.7	52.6	52.4	52.2	52.1	51.9	51.7	51.6	51.4	51.2	51.1	50.9	50.7	50.6	50.4	50.2	50.1
49.9	49.7	49.5	49.4	49.2	49.0	48.9	48.7	48.5	48.4	48.2	48.0	47.9	47.7	47.5	47.4	47.2	47.0	46.9	46.7
46.6																			

Table 20 (Cont'd)

DAY EX NEG MEAN					DAY EX NEG MEAN	
9	301	100.00	-199.00		100.00	1.00
118.10	100.00METER				304.80	49.40
106.10	1000.00FEET				609.60	79.50
97.00	2000.00FEET				1609.34	121.66
86.90	1.00MILE				3218.69	151.77
77.10	2.00MILE				8046.72	191.56
60.50	5.00MILE				16093.44	221.66
54.60	10.00MILE				24140.16	239.27
49.10	15.00MILE				100000.00	301.00
39.10	100000.00METER					

118.1 117.7 117.5 117.2 117.0 116.7 116.5 116.2 116.0 115.7 115.5 115.2 115.0 114.8 114.5 114.3 114.0 113.8 113.5 113.3
113.0 112.8 112.5 112.3 112.0 111.8 111.5 111.3 111.0 110.8 110.5 110.3 110.0 109.8 109.5 109.3 109.1 108.8 108.6 108.3
108.1 107.8 107.6 107.3 107.1 106.8 106.6 106.3 106.1 105.8 105.5 105.2 104.9 104.6 104.3 104.0 103.7 103.3 103.0 102.7
102.4 102.1 101.8 101.5 101.2 100.9 100.6 100.3 100.0 99.7 99.4 99.1 98.8 98.5 98.2 97.9 97.6 97.3 97.0 96.8
96.5 96.3 96.0 95.8 95.6 95.3 95.1 94.8 94.6 94.4 94.1 93.9 93.6 93.4 93.2 92.9 92.7 92.4 92.2 92.0
91.7 91.5 91.3 91.0 90.8 90.5 90.3 90.1 89.8 89.6 89.3 89.1 88.9 88.6 88.4 88.1 87.9 87.7 87.4 87.2
86.9 86.6 86.3 86.0 85.7 85.3 85.0 84.7 84.3 84.0 83.7 83.4 83.0 82.7 82.4 82.1 81.7 81.4 81.1 80.8
80.4 80.1 79.8 79.5 79.1 78.8 78.5 78.2 77.8 77.5 77.2 76.8 76.4 76.0 75.5 75.1 74.7 74.3 73.9 73.5
73.0 72.6 72.2 71.8 71.4 71.0 70.5 70.1 69.7 69.3 68.9 68.5 68.0 67.6 67.2 66.8 66.4 65.9 65.5 65.1
64.7 64.3 63.9 63.4 63.0 62.6 62.2 61.8 61.4 60.9 60.5 60.3 60.1 59.9 59.7 59.5 59.3 59.1 58.9 58.7
58.6 58.4 58.2 58.0 57.8 57.6 57.4 57.2 57.0 56.8 56.6 56.4 56.2 56.0 55.8 55.6 55.4 55.2 55.0 54.8
54.6 54.3 54.0 53.7 53.4 53.1 52.8 52.5 52.2 51.8 51.5 51.2 50.9 50.6 50.3 50.0 49.7 49.3 49.1 48.9
48.7 48.6 48.4 48.3 48.1 47.9 47.8 47.6 47.4 47.3 47.1 47.0 46.8 46.6 46.5 46.3 46.1 46.0 45.8 45.7
45.5 45.3 45.2 45.0 44.9 44.7 44.5 44.4 44.2 44.0 43.9 43.7 43.6 43.4 43.2 43.1 42.9 42.7 42.6 42.4
42.3 42.1 41.9 41.8 41.6 41.4 41.3 41.1 41.0 40.8 40.6 40.5 40.3 40.2 40.0 39.8 39.7 39.5 39.3 39.2
39.1

Table 20 (Cont'd)

DAY Ex NEG MIN																					
	9	3 1	100.00	-194.00		DAY Ex NEG MIN															
	111.10	100.00METER					100.00	1.00													
	97.10	1000.00FEET					304.80	43.40													
	88.10	2000.00FEET					609.60	79.50													
	78.60	1.00MILE					1609.34	121.66													
	68.10	2.00MILE					3218.69	151.77													
	50.60	5.00MILE					8046.72	191.56													
	44.10	10.00MILE					16093.44	221.66													
	38.10	15.00MILE					24140.16	239.27													
	27.10	100000.00METER					100000.00	301.00													

9																					
111.1	110.7	110.4	110.1	109.8	109.5	109.2	108.9	108.6	108.4	108.1	107.8	107.5	107.2	106.9	106.6	106.3	106.0	105.7	105.5		
105.2	104.9	104.6	104.3	104.0	103.7	103.4	103.1	102.9	102.6	102.3	102.0	101.7	101.4	101.1	100.8	100.5	100.3	100.0	99.7		
99.4	99.1	98.8	98.5	98.2	97.9	97.7	97.4	97.1	96.8	96.5	96.2	95.9	95.6	95.3	95.0	94.7	94.4	94.1	93.8		
93.5	93.2	92.9	92.6	92.3	92.0	91.7	91.4	91.1	90.8	90.5	90.2	89.9	89.6	89.3	89.0	88.7	88.4	88.1	87.8		
87.7	87.4	87.2	87.0	86.7	86.5	86.3	86.1	85.8	85.6	85.4	85.2	84.9	84.7	84.5	84.3	84.0	83.8	83.6	83.4		
83.1	82.9	82.7	82.5	82.2	82.0	81.8	81.6	81.3	81.1	80.9	80.7	80.4	80.2	80.0	79.8	79.5	79.3	79.1	78.9		
78.6	78.3	78.0	77.6	77.3	76.9	76.6	76.2	75.9	75.5	75.2	74.8	74.5	74.1	73.8	73.4	73.1	72.7	72.4	72.0		
71.7	71.3	71.0	70.6	70.3	69.9	69.6	69.2	68.9	68.5	68.2	67.8	67.3	66.9	66.5	66.0	65.6	65.1	64.7	64.3		
63.8	63.4	62.9	62.5	62.1	61.6	61.2	60.7	60.3	59.9	59.4	59.0	58.5	58.1	57.7	57.2	56.8	56.3	55.9	55.5		
55.0	54.6	54.1	53.7	53.3	52.8	52.4	51.9	51.5	51.1	50.6	50.4	50.2	50.0	49.7	49.5	49.3	49.1	48.9	48.7		
48.5	48.2	48.0	47.8	47.6	47.4	47.2	46.9	46.7	46.5	46.3	46.1	45.9	45.6	45.4	45.2	45.0	44.8	44.6	44.4		
44.1	43.8	43.5	43.1	42.8	42.5	42.1	41.8	41.4	41.1	40.7	40.4	40.1	39.7	39.4	39.0	38.7	38.4	38.1	37.9		
37.7	37.5	37.3	37.2	37.0	36.8	36.6	36.5	36.3	36.1	35.9	35.7	35.6	35.4	35.2	35.0	34.9	34.7	34.5	34.3		
34.1	34.0	33.8	33.6	33.4	33.2	33.1	32.9	32.7	32.5	32.4	32.2	32.0	31.8	31.6	31.5	31.3	31.1	30.9	30.8		
30.6	30.4	30.2	30.0	29.9	29.7	29.5	29.3	29.1	29.0	28.8	28.6	28.4	28.3	28.1	27.9	27.7	27.5	27.4	27.2		
27.1																					

Table 20 (Cont'd)

```
NIGHT FOCUS MAX                                          10
        9        301     100.00    -199.00     NIGHT FOCUS MAX
   140.90    100.00METER                          100.00       1.00
   132.10   1000.00FEET                           304.80      49.40
   127.10   2000.00FEET                           609.60      79.50
   115.90      1.00MILE                          1609.34     121.66
   106.40      2.00MILE                          3218.69     151.77
    96.70      5.00MILE                          8046.72     191.56
    93.00     10.00MILE                         16093.44     221.66
    91.60     15.00MILE                         24140.16     239.27
    86.60 100000.00METER                       100000.00     301.00
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140.9	140.6	140.4	140.3	140.1	139.9	139.7	139.5	139.4	139.2	139.0	138.8	138.6	138.4	138.3	138.1	137.9	137.7	137.5	137.4
137.2	137.0	136.8	136.6	136.4	136.3	136.1	135.9	135.7	135.5	135.4	135.2	135.0	134.8	134.6	134.4	134.3	134.1	133.9	133.7
133.5	133.4	133.2	133.0	132.8	132.6	132.4	132.3	132.1	131.9	131.8	131.6	131.4	131.3	131.1	130.9	130.8	130.6	130.4	130.3
130.1	129.9	129.8	129.6	129.4	129.3	129.1	128.9	128.8	128.6	128.4	128.3	128.1	127.9	127.8	127.6	127.4	127.3	127.1	126.8
126.6	126.3	126.0	125.8	125.5	125.2	125.0	124.7	124.4	124.2	123.9	123.6	123.4	123.1	122.9	122.6	122.3	122.1	121.8	121.5
121.3	121.0	120.7	120.5	120.2	119.9	119.7	119.4	119.1	118.9	118.6	118.3	118.1	117.8	117.5	117.3	117.0	116.7	116.5	116.2
115.9	115.6	115.3	115.0	114.7	114.4	114.1	113.7	113.4	113.1	112.8	112.5	112.2	111.8	111.5	111.2	110.9	110.6	110.3	110.0
109.6	109.3	109.0	108.7	108.4	108.1	107.7	107.4	107.1	106.8	106.5	106.2	106.0	105.7	105.5	105.2	105.0	104.8	104.5	104.3
104.0	103.8	103.5	103.3	103.1	102.8	102.6	102.3	102.1	101.8	101.6	101.3	101.1	100.9	100.6	100.4	100.1	99.9	99.6	99.4
99.2	98.9	98.7	98.4	98.2	97.9	97.7	97.4	97.2	97.0	96.7	96.6	96.5	96.3	96.2	96.1	96.0	95.8	95.7	95.6
95.5	95.4	95.2	95.1	95.0	94.9	94.7	94.6	94.5	94.4	94.2	94.1	94.0	93.9	93.8	93.6	93.5	93.4	93.3	93.1
93.0	92.9	92.9	92.8	92.7	92.6	92.5	92.5	92.4	92.3	92.2	92.1	92.1	92.0	91.9	91.8	91.7	91.7	91.6	91.5
91.4	91.3	91.3	91.2	91.1	91.0	90.9	90.9	90.8	90.7	90.6	90.5	90.4	90.4	90.3	90.2	90.1	90.0	90.0	89.9
89.8	89.7	89.6	89.6	89.5	89.4	89.3	89.2	89.2	89.1	89.0	88.9	88.8	88.7	88.7	88.6	88.5	88.4	88.3	88.3
88.2	88.1	88.0	87.9	87.9	87.8	87.7	87.6	87.5	87.5	87.4	87.3	87.2	87.1	87.0	87.0	86.9	86.8	86.7	86.6
86.6																			

Table 20 (Cont'd)

NIGHT FOCUS MEAN					NIGHT FOCUS MEAN	
9	301	100.00	-199.00		11	
139.30	100.00METER				100.00	1.00
130.40	1000.00FEET				304.80	49.40
124.30	2000.00FEET				609.60	79.50
110.90	1.00MILE				1609.34	121.66
101.40	2.00MILE				3218.69	151.77
91.70	5.00MILE				8046.72	191.56
88.00	10.00MILE				16093.44	221.66
86.60	15.00MILE				24140.16	239.27
82.10	100000.00METER				100000.00	301.00

139.3	139.0	138.8	138.7	138.5	138.3	138.1	137.9	137.7	137.6	137.4	137.2	137.0	136.8	136.6	136.4	136.3	136.1	135.9	135.7
135.5	135.3	135.2	135.0	134.8	134.6	134.4	134.2	134.1	133.9	133.7	133.5	133.3	133.1	133.0	132.8	132.6	132.4	132.2	132.0
131.9	131.7	131.5	131.3	131.1	130.9	130.7	130.6	130.4	130.2	130.0	129.8	129.6	129.4	129.2	129.0	128.8	128.6	128.4	128.2
127.9	127.7	127.5	127.3	127.1	126.9	126.7	126.5	126.3	126.1	125.9	125.7	125.5	125.3	125.1	124.9	124.7	124.5	124.3	124.1
123.7	123.5	123.0	122.7	122.4	122.1	121.8	121.4	121.1	120.8	120.5	120.2	119.9	119.5	119.2	118.9	118.6	118.3	117.9	117.6
117.3	117.0	116.7	116.4	116.0	115.7	115.4	115.1	114.8	114.4	114.1	113.8	113.5	113.2	112.9	112.5	112.2	111.9	111.6	111.3
111.0	110.6	110.3	110.0	109.7	109.4	109.1	108.7	108.4	108.1	107.8	107.5	107.2	106.8	106.5	106.2	105.9	105.6	105.3	105.0
104.6	104.3	104.0	103.7	103.4	103.1	102.7	102.4	102.1	101.8	101.5	101.2	101.0	100.7	100.5	100.2	100.0	99.6	99.5	99.3
99.0	98.8	98.5	98.3	98.1	97.8	97.6	97.3	97.1	96.8	96.6	96.3	96.1	95.9	95.6	95.4	95.1	94.9	94.6	94.4
94.2	93.9	93.7	93.4	93.2	92.9	92.7	92.4	92.2	92.0	91.7	91.6	91.5	91.3	91.2	91.1	91.0	90.8	90.7	90.6
90.5	90.4	90.2	90.1	90.0	89.9	89.7	89.6	89.5	89.4	89.2	89.1	89.0	88.9	88.8	88.6	88.5	88.4	88.3	88.1
88.0	87.9	87.9	87.8	87.7	87.6	87.5	87.5	87.4	87.3	87.2	87.1	87.1	87.0	86.9	86.8	86.7	86.7	86.6	86.5
86.4	86.4	86.3	86.2	86.1	86.1	86.0	85.9	85.9	85.8	85.7	85.6	85.6	85.5	85.4	85.3	85.3	85.2	85.1	85.1
85.0	84.9	84.8	84.8	84.7	84.6	84.5	84.5	84.4	84.3	84.3	84.2	84.1	84.0	84.0	83.9	83.8	83.7	83.7	83.6
83.5	83.4	83.4	83.3	83.2	83.2	83.1	83.0	82.9	82.9	82.8	82.7	82.6	82.6	82.5	82.4	82.4	82.3	82.2	82.1
82.1																			

Table 20 (Cont'd)

NIGHT BASE MAX

9	301	100.00	-199.00
138.10	100.00METER		
128.60	1000.00FEET		
122.60	2000.00FEET		
109.60	1.00MILE		
99.60	2.00MILE		
89.20	5.00MILE		
83.50	10.00MILE		
79.90	15.00MILE		
68.10	100000.00METER		

12

NIGHT BASE MAX	
100.00	1.00
304.80	49.40
609.60	79.50
1609.34	121.66
3218.69	151.77
8046.72	191.56
16093.44	221.66
24140.16	239.27
100000.00	301.00

138.1	137.8	137.6	137.4	137.2	137.0	136.8	136.6	136.4	136.2	136.0	135.8	135.6	135.5	135.3	135.1	134.9	134.7	134.5	134.3
134.1	133.9	133.7	133.5	133.3	133.1	132.9	132.7	132.5	132.3	132.1	131.9	131.7	131.5	131.3	131.1	130.9	130.7	130.5	130.3
130.2	130.0	129.8	129.6	129.4	129.2	129.0	128.8	128.6	128.4	128.2	128.0	127.8	127.6	127.4	127.2	127.0	126.8	126.6	126.4
126.2	126.0	125.8	125.6	125.4	125.2	125.0	124.8	124.6	124.4	124.2	124.0	123.8	123.6	123.4	123.2	123.0	122.8	122.6	122.3
122.0	121.7	121.4	121.1	120.8	120.4	120.1	119.8	119.5	119.2	118.9	118.6	118.3	118.0	117.7	117.4	117.1	116.7	116.4	116.1
115.8	115.5	115.2	114.9	114.6	114.3	114.0	113.7	113.4	113.0	112.7	112.4	112.1	111.8	111.5	111.2	110.9	110.6	110.3	110.0
109.7	109.3	109.0	108.7	108.3	108.0	107.7	107.3	107.0	106.7	106.3	106.0	105.7	105.3	105.0	104.7	104.3	104.0	103.7	103.3
103.0	102.7	102.3	102.0	101.7	101.3	101.0	100.7	100.4	100.0	99.7	99.4	99.1	98.9	98.6	98.4	98.1	97.8	97.6	97.3
97.1	96.8	96.5	96.3	96.0	95.7	95.5	95.2	95.0	94.7	94.4	94.2	93.9	93.7	93.4	93.1	92.9	92.6	92.4	92.1
91.8	91.6	91.3	91.0	90.8	90.5	90.3	90.0	89.7	89.5	89.2	89.0	88.8	88.6	88.5	88.3	88.1	87.9	87.7	87.5
87.3	87.1	86.9	86.8	86.6	86.4	86.2	86.0	85.8	85.6	85.4	85.2	85.0	84.9	84.7	84.5	84.3	84.1	83.9	83.7
83.5	83.3	83.1	82.9	82.7	82.5	82.3	82.1	81.9	81.7	81.5	81.3	81.1	80.9	80.7	80.5	80.3	80.1	79.9	79.7
79.5	79.3	79.1	78.9	78.7	78.5	78.3	78.1	77.9	77.8	77.6	77.4	77.2	77.0	76.8	76.6	76.4	76.2	76.0	75.8
75.7	75.5	75.3	75.1	74.9	74.7	74.5	74.3	74.1	73.9	73.7	73.5	73.4	73.2	73.0	72.8	72.6	72.4	72.2	72.0
71.8	71.6	71.4	71.3	71.1	70.9	70.7	70.5	70.3	70.1	69.9	69.7	69.5	69.3	69.2	69.0	68.8	68.6	68.4	68.2
68.1																			

Table 20 (Cont'd)

NIGHT BASE MEAN						NIGHT BASE MEAN	
9	501	100.00	-199.00			13	
135.19	100.00METER					100.00	1.00
124.38	1000.00FEET					304.80	92.96
117.20	2000.00FEET					609.60	79.53
104.60	1.00MILE					1609.34	121.88
95.30	2.00MILE					3218.69	151.77
84.70	5.00MILE					8046.72	191.56
78.80	10.00MILE					16093.44	221.88
76.10	15.00MILE					24140.16	239.27
65.10	100000.00METER					100000.00	301.00

135.1	134.8	134.5	134.3	134.1	133.9	133.6	133.4	133.2	133.0	132.8	132.5	132.3	132.1	131.9	131.6	131.4	131.2	131.0	130.7
130.5	130.3	130.1	129.9	129.6	129.4	129.2	129.0	128.7	128.5	128.3	128.1	127.8	127.6	127.4	127.2	126.9	126.7	126.5	126.3
126.1	125.8	125.6	125.4	125.2	124.9	124.7	124.5	124.3	124.0	123.8	123.6	123.3	123.1	122.9	122.6	122.4	122.2	122.0	121.7
121.4	121.2	121.0	120.7	120.5	120.3	120.0	119.8	119.6	119.3	119.1	118.9	118.6	118.4	118.1	117.9	117.7	117.4	117.2	116.9
116.6	116.3	116.0	115.7	115.4	115.1	114.8	114.5	114.2	113.9	113.6	113.3	113.0	112.7	112.4	112.1	111.8	111.5	111.2	110.9
110.6	110.3	110.0	109.7	109.4	109.1	108.8	108.5	108.2	107.9	107.6	107.3	107.	106.7	106.4	106.1	105.8	105.5	105.2	104.9
104.6	104.3	104.0	103.7	103.4	103.1	102.8	102.5	102.2	101.9	101.6	101.3	101.0	100.7	100.3	100.	99.7	99.4	99.	98.7
98.5	98.2	97.9	97.5	97.2	96.9	96.6	96.3	96.0	95.7	95.4	95.1	94.8	94.5	94.3	94.	93.8	93.5	93.	92.7
92.7	92.4	92.2	91.9	91.6	91.4	91.1	90.8	90.6	90.3	90.0	89.8	89.5	89.2	89.0	88.7	88.4	88.2	87.9	87.6
87.4	87.1	86.8	86.6	86.3	86.0	85.8	85.5	85.2	85.0	84.7	84.5	84.3	84.1	83.9	83.7	83.5	83.3	83.1	82.9
82.8	82.6	82.4	82.2	82.0	81.8	81.6	81.4	81.2	81.0	80.8	80.6	80.4	80.2	80.0	79.8	79.6	79.4	79.2	79.
78.8	78.7	78.5	78.4	78.2	78.1	77.9	77.8	77.6	77.4	77.3	77.1	77.0	76.8	76.7	76.5	76.4	76.2	76.1	75.9
75.7	75.5	75.3	75.2	75.0	74.8	74.6	74.5	74.3	74.1	73.9	73.7	73.6	73.4	73.2	73.1	72.9	72.7	72.5	72.4
72.1	72.0	71.8	71.6	71.4	71.2	71.1	70.9	70.7	70.5	70.4	70.2	70.0	69.8	69.6	69.5	69.3	69.1	68.9	68.7
68.6	68.4	68.2	68.0	67.9	67.7	67.5	67.3	67.1	67.0	66.8	66.6	66.4	66.3	66.1	65.9	65.7	65.5	65.4	65.2
65.1																			

Table 20 (Cont'd)

WIGHT NEG MAX																					
	9		301	100.00	-139.00																
133.60	100.00METER																				
121.60	1000.00FEET																				
111.60	2000.00FEET																				
98.60	1.00MILE																				
90.40	2.00MILE																				
77.40	5.00MILE																				
72.70	10.00MILE																				
67.40	15.00MILE																				
52.60	100000.00METER																				

WIGHT NEG MAX																					
	14																				
WIGHT NEG MAX																					
100.00	1.00																				
304.80	49.40																				
609.60	79.50																				
1609.34	121.66																				
3218.69	151.77																				
8046.72	191.56																				
16093.44	221.66																				
24140.16	239.27																				
100000.00	301.00																				

133.6	133.2	133.0	132.7	132.5	132.2	132.0	131.7	131.5	131.2	131.0	130.7	130.5	130.3	130.0	129.8	129.5	129.3	129.0	128.8		
128.5	128.3	128.0	127.8	127.5	127.3	127.0	126.8	126.5	126.3	126.0	125.8	125.5	125.3	125.0	124.8	124.5	124.3	124.1	123.8		
123.6	123.3	123.1	122.8	122.6	122.3	122.1	121.8	121.6	121.2	120.9	120.6	120.2	119.9	119.6	119.2	118.9	118.6	118.2	117.9		
117.6	117.2	116.9	116.6	116.3	115.9	115.6	115.3	114.9	114.6	114.3	113.9	113.6	113.3	112.9	112.6	112.3	111.9	111.6	111.3		
111.0	110.7	110.4	110.1	109.8	109.4	109.1	108.8	108.5	108.2	107.9	107.6	107.3	107.0	106.7	106.4	106.1	105.7	105.4	105.1		
104.8	104.5	104.2	103.9	103.6	103.3	103.0	102.7	102.4	102.0	101.7	101.4	101.1	100.8	100.5	100.2	99.9	99.6	99.3	99.0		
98.7	98.4	98.1	97.9	97.6	97.3	97.1	96.8	96.6	96.3	96.1	95.8	95.5	95.3	95.0	94.8	94.5	94.2	94.0	93.7		
93.5	93.2	92.9	92.7	92.4	92.2	91.9	91.6	91.4	91.1	90.9	90.6	90.2	89.9	89.5	89.2	88.9	88.5	88.2	87.9		
87.5	87.2	86.8	86.5	86.2	85.8	85.5	85.2	84.8	84.5	84.2	83.8	83.5	83.1	82.8	82.5	82.1	81.8	81.5	81.1		
80.8	80.5	80.1	79.8	79.4	79.1	78.8	78.4	78.1	77.8	77.4	77.3	77.1	76.9	76.8	76.6	76.5	76.3	76.2	76.0		
75.8	75.7	75.5	75.4	75.2	75.1	74.9	74.8	74.6	74.4	74.3	74.1	74.0	73.8	73.7	73.5	73.4	73.2	73.0	72.9		
72.7	72.4	72.1	71.8	71.5	71.2	70.9	70.6	70.3	70.0	69.7	69.4	69.1	68.8	68.5	68.2	67.9	67.6	67.3	67.1		
66.9	66.6	66.4	66.1	65.9	65.7	65.4	65.2	64.9	64.7	64.5	64.2	64.0	63.7	63.5	63.3	63.0	62.8	62.6	62.3		
62.1	61.8	61.6	61.4	61.1	60.9	60.6	60.4	60.2	59.9	59.7	59.4	59.2	59.0	58.7	58.5	58.2	58.0	57.8	57.5		
57.3	57.0	56.8	56.6	56.3	56.1	55.8	55.6	55.4	55.1	54.9	54.6	54.4	54.2	53.9	53.7	53.4	53.2	53.0	52.7		
52.6																					

Table 20 (Cont'd)

| | | |

Table 20 (Cont'd)

NIGHT EX NEG MAX

9 301 100.00 -199.00

122.50	100.00METER
108.80	1000.00FEET
99.60	2000.00FEET
86.60	1.00MILE
78.10	2.00MILE
66.40	5.00MILE
62.00	10.00MILE
58.40	15.00MILE
45.10	100000.00METER

16

NIGHT EX NEG MAX

100.00	1.00
304.80	49.40
609.60	79.50
1609.34	121.66
3218.69	151.77
8046.72	191.56
16093.44	221.66
24140.16	239.27
100000.00	301.00

122.5	122.1	121.8	121.5	121.2	120.9	120.6	120.3	120.1	119.8	119.5	119.2	118.9	118.6	118.3	118.0	117.8	117.5	117.2	116.9
116.6	116.3	116.0	115.8	115.5	115.2	114.9	114.6	114.3	114.0	113.7	113.5	113.2	112.9	112.6	112.3	112.0	111.7	111.4	111.2
110.9	110.6	110.3	110.0	109.7	109.4	109.1	108.9	108.6	108.3	108.0	107.7	107.4	107.1	106.8	106.5	106.2	105.9	105.6	105.3
105.0	104.7	104.4	104.1	103.8	103.5	103.2	102.9	102.6	102.3	102.0	101.7	101.4	101.1	100.8	100.5	100.2	99.9	99.6	99.3
99.0	98.7	98.4	98.1	97.8	97.4	97.1	96.8	96.5	96.2	95.9	95.6	95.3	95.0	94.7	94.4	94.1	93.7	93.4	93.1
92.8	92.5	92.2	91.9	91.6	91.3	91.0	90.7	90.4	90.0	89.7	89.4	89.1	88.8	88.5	88.2	87.9	87.6	87.3	87.0
86.7	86.4	86.1	85.8	85.6	85.3	85.0	84.8	84.5	84.2	84.0	83.7	83.4	83.1	82.9	82.6	82.3	82.1	81.8	81.5
81.3	81.0	80.7	80.5	80.2	79.9	79.6	79.4	79.1	78.8	78.6	78.3	77.9	77.6	77.3	76.9	76.6	76.3	76.0	75.7
75.3	75.0	74.6	74.3	74.0	73.7	73.3	73.0	72.7	72.3	72.0	71.7	71.3	71.0	70.7	70.4	70.1	69.7	69.4	69.1
68.7	68.4	68.1	67.7	67.4	67.1	66.7	66.4	66.1	65.7	65.4	65.3	65.2	65.1	65.0	64.8	64.7	64.6	64.5	64.4
64.3	64.2	64.1	63.9	63.8	63.7	63.6	63.5	63.4	63.3	63.1	63.0	62.9	62.8	62.7	62.6	62.5	62.4	62.2	62.1
62.0	61.8	61.6	61.4	61.2	61.0	60.8	60.6	60.4	60.2	60.0	59.8	59.6	59.4	59.2	59.0	58.8	58.6	58.4	58.2
57.9	57.7	57.5	57.3	57.1	56.8	56.6	56.4	56.2	56.0	55.8	55.6	55.3	55.1	54.9	54.7	54.5	54.3	54.0	53.8
53.6	53.4	53.2	53.0	52.7	52.5	52.3	52.1	51.9	51.7	51.5	51.2	51.0	50.8	50.6	50.4	50.2	50.0	49.7	49.5
49.3	49.1	48.9	48.7	48.4	48.2	48.0	47.8	47.6	47.4	47.1	46.9	46.7	46.5	46.3	46.1	45.9	45.6	45.4	45.2
45.1																			

Table 20 (Cont'd)

NIGHT EX NEG MEAN

9	301	100.00	-199.00
121.30	100.00METER		
106.50	1000.00FEET		
97.60	2000.00FEET		
82.60	1.00MILE		
73.20	2.00MILE		
60.50	5.00MILE		
55.10	10.00MILE		
51.60	15.00MILE		
39.60	100000.00METER		

17

NIGHT EX NEG MEAN	
100.00	1.00
304.80	49.40
609.60	79.50
1609.34	121.66
3218.69	151.77
8046.72	191.56
16093.44	221.66
24140.16	239.27
100000.00	301.00

XY

121.3	120.8	120.5	120.2	119.9	119.6	119.3	119.0	118.7	118.4	118.1	117.8	117.5	117.2	116.9	116.6	116.3	115.9	115.6	115.3
115.0	114.7	114.4	114.1	113.8	113.5	113.2	112.9	112.6	112.3	112.0	111.7	111.4	111.1	110.8	110.4	110.1	109.8	109.5	109.2
108.9	108.6	108.3	108.0	107.7	107.4	107.1	106.8	106.5	106.2	105.9	105.6	105.3	105.0	104.7	104.4	104.1	103.8	103.5	103.2
102.9	102.6	102.3	102.0	101.7	101.4	101.1	100.9	100.6	100.3	100.0	99.7	99.4	99.1	98.8	98.5	98.2	97.9	97.6	97.3
96.9	96.5	96.2	95.8	95.5	95.1	94.8	94.4	94.0	93.7	93.3	93.0	92.6	92.3	91.9	91.6	91.2	90.8	90.5	90.1
89.8	89.4	89.1	88.7	88.4	88.0	87.6	87.3	86.9	86.6	86.2	85.9	85.5	85.1	84.8	84.4	84.1	83.7	83.4	83.0
82.7	82.3	82.0	81.7	81.4	81.1	80.8	80.5	80.2	79.8	79.5	79.2	78.9	78.6	78.3	78.0	77.7	77.3	77.0	76.7
76.4	76.1	75.8	75.5	75.2	74.8	74.5	74.2	73.9	73.6	73.3	73.0	72.6	72.3	72.0	71.7	71.4	71.1	70.7	70.4
70.1	69.8	69.5	69.1	68.8	68.5	68.2	67.9	67.5	67.2	66.9	66.6	66.3	65.9	65.6	65.3	65.0	64.7	64.3	64.0
63.7	63.4	63.1	62.8	62.4	62.1	61.8	61.5	61.2	60.8	60.5	60.3	60.2	60.0	59.8	59.6	59.4	59.3	59.1	58.9
58.7	58.5	58.4	58.2	58.0	57.8	57.6	57.5	57.3	57.1	56.9	56.7	56.6	56.4	56.2	56.0	55.8	55.7	55.5	55.3
55.1	54.9	54.7	54.5	54.3	54.1	53.9	53.7	53.5	53.3	53.1	52.9	52.7	52.5	52.4	52.2	52.0	51.8	51.6	51.4
51.2	51.0	50.8	50.6	50.4	50.2	50.0	49.8	49.6	49.4	49.2	49.0	48.8	48.6	48.4	48.3	48.1	47.9	47.7	47.5
47.3	47.1	46.9	46.7	46.5	46.3	46.1	45.9	45.7	45.5	45.3	45.1	44.9	44.8	44.6	44.4	44.2	44.0	43.8	43.6
43.4	43.2	43.0	42.8	42.6	42.4	42.2	42.0	41.8	41.6	41.4	41.3	41.1	40.9	40.7	40.5	40.3	40.1	39.9	39.7
39.6																			

Table 20 (Cont'd)

NIGHT EX NEG MIN					18	
9	301	100.00	-199.00	NIGHT EX NEG MIN		
117.10	100.00METER				100.00	1.00
100.80	1000.00FEET				304.80	49.40
90.70	2000.00FEET				609.60	79.50
75.10	1.00MILE				1609.34	121.66
64.10	2.00MILE				3218.69	151.77
50.60	5.00MILE				8046.72	191.56
44.60	10.00MILE				16093.44	221.66
40.60	15.00MILE				24140.16	239.27
29.00	100000.00METER				100000.00	301.00

117.1	116.6	116.3	115.9	115.6	115.2	114.9	114.6	114.2	113.9	113.6	113.2	112.9	112.6	112.2	111.9	111.5	111.2	110.9	110.5
110.2	109.9	109.5	109.2	108.8	108.5	108.2	107.8	107.5	107.2	106.8	106.5	106.2	105.8	105.5	105.1	104.8	104.5	104.1	103.8
103.5	103.1	102.8	102.5	102.1	101.8	101.4	101.1	100.8	100.4	100.1	99.8	99.4	99.1	98.8	98.4	98.1	97.7	97.4	97.1
96.7	96.4	96.1	95.7	95.4	95.1	94.7	94.4	94.1	93.7	93.4	93.1	92.7	92.4	92.0	91.7	91.4	91.0	90.7	90.3
90.0	89.6	89.2	88.9	88.5	88.1	87.7	87.4	87.0	86.6	86.3	85.9	85.5	85.2	84.8	84.4	84.0	83.7	83.3	82.9
82.6	82.2	81.8	81.5	81.1	80.7	80.3	80.0	79.6	79.2	78.9	78.5	78.1	77.8	77.4	77.0	76.6	76.3	75.9	75.5
75.2	74.8	74.4	74.1	73.7	73.3	73.0	72.6	72.2	71.9	71.5	71.1	70.8	70.4	70.0	69.7	69.3	68.9	68.6	68.2
67.9	67.5	67.1	66.8	66.4	66.0	65.7	65.3	64.9	64.6	64.2	63.9	63.5	63.2	62.8	62.5	62.2	61.8	61.5	61.1
60.8	60.5	60.1	59.8	59.4	59.1	58.8	58.4	58.1	57.7	57.4	57.1	56.7	56.4	56.0	55.7	55.4	55.0	54.7	54.4
54.0	53.7	53.3	53.0	52.7	52.3	52.0	51.6	51.3	51.0	50.6	50.4	50.2	50.0	49.8	49.6	49.4	49.2	49.0	48.8
48.6	48.4	48.2	48.0	47.8	47.6	47.4	47.2	47.0	46.8	46.6	46.4	46.2	46.0	45.8	45.6	45.4	45.2	45.0	44.8
44.6	44.4	44.2	44.0	43.7	43.5	43.3	43.0	42.8	42.6	42.4	42.1	41.9	41.7	41.5	41.2	41.0	40.8	40.6	40.4
40.2	40.0	39.8	39.6	39.4	39.2	39.1	38.9	38.7	38.5	38.3	38.1	37.9	37.7	37.6	37.4	37.2	37.1	36.8	36.7
36.4	36.2	36.0	35.9	35.7	35.5	35.3	35.1	34.9	34.7	34.5	34.4	34.2	34.0	33.8	33.6	33.4	33.2	33.0	32.9
32.7	32.5	32.3	32.1	31.9	31.7	31.5	31.3	31.2	31.0	30.8	30.6	30.4	30.2	30.0	29.8	29.7	29.5	29.3	29.1
29.0																			

Table 20 (Cont'd)

| DAY FOCUS PERCENT | | |

Table 20 (Cont'd)

DAY BASE PERCENT					DAY BASE PERCENT	
7	301	100.00	-199.00		20	
25.07	1000.00FEET				304.80	49.40
32.44	2000.00FEET				609.60	79.50
18.53	1.00MILE				1609.34	121.66
20.60	2.00MILE				3218.69	151.77
25.90	5.00MILE				8046.72	191.56
31.80	10.00MILE				16093.44	221.66
30.00	15.00MILE				24140.16	239.27

25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.3	25.6	25.8	26.1	26.3	26.6	26.8	27.1	27.3	27.5	27.8	
28.0	28.3	28.5	28.8	29.0	29.3	29.5	29.7	30.0	30.2	30.5	30.7	31.0	31.2	31.5	31.7	31.9	32.2	32.4	32.1	
31.8	31.5	31.1	30.8	30.5	30.1	29.8	29.5	29.1	28.8	28.5	28.2	27.8	27.5	27.2	26.8	26.5	26.2	25.8	25.5	
25.2	24.9	24.5	24.2	23.9	23.5	23.2	22.9	22.5	22.2	21.9	21.6	21.2	20.9	20.6	20.2	19.9	19.6	19.2	18.9	
18.6	18.6	18.7	18.7	18.8	18.9	18.9	19.0	19.1	19.1	19.2	19.3	19.3	19.4	19.5	19.6	19.6	19.7	19.8	19.8	
19.9	20.0	20.0	20.1	20.2	20.2	20.3	20.4	20.4	20.5	20.6	20.7	20.8	21.0	21.1	21.2	21.4	21.5	21.6	21.8	
21.9	22.0	22.2	22.3	22.4	22.6	22.7	22.8	23.0	23.1	23.2	23.4	23.5	23.6	23.8	23.9	24.0	24.2	24.3	24.4	
24.6	24.7	24.8	25.0	25.1	25.2	25.4	25.5	25.6	25.8	25.9	26.1	26.3	26.5	26.7	26.9	27.1	27.3	27.5	27.7	
27.8	28.0	28.2	28.4	28.6	28.8	29.0	29.2	29.4	29.6	29.8	30.0	30.2	30.4	30.6	30.8	31.0	31.2	31.4	31.6	
31.8	31.7	31.6	31.5	31.4	31.3	31.2	31.1	31.0	30.9	30.8	30.7	30.6	30.5	30.4	30.3	30.2	30.1	30.0	30.0	
30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
30.0																				

Table 20 (Cont'd)

```
DAY NEG PERCENT                                 21
      7         301      100.00    -199.00    DAY NEG PERCENT
    72.69    1000.00FEET                            304.80       49.40
    59.22    2000.00FEET                            609.60       79.50
    64.88       1.00MILE                           1609.34      121.66
    39.60       2.00MILE                           3218.69      151.77
    35.00       5.00MILE                           8046.72      191.56
    32.60      10.00MILE                          16093.44      221.66
    32.10      15.00MILE                          24140.16      239.27
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72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7
72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7
72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.2	71.8	71.3	70.9	70.4	70.0	69.5	69.1	68.6	68.2	67.7
67.3	66.8	66.4	65.9	65.5	65.0	64.6	64.1	63.7	63.2	62.8	62.4	61.9	61.5	61.0	60.6	60.1	59.7	59.2	[illegible]
59.5	59.6	59.8	59.9	60.0	60.2	60.3	60.4	60.6	60.7	60.8	61.0	61.1	61.2	61.4	61.5	61.6	61.8	61.9	[illegible]
62.2	62.3	62.4	62.6	62.7	62.8	63.0	63.1	63.2	63.4	63.5	63.6	63.8	63.9	64.1	64.2	64.3	64.5	64.6	[illegible]
64.9	64.2	63.3	62.5	61.7	60.8	60.0	59.1	58.3	57.5	56.6	55.8	54.9	54.1	53.3	52.4	51.6	50.7	49.9	[illegible]
48.2	47.4	46.5	45.7	44.9	44.0	43.2	42.3	41.5	40.7	39.8	39.5	39.4	39.3	39.2	39.1	38.9	38.8	38.7	38.6
38.5	38.4	38.2	38.1	38.0	37.9	37.8	37.7	37.6	37.4	37.3	37.2	37.1	37.0	36.9	36.7	36.6	36.5	36.4	36.3
36.2	36.0	35.9	35.8	35.7	35.6	35.5	35.4	35.2	35.1	35.0	34.9	34.8	34.8	34.7	34.6	34.5	34.4	34.4	34.3
34.2	34.1	34.0	34.0	33.9	33.8	33.7	33.6	33.6	33.5	33.4	33.3	33.3	33.2	33.1	33.0	32.9	32.9	32.8	32.7
32.6	32.6	32.5	32.5	32.5	32.5	32.4	32.4	32.4	32.3	32.3	32.3	32.3	32.2	32.2	32.2	32.2	32.1	32.1	[illegible]
32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
32.1																			

Table 20 (Cont'd)

DAY Ex NEG PERCENT				22	
7	301	100.00	-199.00	DAY EX NEG PERCENT	
2.24	1000.00FEET			304.80	49.40
8.34	2000.00FEET			609.60	79.50
16.13	1.00MILE			1609.34	121.66
37.50	2.00MILE			3218.69	151.77
29.50	5.00MILE			8046.72	191.56
25.90	10.00MILE			16093.44	221.66
34.80	15.00MILE			24140.16	239.27

2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.5	
4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.3	8.5	
8.7	8.9	9.1	9.3	9.4	9.6	9.8	10.0	10.2	10.4	10.6	10.7	10.9	11.1	11.3	11.5	11.7	11.8	12.0	12.2	
12.4	12.6	12.8	13.0	13.1	13.3	13.5	13.7	13.9	14.1	14.3	14.4	14.6	14.8	15.0	15.2	15.4	15.5	15.7	15.9	
16.1	16.7	17.4	18.1	18.9	19.6	20.3	21.0	21.7	22.4	23.1	23.8	24.5	25.2	26.0	26.7	27.4	28.1	28.8	29.5	
30.2	30.9	31.6	32.3	33.1	33.8	34.5	35.2	35.9	36.6	37.3	37.4	37.2	37.0	36.7	36.5	36.3	36.1	35.9	35.7	
35.5	35.3	35.1	34.9	34.7	34.5	34.3	34.1	33.9	33.7	33.5	33.3	33.1	32.9	32.7	32.5	32.3	32.1	31.9	31.7	
31.5	31.3	31.1	30.9	30.7	30.5	30.3	30.1	29.9	29.7	29.5	29.4	29.3	29.1	29.0	28.9	28.8	28.7	28.6	28.4	
28.3	28.2	28.1	28.0	27.8	27.7	27.6	27.5	27.4	27.2	27.1	27.0	26.9	26.8	26.6	26.5	26.4	26.3	26.2	26.	
25.9	26.3	26.8	27.3	27.8	28.3	28.8	29.4	29.9	30.4	30.9	31.4	31.9	32.4	32.9	33.4	33.9	34.4	34.8	34.8	
34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	
34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	
34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8	
34.8																				

Table 20 (Cont'd)

NIGHT FOCUS	PERCENT				23	
	7	301	100.00	-199.00	NIGHT FOCUS	PERCENT
	0.00	1000.00FEET			304.80	49.40
	0.00	2000.00FEET			609.60	79.50
	2.64	1.00MILE			1609.34	121.66
	6.10	2.00MILE			3218.69	151.77
	7.60	5.00MILE			8046.72	191.56
	7.10	10.00MILE			16093.44	221.66
	4.40	15.00MILE			24140.16	239.27

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
.1	.2	.3	.3	.4	.4	.5	.6	.6	.7	.8	.8	.9	.9	1.0	1.1	1.1	1.2	1.3	1.3
1.4	1.4	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.5
2.6	2.7	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.5	4.6	4.7	4.8
4.9	5.0	5.1	5.3	5.4	5.5	5.6	5.7	5.8	6.0	6.1	6.1	6.2	6.2	6.2	6.3	6.3	6.4	6.4	6.4
6.5	6.5	6.5	6.6	6.6	6.7	6.7	6.7	6.8	6.8	6.8	6.9	6.9	7.0	7.0	7.0	7.1	7.1	7.1	7.2
7.2	7.3	7.3	7.3	7.4	7.4	7.4	7.5	7.5	7.6	7.6	7.6	7.6	7.6	7.6	7.5	7.5	7.5	7.5	7.5
7.4	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.2	7.3	7.3	7.2	7.2	7.2	7.2	7.2	7.2	7.1	7.1
7.1	7.0	6.8	6.7	6.5	6.4	6.2	6.1	5.9	5.7	5.6	5.4	5.3	5.1	5.0	4.8	4.7	4.5	4.4	4.4
4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.4																			

Table 20 (Cont'd)

NIGHT BASE PERCENT						NIGHT BASE PERCENT	
7	301	100.00	-199.00	24			
27.34	1000.00FEET			304.80	49.40		
47.67	2000.00FEET			609.60	79.50		
65.86	1.00MILE			1609.34	121.66		
39.00	2.00MILE			3218.69	151.77		
27.30	5.00MILE			8046.72	191.56		
20.00	10.00MILE			16093.44	221.66		
16.70	15.00MILE			24140.16	239.27		

27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	28.1	28.8	29.4	30.1	30.8	31.5	32.1	32.8	33.5	34.2	34.8	
35.5	36.2	36.9	37.5	38.2	38.9	39.6	40.2	40.9	41.6	42.3	42.9	43.6	44.3	45.0	45.6	46.3	47.0	47.7	48.1	
48.5	49.0	49.4	49.8	50.3	50.7	51.1	51.6	52.0	52.4	52.8	53.3	53.7	54.1	54.6	55.0	55.4	55.9	56.3	56.7	
57.2	57.6	58.0	58.5	58.9	59.3	59.7	60.2	60.6	61.0	61.5	61.9	62.3	62.8	63.2	63.6	64.1	64.5	64.9	65.4	
65.8	65.1	64.2	63.3	62.4	61.5	60.7	59.8	58.9	58.0	57.1	56.2	55.3	54.4	53.5	52.6	51.7	50.8	49.9	49.1	
48.2	47.3	46.4	45.5	44.6	43.7	42.8	41.9	41.0	40.1	39.2	38.8	38.5	38.2	37.9	37.6	37.3	37.0	36.7	36.4	
36.1	35.8	35.6	35.3	35.0	34.7	34.4	34.1	33.8	33.5	33.2	32.9	32.6	32.3	32.0	31.7	31.4	31.1	30.8	30.6	
30.3	30.0	29.7	29.4	29.1	28.8	28.5	28.2	27.9	27.6	27.3	27.1	26.8	26.6	26.3	26.1	25.9	25.6	25.4	25.1	
24.9	24.6	24.4	24.2	23.9	23.7	23.4	23.2	22.9	22.7	22.5	22.2	22.0	21.7	21.5	21.3	21.0	20.8	20.5	20.3	
20.0	19.8	19.7	19.5	19.3	19.1	18.9	18.7	18.5	18.3	18.2	18.0	17.8	17.6	17.4	17.2	17.0	16.8	16.7	16.7	
16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	
16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	
16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	
16.7																				

Table 20 (Cont'd)

NIGHT NEG PERCENT					NIGHT NEG PERCENT	
7	301	100.00	-199.00	25		
72.66	1000.00FEET				304.80	49.40
44.21	2000.00FEET				609.60	79.50
24.35	1.00MILE				1609.34	121.64
29.50	2.00MILE				3218.69	151.77
31.30	5.00MILE				8046.72	191.56
25.00	10.00MILE				16093.44	221.66
33.70	15.00MILE				24140.16	239.27

72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7
72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7
72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	72.7	71.6	70.7	69.7	68.8	67.8	66.9	66.0	65.1	64.1	63.1	62.2
61.2	60.3	59.3	58.4	57.4	56.5	55.6	54.6	53.7	52.7	51.8	50.8	49.9	48.9	48.0	47.1	46.1	45.2	44.2	43.3
43.3	42.8	42.3	41.9	41.4	40.9	40.4	40.0	39.5	39.0	38.6	38.1	37.6	37.1	36.7	36.2	35.7	35.3	34.8	34.3
33.8	33.4	32.9	32.4	32.0	31.5	31.0	30.6	30.1	29.6	29.1	28.7	28.2	27.7	27.3	26.8	26.3	25.8	25.4	24.9
24.4	24.5	24.7	24.8	25.0	25.2	25.3	25.5	25.7	25.9	26.0	26.2	26.4	26.5	26.7	26.9	27.1	27.2	27.4	27.6
27.7	27.9	28.1	28.3	28.4	28.6	28.8	28.9	29.1	29.3	29.5	29.5	29.6	29.8	29.7	29.7	29.8	29.8	29.8	29.9
29.9	30.0	30.0	30.1	30.1	30.2	30.2	30.3	30.3	30.3	30.4	30.4	30.5	30.5	30.6	30.6	30.7	30.7	30.8	30.8
30.8	30.9	30.9	31.0	31.0	31.1	31.1	31.2	31.2	31.3	31.3	31.1	30.9	30.7	30.5	30.3	30.1	29.8	29.6	29.4
29.2	29.0	28.8	28.6	28.4	28.2	28.0	27.8	27.5	27.3	27.1	26.9	26.7	26.5	26.3	26.1	25.9	25.7	25.5	25.2
25.0	25.4	25.9	26.4	26.9	27.4	27.9	28.4	28.9	29.4	29.9	30.4	30.8	31.3	31.8	32.3	32.8	33.3	33.7	33.7
33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7
33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7
33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7
33.7																			

Table 20 (Cont'd)

NIGHT EX NEG PERCENT						26		
7	301	100.00	-199.00		NIGHT EX NEG	PERCENT		
0.00	1000.00FEET				304.80	49.40		
8.12	2000.00FEET				609.60	79.50		
7.15	1.00MILE				1609.34	121.66		
25.00	2.00MILE				3218.69	151.77		
33.80	5.00MILE				8046.72	191.56		
47.90	10.00MILE				16093.44	221.66		
45.20	15.00MILE				24140.16	239.27		

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	.6	.8	1.1	1.4	1.6	1.9	2.2	2.5	2.7	3.0
3.3	3.5	3.8	4.1	4.3	4.6	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.8	7.0	7.3	7.6	7.8	8.1	8.1
8.1	8.1	8.0	8.0	8.0	8.0	7.9	7.9	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.7	7.7	7.7	7.7	7.6
7.6	7.6	7.6	7.5	7.5	7.5	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.3	7.2	7.2	7.2	7.2
7.2	7.7	8.3	8.9	9.5	10.1	10.7	11.3	11.9	12.5	13.1	13.7	14.3	14.9	15.5	16.1	16.8	17.4	18.0	18.6
19.2	19.8	20.4	21.0	21.6	22.2	22.8	23.4	24.0	24.6	25.2	25.8	25.8	26.0	26.2	26.4	26.6	26.8	27.0	27.2
27.5	27.7	27.9	28.1	28.3	28.5	28.7	28.9	29.1	29.4	29.6	29.8	30.0	30.2	30.4	30.6	30.8	31.0	31.3	31.5
31.7	31.9	32.1	32.3	32.5	32.7	32.9	33.2	33.4	33.6	33.8	34.2	34.7	35.2	35.8	36.1	36.6	37.0	37.5	38.0
38.5	38.9	39.4	39.9	40.3	40.8	41.3	41.7	42.2	42.7	43.1	43.6	44.1	44.5	45.0	45.5	45.9	46.4	46.9	47.4
47.8	47.8	47.6	47.5	47.3	47.2	47.0	46.9	46.7	46.5	46.4	46.2	46.1	45.9	45.8	45.6	45.5	45.3	45.2	45.2
45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2
45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2
45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2
45.2																			

Table 20 (Cont'd)

CHARGE	SIZE	CORRECTI
	21	
-29.80		.01
-28.10		.02
-22.50		.04
-18.90		.08
-15.40		.16
-12.00		.31
-8.80		.63
-5.8		1.25
-2.7		2.50
		5.00
2.40		10.00
4.8		20.00
7.20		40.00
8.50		80.00
10.20		160.00
11.80		320.00
13.40		640.00
14.90		1280.00
16.40		2560.00
17.60		5120.00
18.20		9999.00

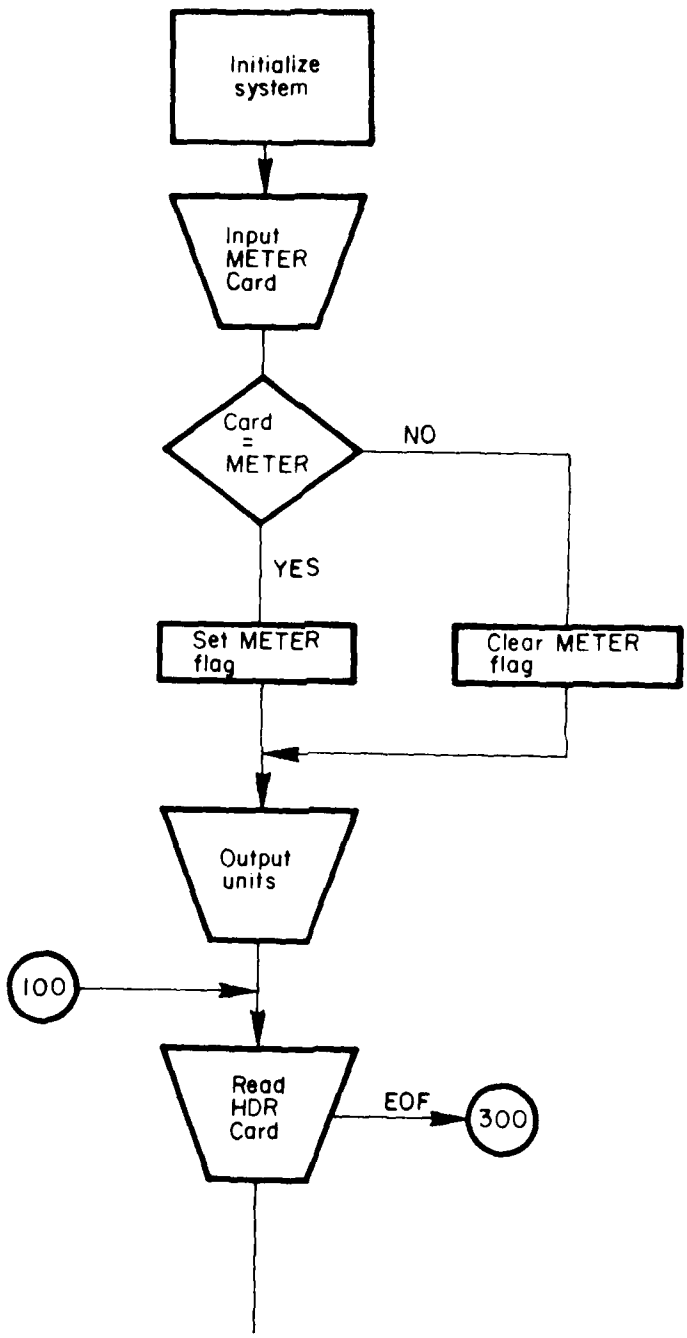

Figure 5 CDNL flowchart

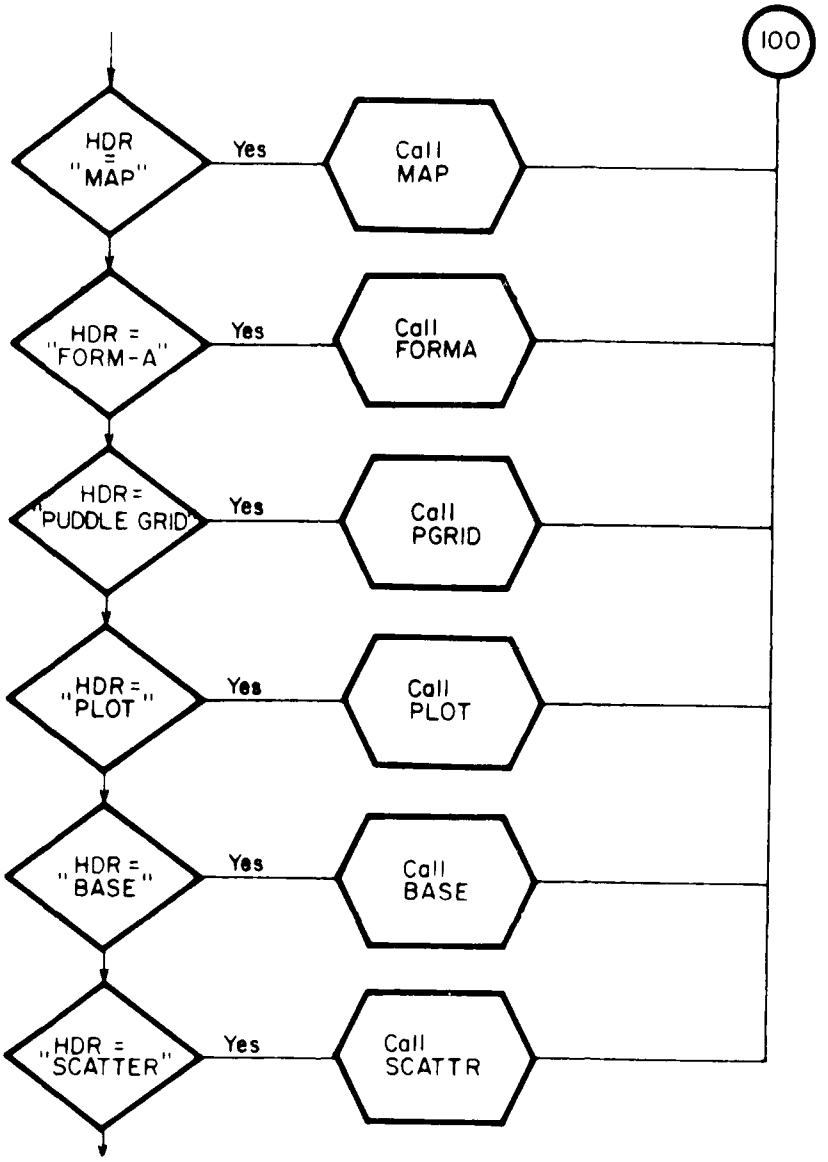

Figure 5. (Cont'd)

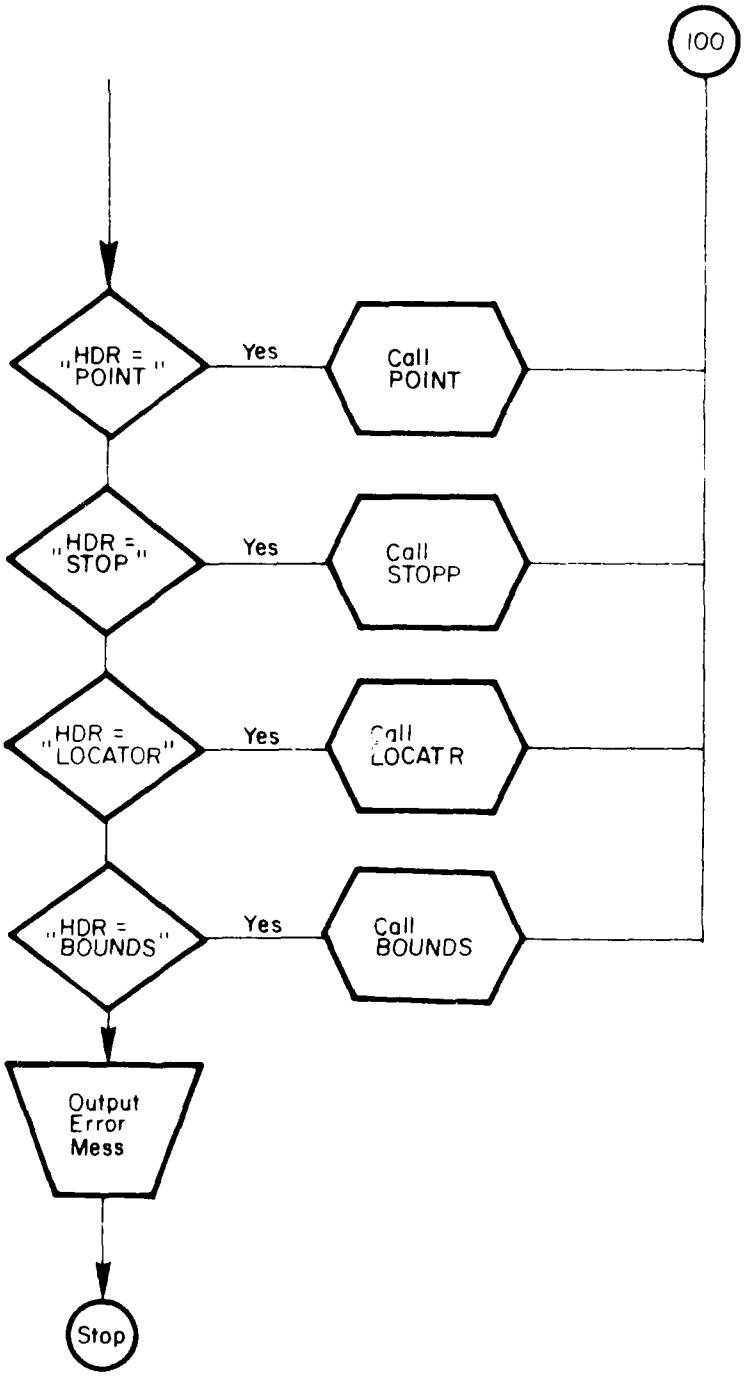

Figure 5. (Cont'd)

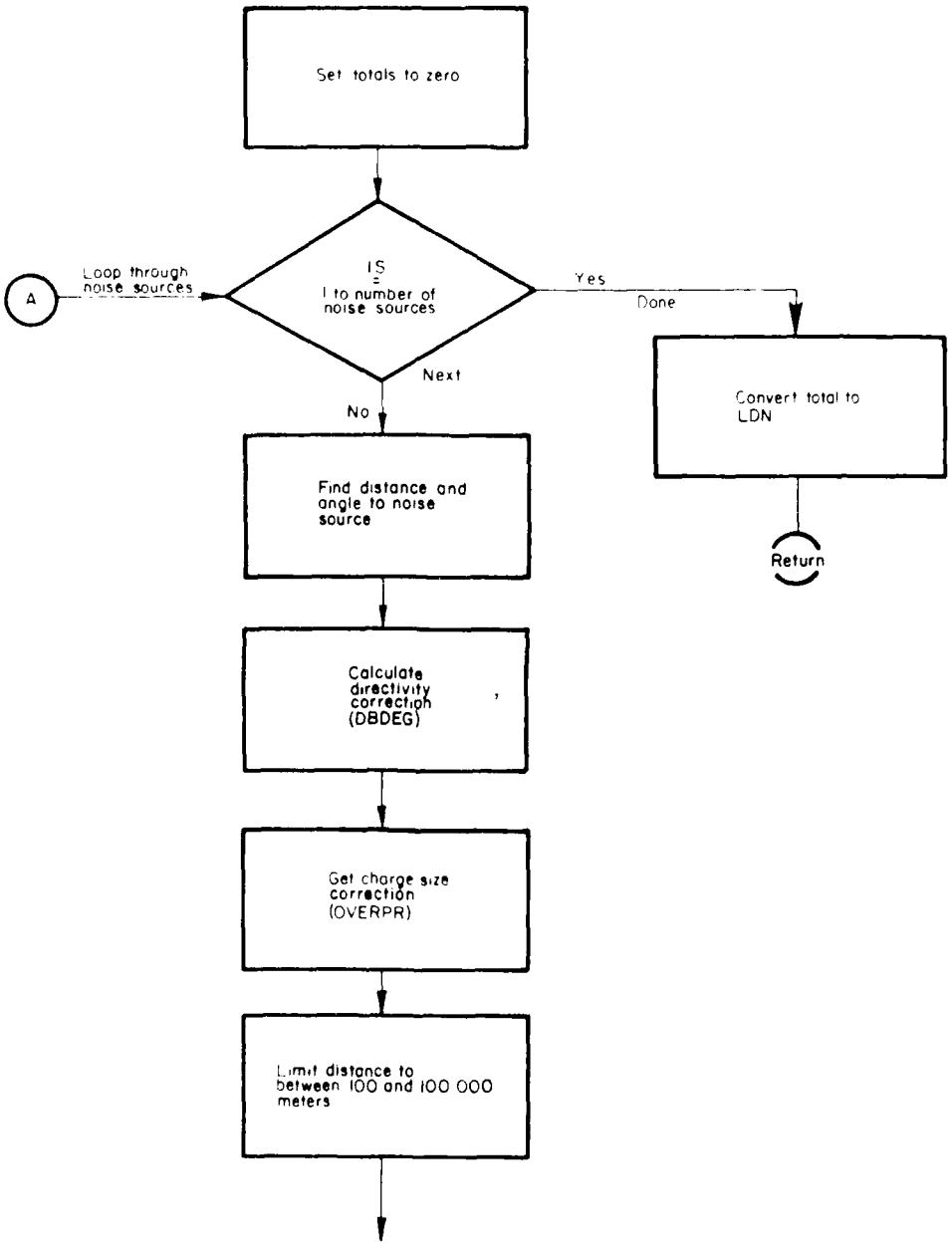

Figure 6 CALCNR flowchart

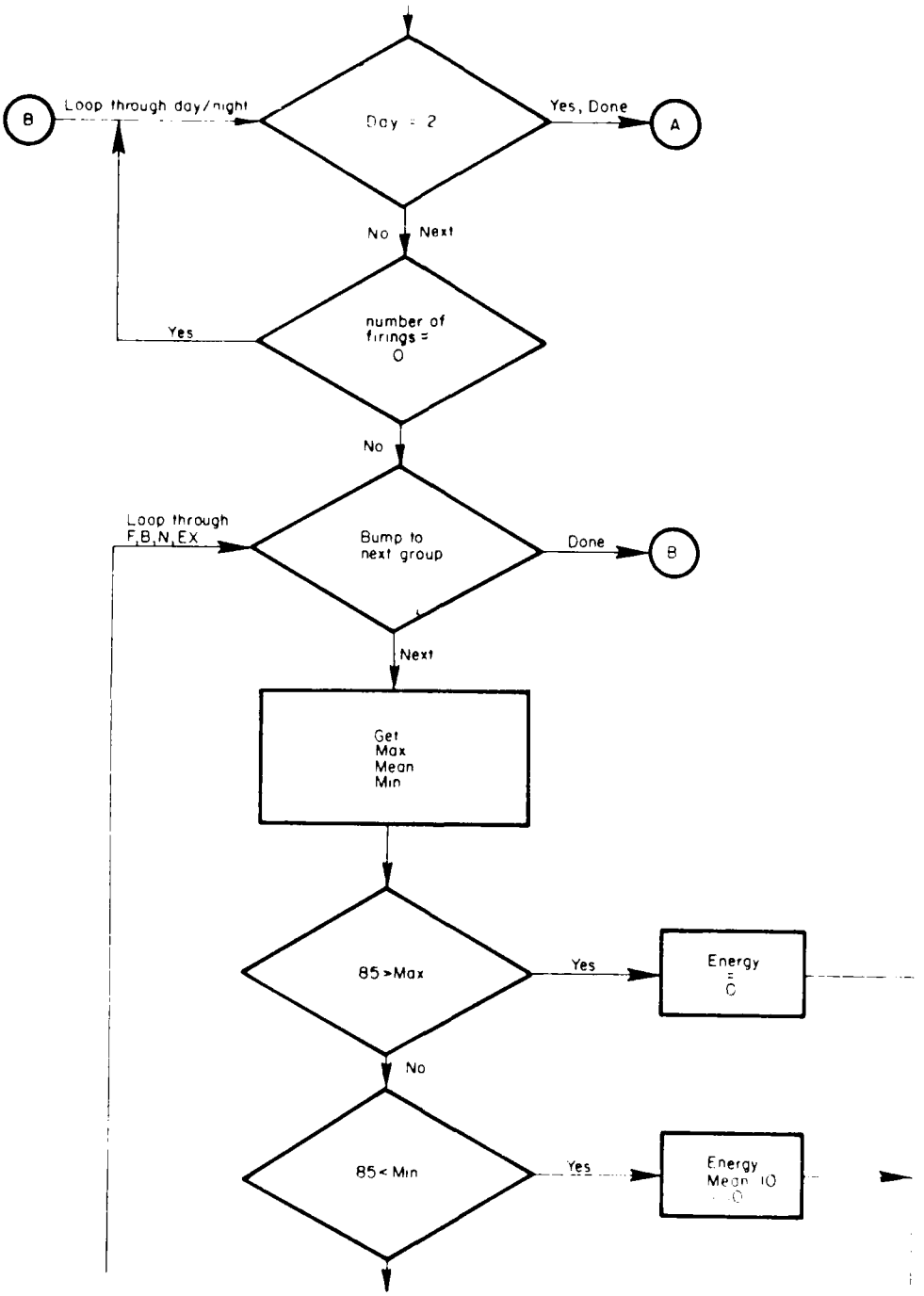

Figure 6. (Cont'd)

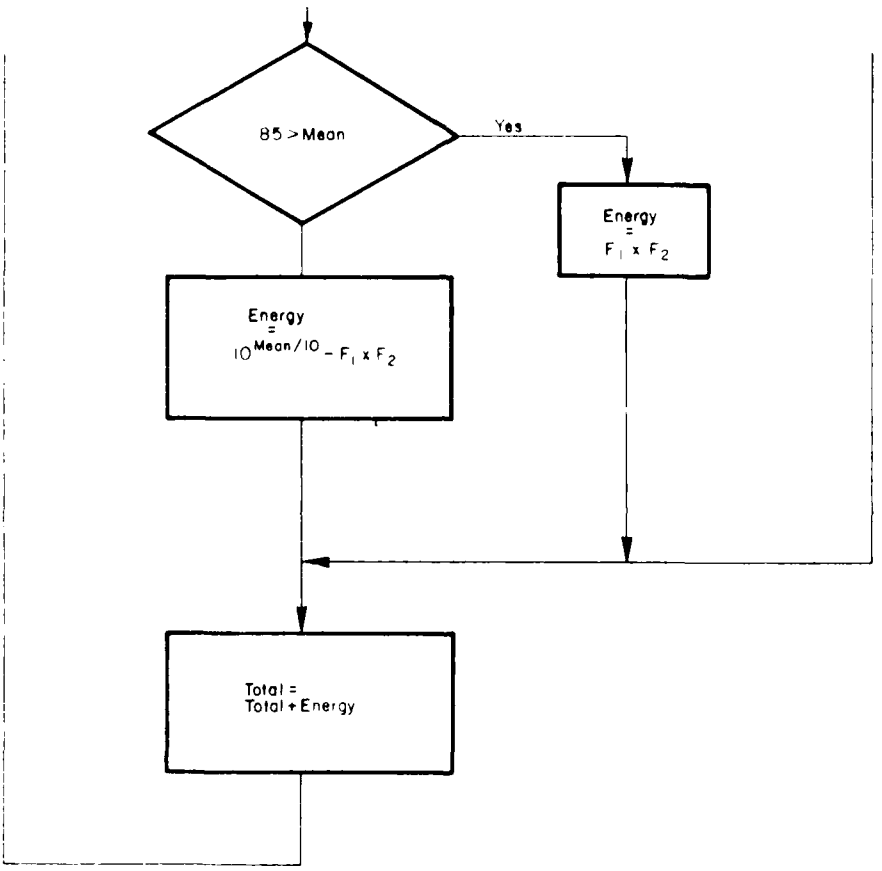

Figure 6. (Cont'd).

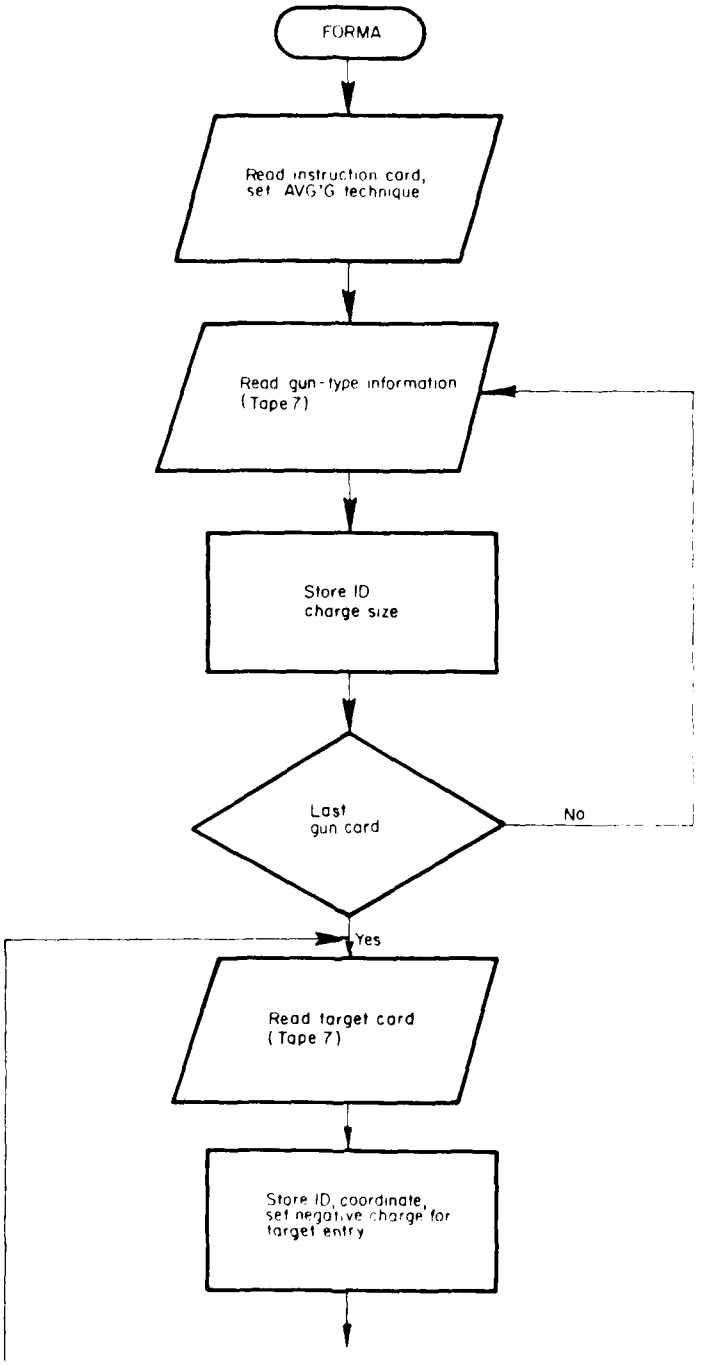

Figure 7 FORMA flowchart

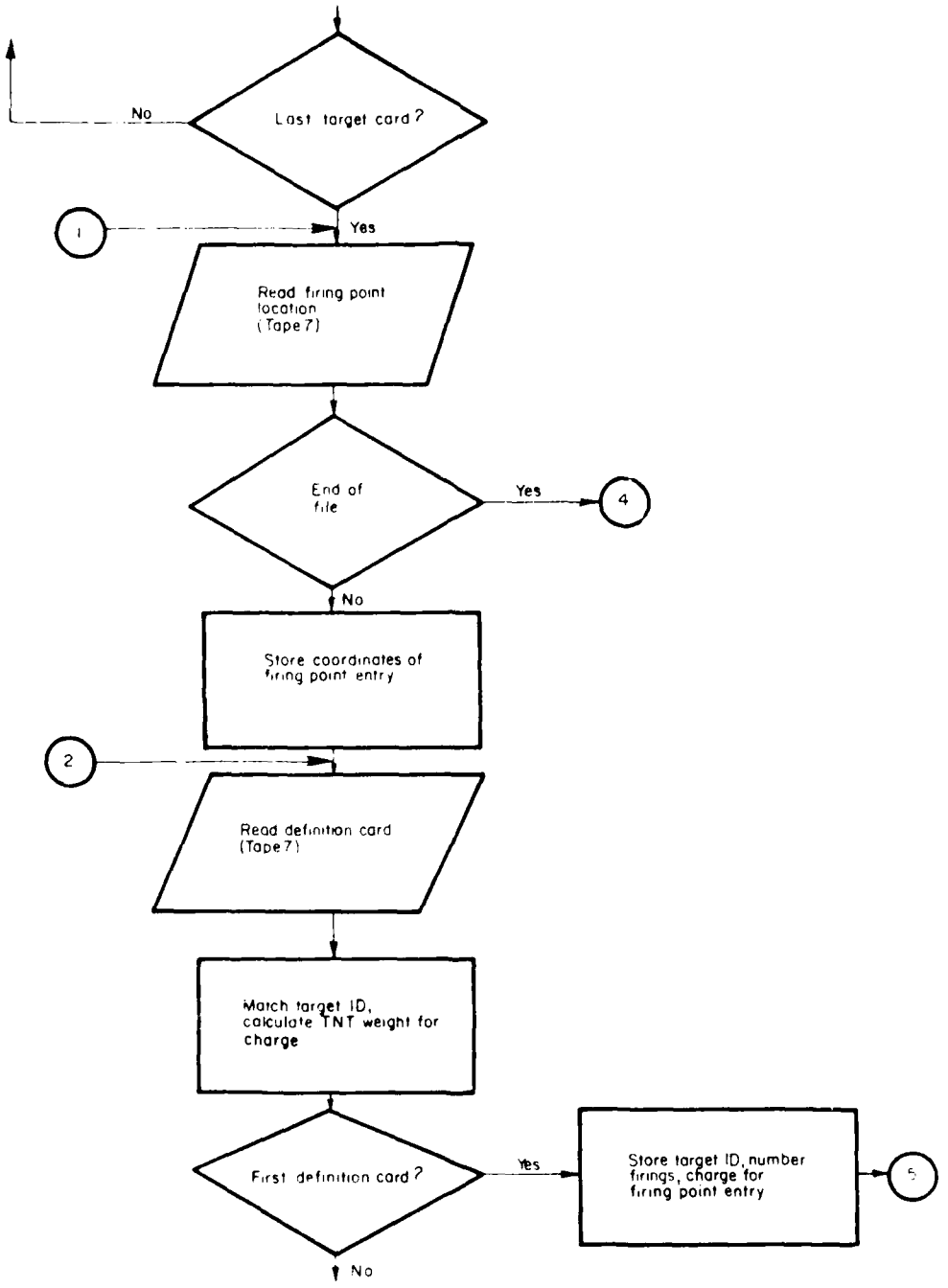

Figure 7. (Cont'd)

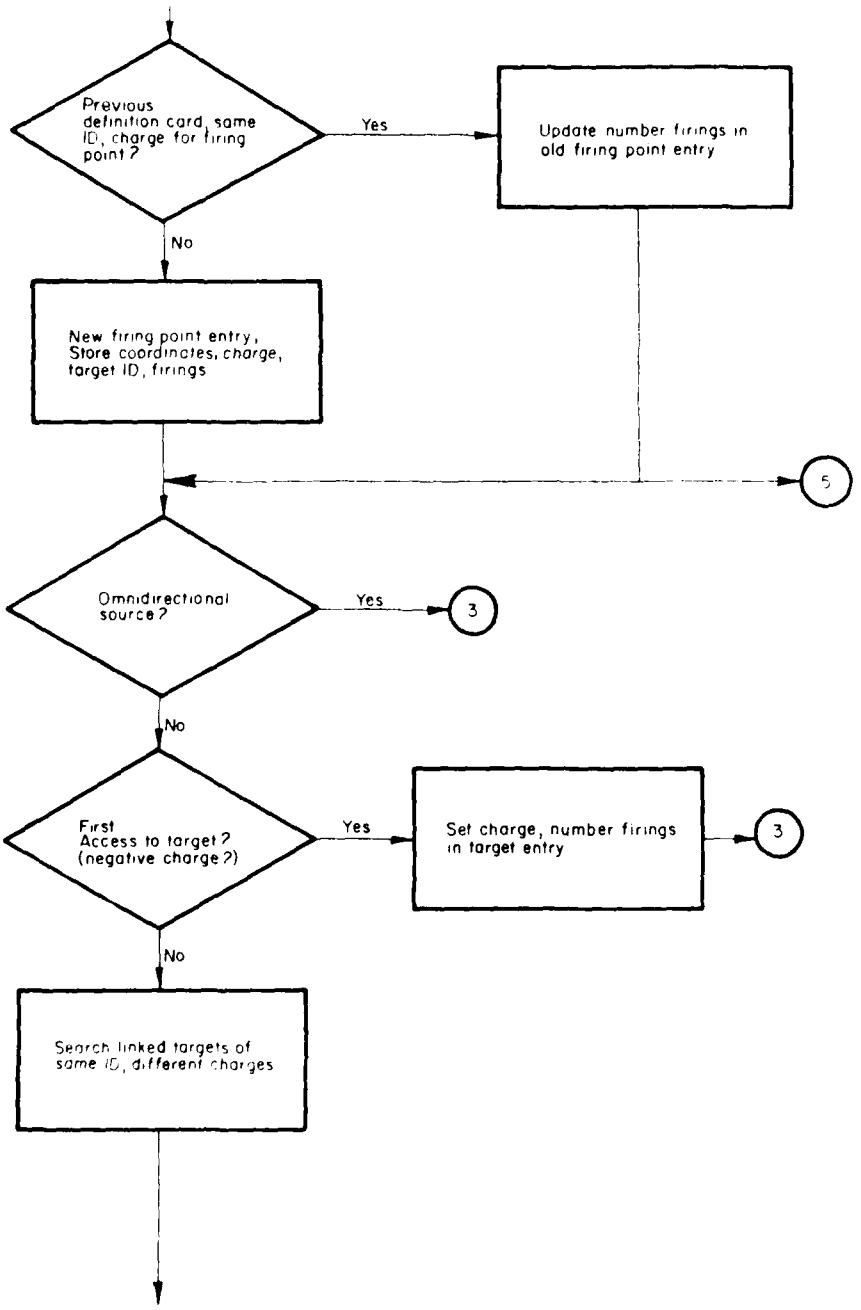

Figure 7. (Cont'd)

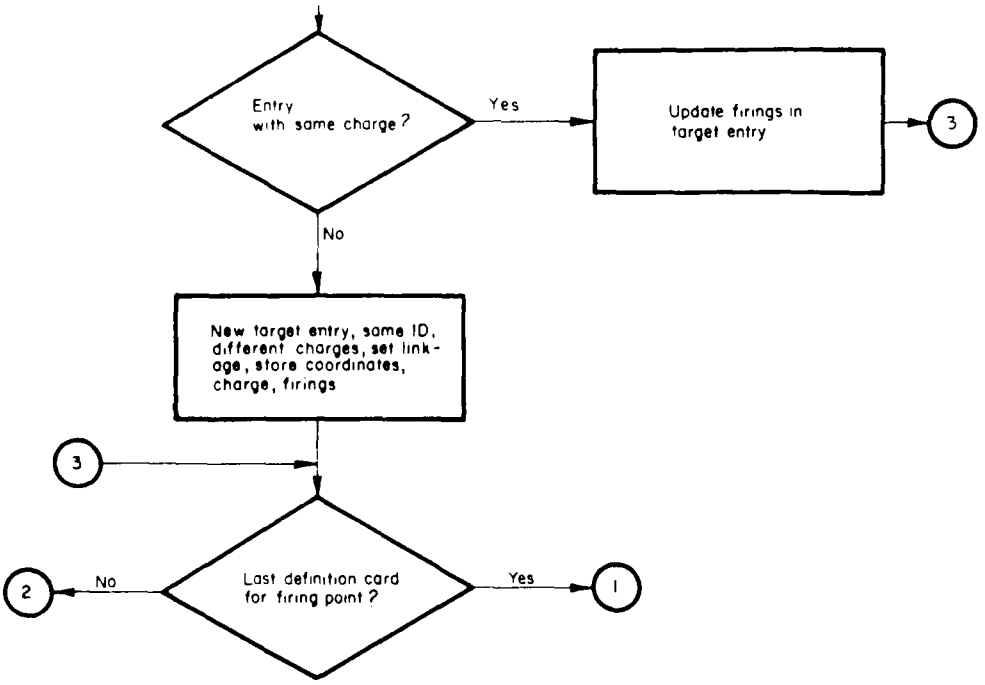

Figure 7. (Cont'd).

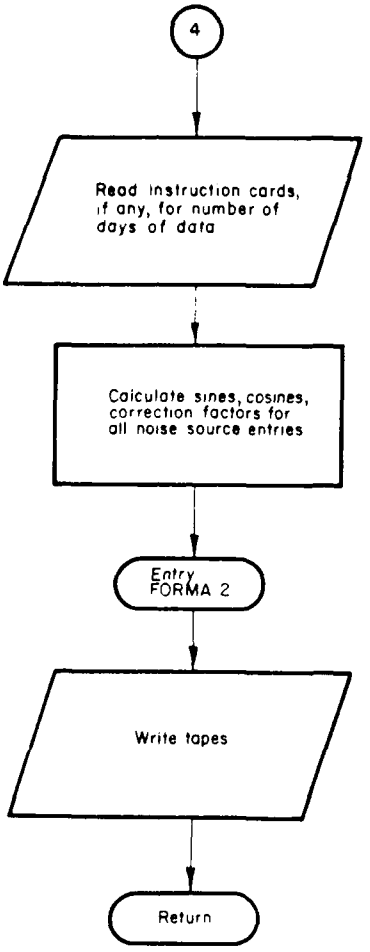

Figure 7. (Cont'd)

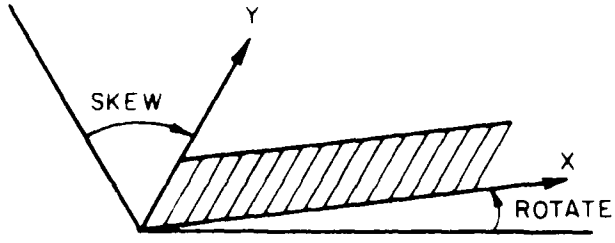

Figure 8 Determination of angles.

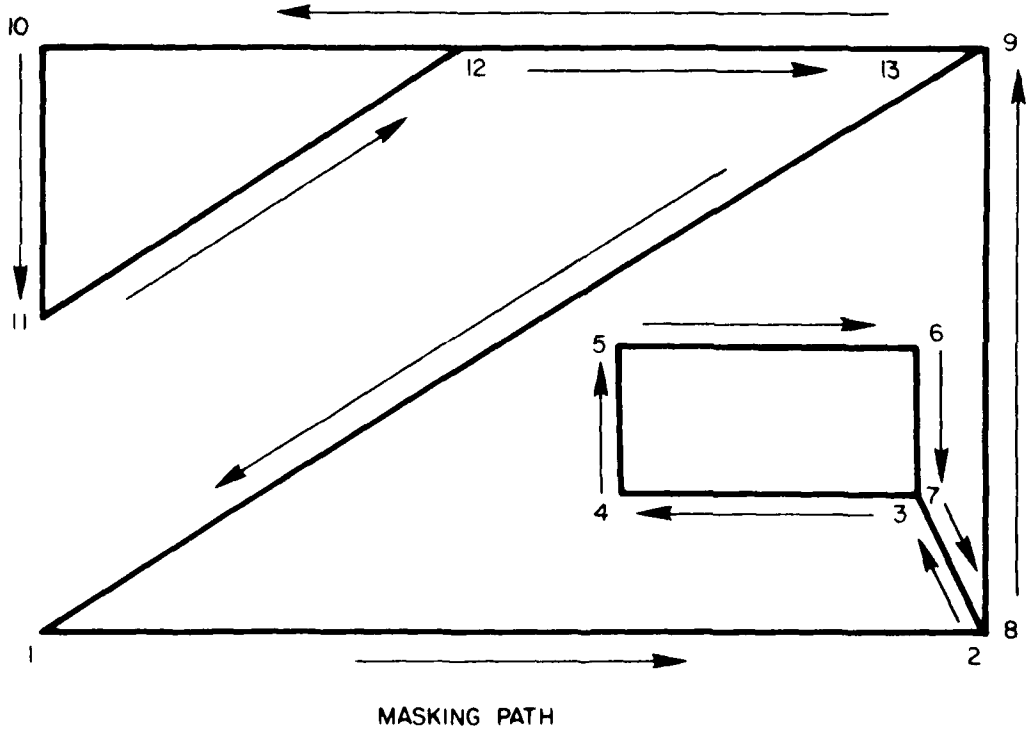

Figure 9 Masking path.

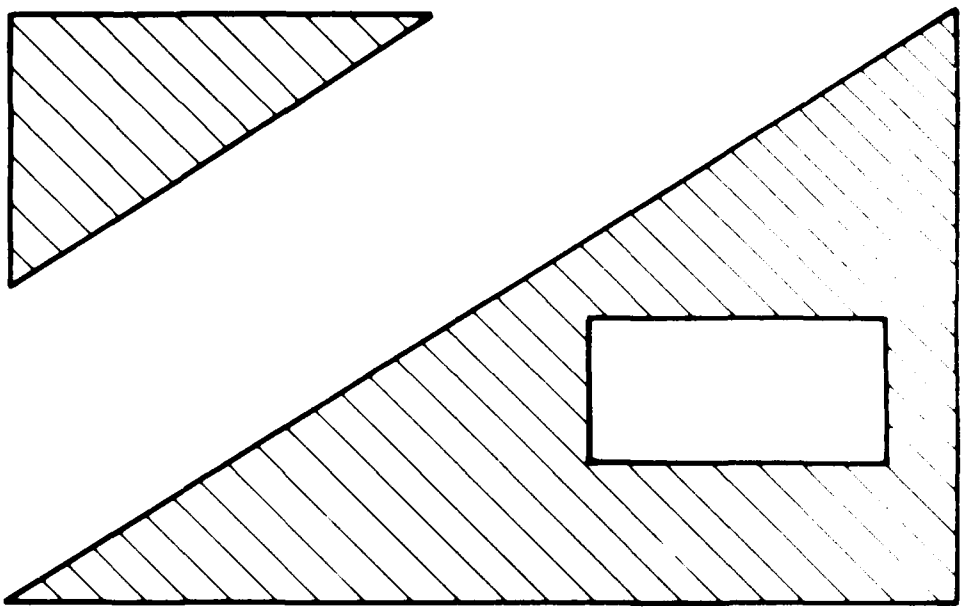

Figure 10 Contouring regions

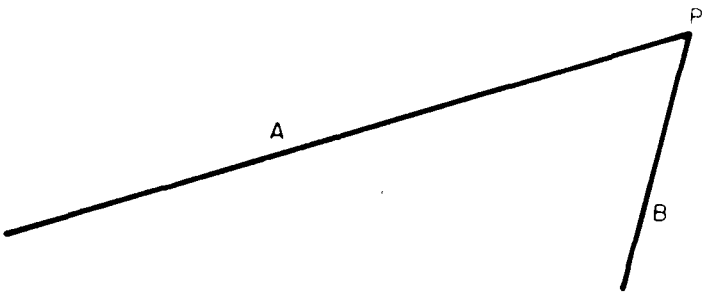

Figure 11 Pair of contour segments

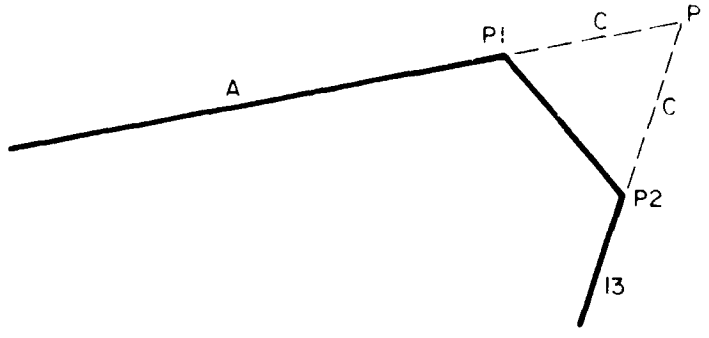

Figure 12. C as less than or equal to one-third of A.

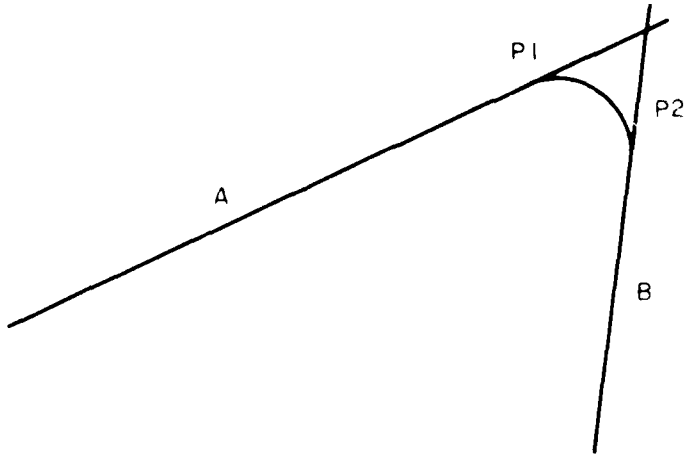

Figure 13. Circular arc smoothing.

4 EXAMPLE OF A BLAST NOISE PROGRAM RUN

This chapter presents a sample run of the Blast Noise Prediction program and includes [illegible] both input and output. This example does not include data collection, but does show what [illegible] should do with the operational data when he has received it. The example also describes what [illegible] the user wanted from the sample data and the output that the computer produced as a result [illegible] instructions.

Data Received

These data were obtained from the hypothetical installation "SHOW" for the month of [illegible] days). A map of the installation in metric coordinates (Figure 14) was received with the [illegible] types of activities occurred during this time, and five sites were involved in these activities. All [illegible] were fired from three firing points toward two target points.

The first activity used a 155-mm self-propelled howitzer (M109) to fire 360 rounds from firing point 2 (located at coordinates 38000, 200000) to target point 2 (located at coordinates 32000, [illegible]). One hundred and fifty of the rounds were fired during the day (0700 to 2200 hours), and 10 were fired at night (2200 to 0700 hours). Charge zones 4 and 5 were used for this weapon. The second activity used an 81-mm mortar which fired 325 rounds from firing point 1 (located at coordinates 27000, 230000) to target point 2. All 325 projectiles were nonexploding, i.e., smoke or illuminating. Three hundred of the rounds were fired during the day, and 25 were fired at night, using charge zones 5 to 7. The third activity involved demolitions at firing point 3, located at coordinates 32000, [illegible]. There were 100 daytime explosions, each of which set off 15 lb (6 kg) of ammunition. The last activity used a nonstandard weapon (not listed in Table 2). It fired 17 night rounds from firing point 1 to target point 1 (located at coordinates 27000, 250000), using charge zones 3 and 4. All rounds exploded 100 ft (30 m) above the target. The user learned that this weapon fires a projectile containing 10.5 lb (4.8 kg) of explosive, and has six charge zones containing 1.2, 3.4, 5.7, 7.3, 9.2, and 12.1 lb (0.54, 1.54, 3.31, 4.17, and 5.49 kg) of propellant in zones 1 through 6, respectively, and that it had a [illegible] pattern which is the same as the 105 mm self-propelled howitzer (M102).

The user wants to generate a set of CDNL contours for this set of data and have the [illegible] installation drawn on them for reference. In addition, he wants an indication of the actual [illegible] tudes and locations.

Creating the USER'S RUN

JCL Cards

The user obtains an account number for his run. He then types a set of JCL cards with [illegible] the rest of the cards in his deck.

Input Data Cards

The first section of the deck is composed of the input data cards the user has created [illegible] operational data he has received. For this example, there will be four sets of gun type cards, [illegible] point cards, and three sets of firing point cards.

Tables 3 to 5 provide information for the first three gun types, which correspond to the [illegible] weapons in the example. The last weapon is not on the list, since it is not a standard weapon. [illegible] fore, the user must create his own weapon code and gun type card for it from the information [illegible] received. The gun type cards are shown in Figure 15. A weapon code of 80 was chosen and [illegible] into columns 2 and 3 of that gun type card (Gun 1d). The rest of the information was [illegible] appropriate columns, as shown in Table 5. A "1" was placed in column 1 of card Gun 5, the [illegible] last gun type card. Following the gun type cards, target point cards (TRG 1a, 2a) were [illegible] Table 6. Short target point names were made up to fit into the allocated columns.

Two types of cards are associated with each firing point. Cards of type FP-1 (Table 7) give the name and location of the firing point. In the example, shortened firing point names were created to fit into the allocated columns. The location information which was [illegible] the shortened names were typed into the appropriate columns. Cards of type FP-2 (Table 8) are used to describe the activities occurring at each firing point. Each FP-1 card must have at least one but may have many FP-2 cards associated with it. Two activities which differ only in "no. of day rounds" or "no. of night rounds" but which are identical in all other descriptions may be specified on two separate cards or on one card in which case the "no. of rounds" will be the sum of the two activities. Since firing point 2 had two weapons firing from it, two FP-2 cards were required to describe activities there. The first (see Figure 18) described the special weapon (gun type "80"). It fires 15 night rounds (columns 28 to 30) and no day rounds (columns 21 through 24). The minimum charge zone (columns 29 and 30) and maximum charge zone (columns 31 and 32) are 3 and 4, respectively. The weapon was fired toward target point 1 (FP1) (columns 35 through 38). All rounds exploded 100 ft (30 m) above the ground (columns 39 through 42) at the target point.

Card FP-2b described the 81-mm mortar (gun type 22). The number of rounds, charge zones, and target point were typed into the appropriate columns. In addition, a 1 was typed in the "no. rounds at target flag" column, since the rounds were noiseless, i.e., smoke or illumination. The second firing point had only one activity, so only one FP-2 type card was required (FP-2c). This card described the activities of the 155-mm self-propelled howitzer (M109). The number of rounds it shoots, charge zones, and target point were typed into the appropriate columns.

The only activity at firing point 3 was demolition. A 15-lb (6-kg) explosive corresponds to charge zone 5 for the standard gun-type used which has been created for small demolition (gun type 100). Card FP-2d described the demolition. The number of rounds and the minimum and maximum charge zones were typed into the appropriate columns. The target point, which was left blank, and the "1" in column 36 signified an omnidirectional noise at the firing point. Cards FP-2b, FP-2c, and FP-2d all had a "1" in column 1, since they were the last cards associated with each firing point.

The input data for the rest of the deck consisted of the gun-type, target point, and firing point definition cards.

Module Cards

The second portion of the deck consisted of the module cards which tell the computer what it must do with the input data. In this example, the data were checked and several types of plots were generated. The first plot (Figure 16) had an outline of the installation with target and firing points marked, along with the CDNL contours for the area. The second plot (Figure 17) had the installation outline and a noise density plot (scattergram).

All grid coordinates are given in metric units, so the first card (NEED) must contain the specification "METERS". Next, a MAP-1 card invokes the MAP module, which checks the data and produces cross-reference tables. The MAP-2 card has a "1" in columns 1 through 5, requesting all of the cross-referenced tables. The number of days (300) is entered on the MAP-3 card. The MAP-4 card is set to "01", and MAP-5 is set to "280", since the cost is not of interest for this run. The BOUNDS module must be invoked before most of the other modules can be entered. This is accomplished by the BDS-1 card. The coordinates of the lower left-hand corner of the rectangular area under consideration are (-4000, 0), the upper right ones are (+9000, +9000). These values are entered on cards BDS-2 and BDS-3, respectively.

The BASE module is used to produce an outline of the installation. In this example, the user also wanted a registration mark (+) on the plot so that it could easily be overlaid on a map of the area. The BASE module is invoked with the BASE-1 card. The horizontal registration line is defined with the BASE-2a and BASE-2b cards. The star ("*") in column 21 of BASE-2b indicates the end of the segment. Cards BASE-2c and BASE-2d define the vertical registration line. BASE cards BASE-3 through BASE-3d define the installation outline. Since the last segment of the installation outline is connected to the first, only the last (BASE-3d) card needs a "1" in column 2 to indicate the end of the figure. The BASE-4 card indicates to the program that there is no more input for the BASE module.

AD-A099 335 CONSTRUCTION ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL F/G 20/1
BLAST NOISE PREDICTION. VOLUME II. BNOISE 3.2 COMPUTER PROGRAM --ETC(
MAR 81 L L LITTLE, V I PAWLOWSKA, D L EFFLAND

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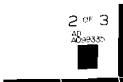


The FORMA and PUDDLE GRID modules must be included to produce a contour. FORMA must precede PUDDLE GRID, since PUDDLE GRID uses the output from FORMA. A FRMA-1 card is used to invoke the FORMA module. "MAX" is chosen as the parameter on the FRMA-2 card, since the user would like to investigate the worst case of his operations. The number of days (30) is typed on the FRMA-3 card. PUDDLE GRID may now be invoked with the PGRD-1 card. The closest city (both geographically and meteorologically) to the installation "SHOW" is Midland, TX. The inversion factors 65.8, 15.5, and 27.9 are found in Table 18. These values are entered into columns 1 through 10, 11 through 20, and 21 through 30 on card PGRD-2. The grid size chosen is 2000 m (columns 31 through 40, card PGRD-2). The SCATTER module, which is invoked with an SCT-1 card, generates a representation of the noise density by drawing dots in proportion to the number of operations. All day and night firing from both firing and target points will be considered. Thus, "T," "F," and "B" are typed in columns 1, 2, and 3, respectively, of card SCT-2. A multiplier of "2" is used to help represent the operations visually (columns 61 through 70, card SCT-2). The number of days (30) is typed on the SCT-3 card.

The LOCATOR module is invoked with LOC-1 card. It uses "0" and "X" to mark the locations of the firing and target points, respectively, on the plot. In the example, the user wanted both types of points marked, so "ALL" was entered on card LOC-2.

The first PLOT invoked with the PLT-1a card uses output from the PUDDLE GRID, LOCATOR, and BASE modules. This is specified by the "1" placed in columns 1, 2, and 4 of card PLT-2a. The user wanted the scale to be 1:50000, and contours to be drawn from 55 to 75 dB in 5-dB increments. Since those are the default values for these specifications on the PLT-3a card, the columns can be left blank. Columns 16 through 19 of card PLT-3a show that a 0.3 magnification will be used (this is done for reproduction purposes). No labeling is to be done, so cards PLT-4 and PLT-5 are omitted. The "*" in column 80 of card PLT-6a indicates that the first plot is completed.

The second plot, invoked with the PLT-1b card, uses output from the SCATTER and BASE modules, and is specified by the "1" typed in columns 3 and 4 of card PLT-2b. The user wanted the resultant drawing to be the same size as the first plot, so the specifications on the PLT-3b card were the same as those used on the PLT-3a card. Again, there were no labels to be printed, so the PLT-4 and PLT-5 cards were omitted. The PLT-6b card signified that the second plot was completed.

The STOPP module, which is invoked with the STP-1 card, indicates that the user has finished providing instructions for that run. The USER'S RUN consists of the JCL, input data, and module cards, respectively, separated by the "789" cards. A final card, which has a 6789 typed in the first column, signifies the end of information to the computer.

Output Received

The user received several pages of site-dependent information from the computer at the beginning and end of his output. These pages, which may include local Automated Data Processing (ADP) announcements and billing information, are not shown here, since this report is concerned only with the Blast Noise Prediction program. The user's output is shown as Figure 18.

The first page of output (page A) tells the user the units of his coordinates. Note that height/depth information is always in feet. This output was generated by the NEF-1 card.

The next module is MAP. Since the user in the example requested that the data be listed, they were printed out on pages B, C, and D. The gun-type cards were listed on page B. The warning (not necessarily an error) on page B was generated, since two of the charges were greater than 50 lb (20 kg). In this example, it is not an error, since the user did want 70 and 90 lb (28 and 36 kg) for charge zones 9 and 10 of gun type 10. Page C lists the target points; page D lists the firing-point information and gives the total number of errors and warnings found in the input data.

Page E summarizes the input data read, showing how many gun-type, target, and firing point cards were read. It provides statistics on the number of total firings and the number of firings per day for both day and night. Charge information about minimum and maximum charge zones and weight are also given. The average weight of firings is given in pounds, and the maximum height and depth are

given in feet. The maximum and minimum values for coordinates read are given, along with the coordinate pair in which each occurs. The final item on Page E is the number of points resulting from the grid size specified in MAP.

Pages F, G, H, and I are the cross-reference tables requested on the MAP-2 card. The first cross-reference table (targets by firing points) provides the average number of rounds fired by day for each target and firing point combination. The second table lists targets by gun type and provides the average total weight exploding at each target for each gun type. The third table provides the same information as the second table, but in a different order -- gun types by targets. The last table lists gun types by firing point, giving the average daily charge weight of each combination. Page I also lists the amount of time that the computer spent on the MAP module.

Page J gives the information for the BOUNDS module, including the maximum and minimum coordinates and the amount of time spent by the computer in this module.

The BASE module output on page K shows the start and end coordinates for the lines to be drawn. It informs the user when a new figure is started and how much time the computer spent in this module.

Page L lists the FORMA module output. First, it informs the user which charge averaging technique was used. It lists the number of days for the data base, as well as the number of unique noise sources, including the number of unique explosion types, i.e., unique combinations of height/depth, weight, location, and weapon types. All omnidirectional noise sources, i.e., demolitions and projectile explosions, are classified as the same type for the above statistic. the average number of rounds fired per day and night is given. In MAP, the number of explosions was given, which is always greater than or equal to the number of rounds. The amount of time spent in FORMA is the last piece of information provided.

Page M -- the first page of the PUDDLE GRID output -- tells the user what the start and stop coordinates used by this module are. In this example, the limits had to be changed, since they were not an integral multiple of the grid size chosen. The new units are listed, along with a warning specifying that they were changed. The weather factors are listed, and PUDDLE GRID specifies that both day and night values are used in calculations. The grid size is also provided. A table of values is listed by coordinates in increments of grid size. This table is pages N and O. The amount of time spent in PUDDLE GRID is the last item printed.

Page P lists the SCATTER module's output, followed by the condition under which the scattergram is produced, i.e., day/night/both target/firing point/gun type. The limits of the scattergram are given next. The multiplier, standard deviation, and number of days are listed next, followed by a summary of what will be plotted, which tells how many dots will be plotted for both the firing points and target points. The amount of time spent in SCATTER is the last item printed.

The LOCATOR module output provides the options requested first (page Q), i.e., target/firing points, name, location. Next, the size and angle of the characters to be plotted are given, followed by a listing of the targets and firing points and the amount of time spent in this module.

Pages R and S give the PLOT output for plots 1 and 2, respectively. The first plot (page R) lists the file name used by the system and the date and time that the file was produced. This information is also drawn on the plot itself. For this plot, contours were drawn with a base outline, and the firing point and target points were overlaid. A warning is given about the bounds since PUDDLE GRID modified them. Values used by PLOT for its various parameters are listed. The values having a "*" are equal to default values. If any text cards had been included, they would have been listed next (see Table 13, PLT-4 and PLT-5).

Finally, information concerning the physical plot is given, including the size, how many units (as specified by the NEF-1 card) 1 in. (25.4 mm) equals, and how many sections of plotter paper will be needed. The last piece of information is the amount of time spent in that module.

The second plot uses information from the BASE and SCATTER modules, and provides the same type of information given in the first plot.

The final page (page T) gives the STOPP module's output, which states that the internally stored information is ready to be plotted.

Figures 16 and 17 are the plots produced by this run.

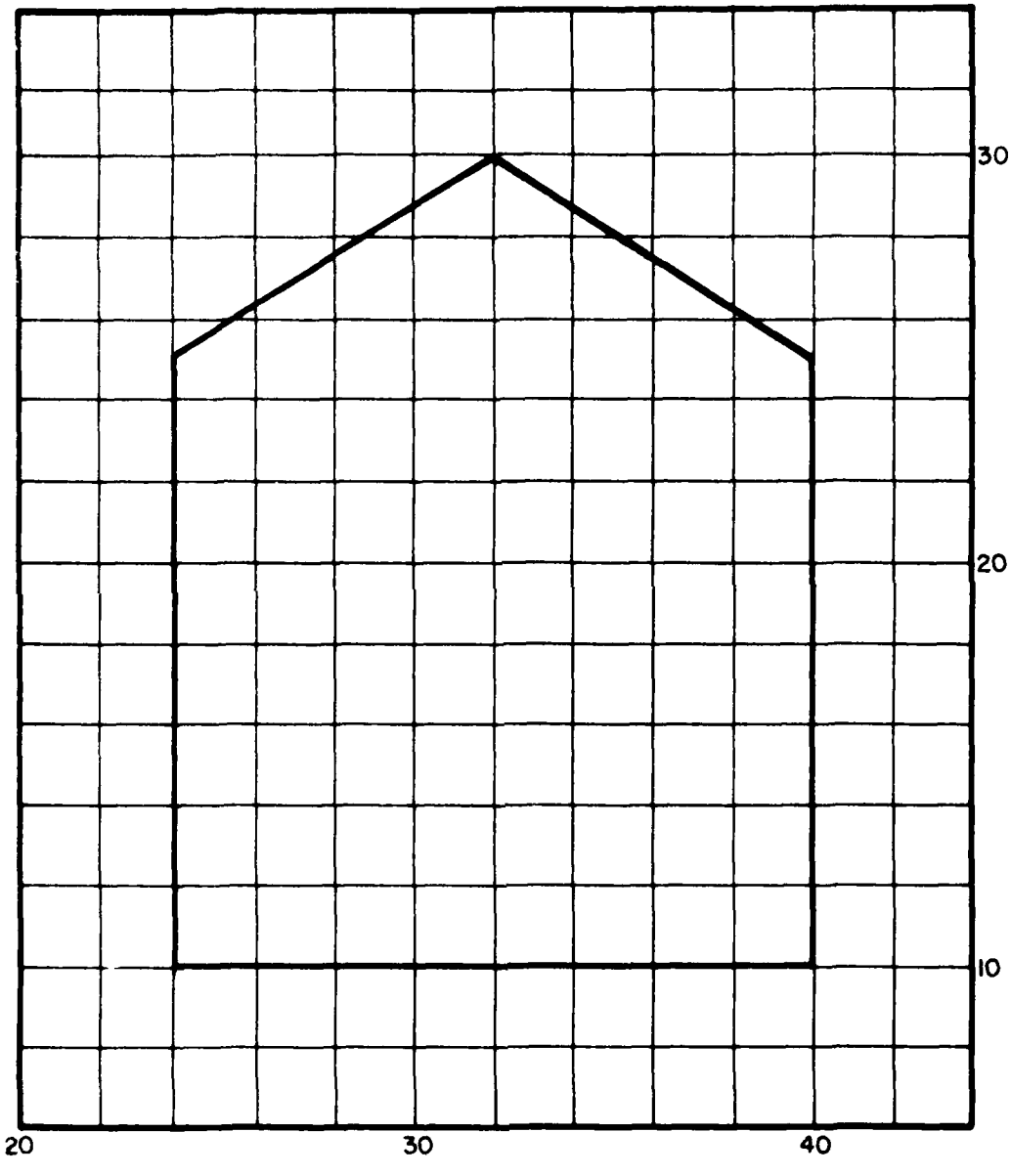


Figure 14. Military installation SHOW.

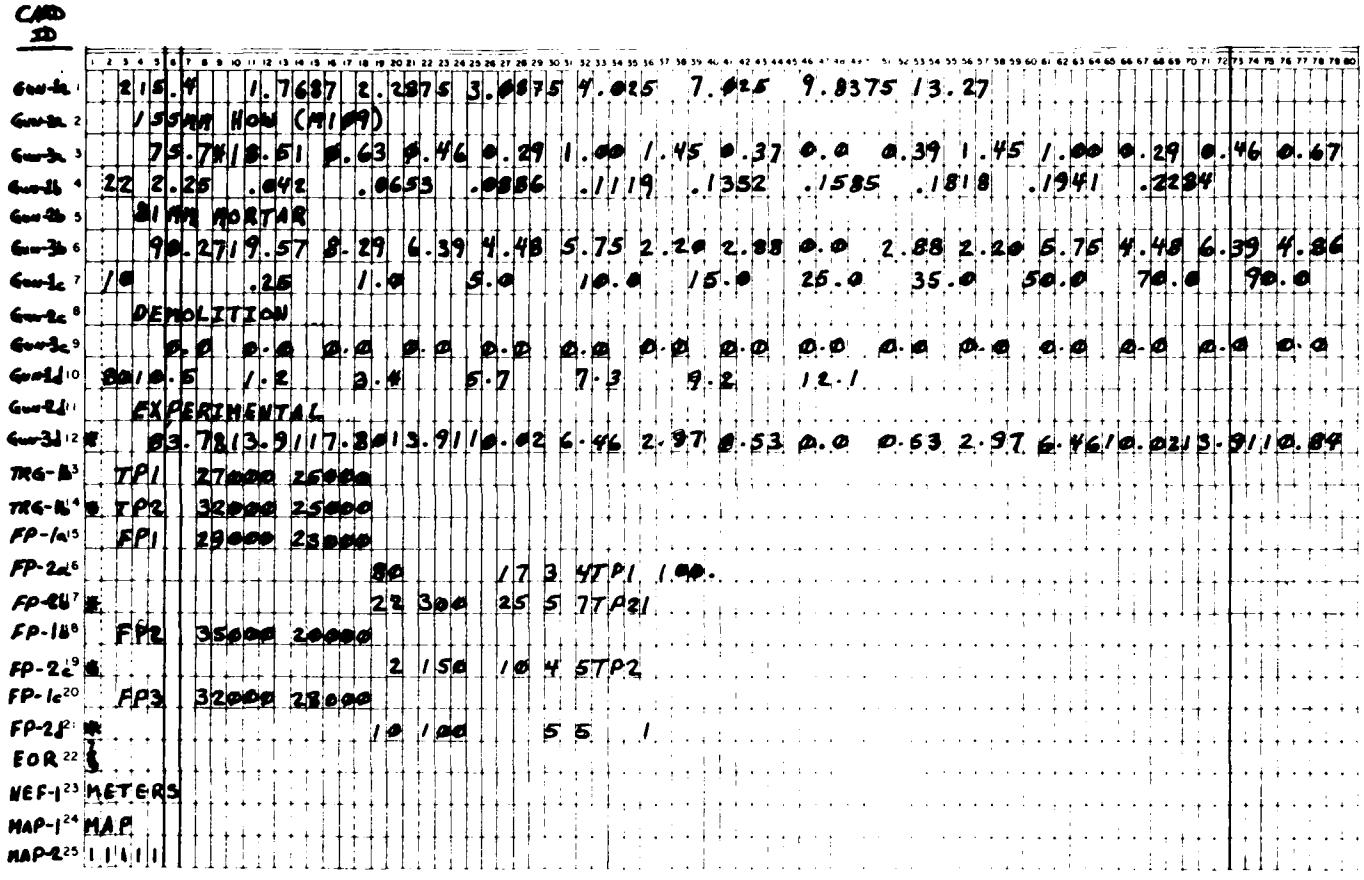


Figure 15 Input data

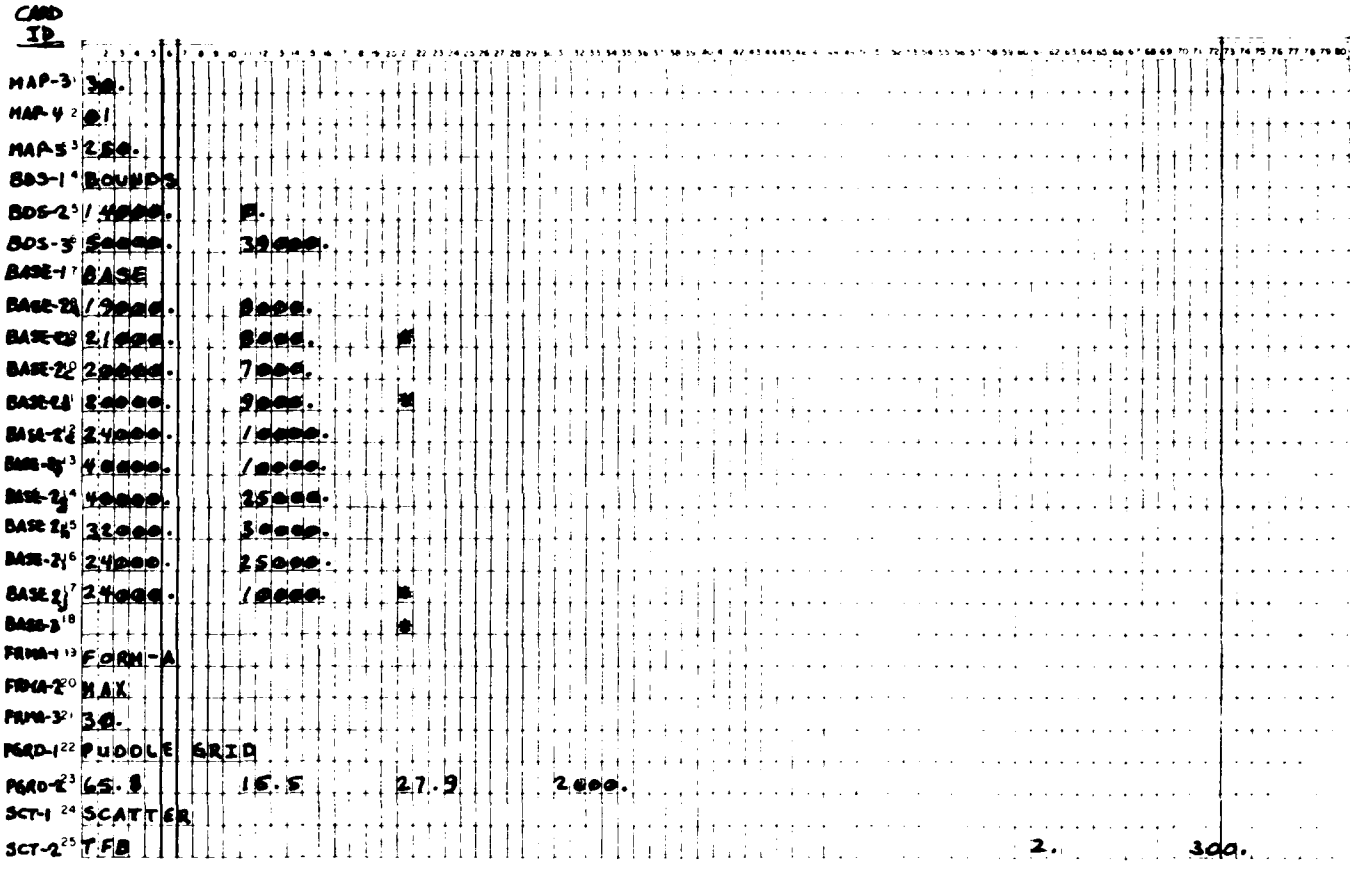


Figure 15. (Cont'd).

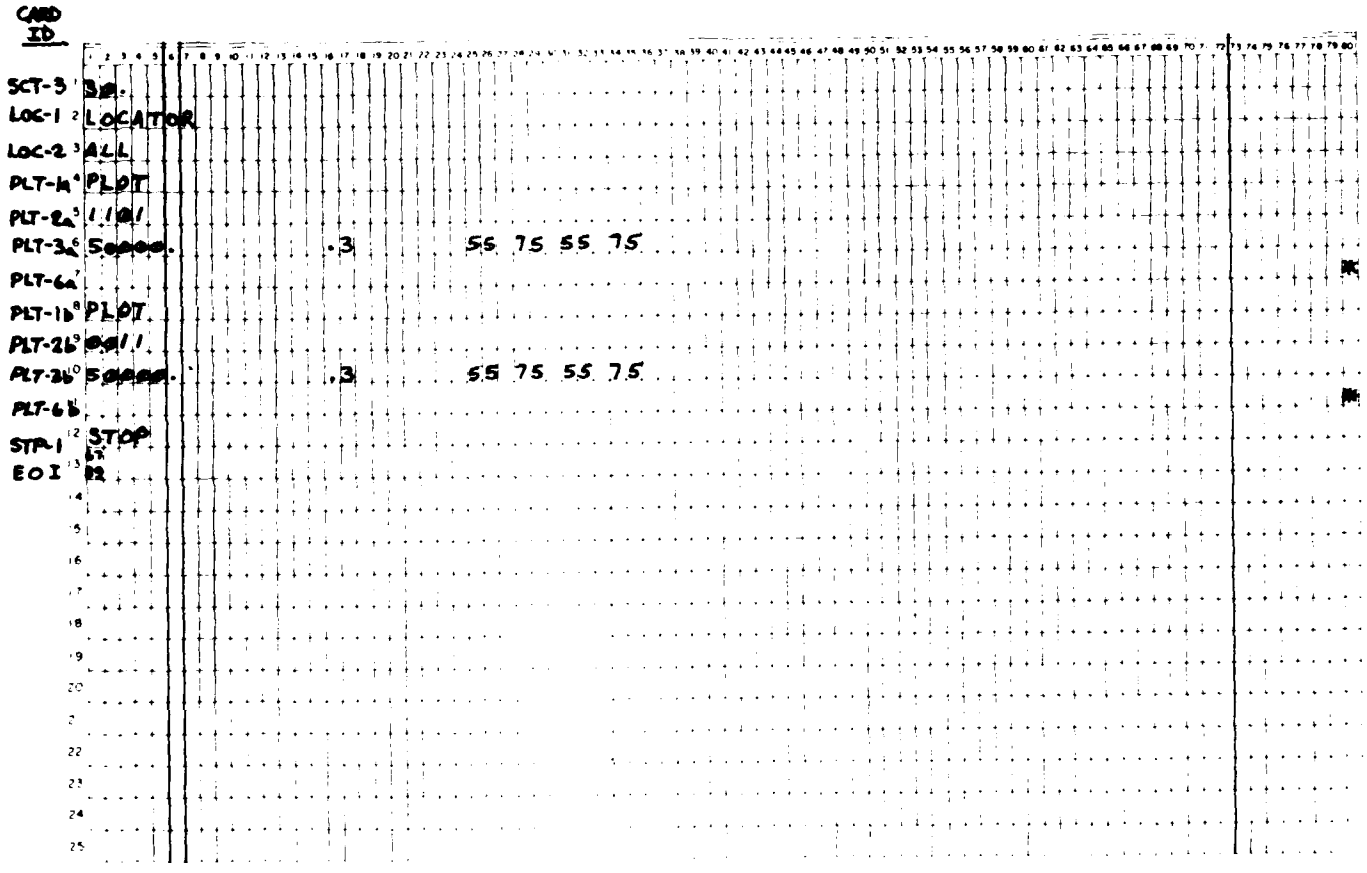


Figure 15. (Cont'd)

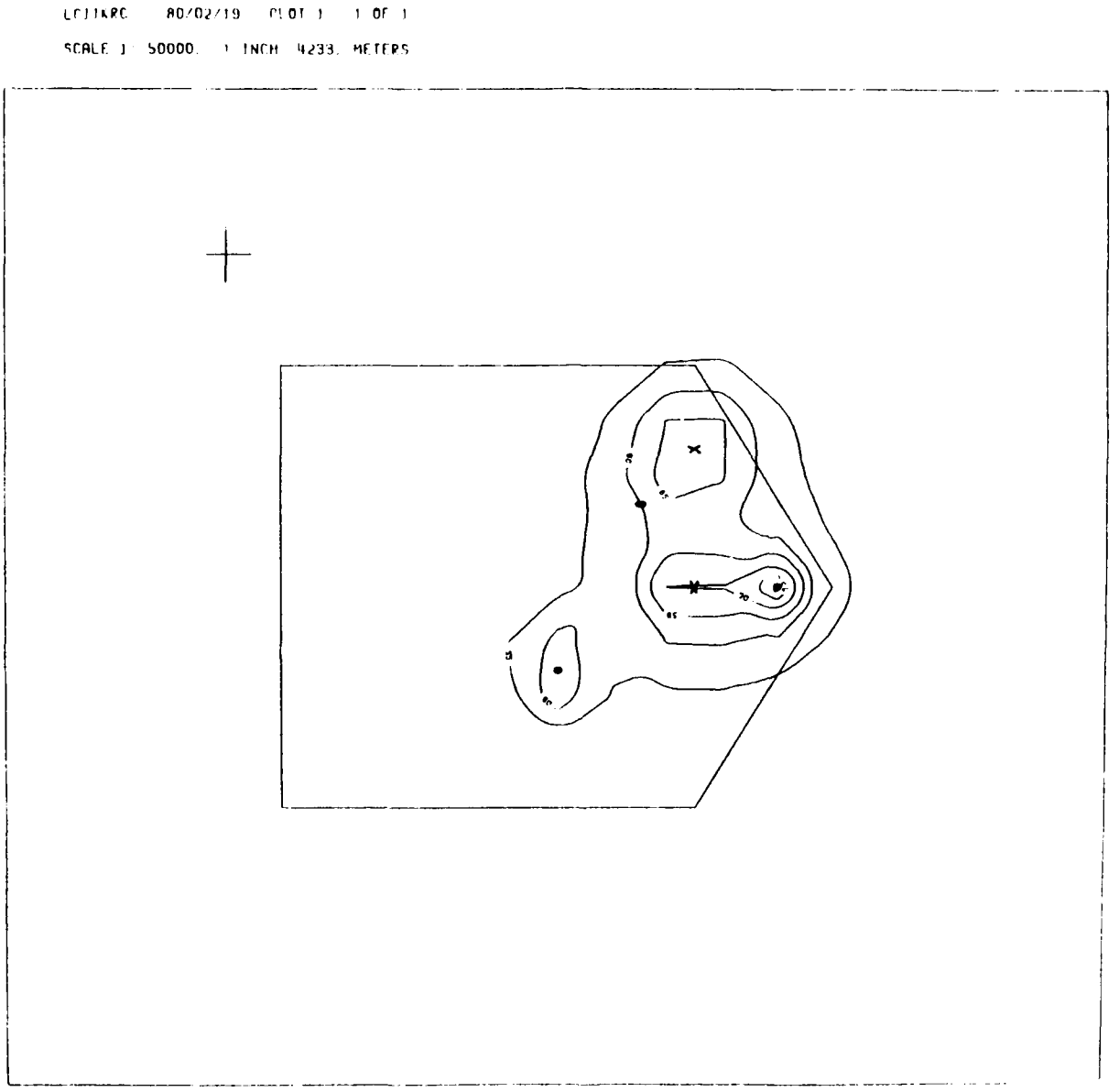


Figure 16. CLDN contours for installation SHOW.

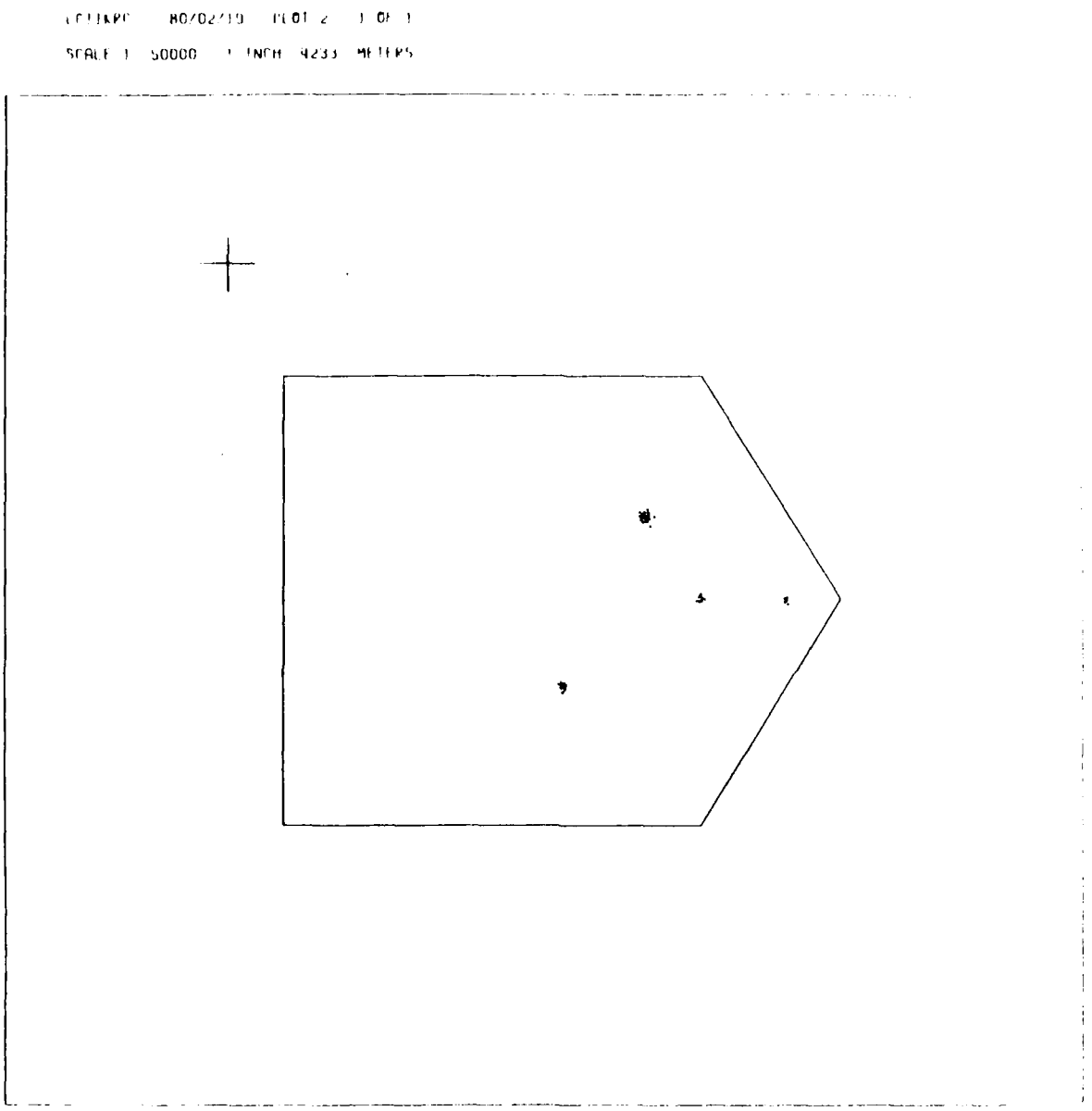


Figure 17. Scattergram for installation SHOW.

```
.....    BNOISE3.2        .....

DISTANCES EXPRESSED IN METERS
```

Page A

```
.....    MAP OF SOURCE POINTS    .....

.....    GUN TYPE CARDS    .....

FLAG  G TYPE  T CHARGE                                    PROPELLANT WEIGHTS

          2      15.40      1.77     2.29     3.09     4.03     7.03     9.84    13.27     0.00     0.00     0.00
         22       2.25       .04      .07      .09      .11      .14      .16      .18      .19      .23     0.00
         10       0.00       .25     1.00     5.00    10.00    15.00    25.00    35.00    50.00    70.00    90.00
.....   WARNING --   2 CHARGES LARGER THAN 50. LBS
      *  80      10.50      1.20     3.40     5.70     7.30     9.20    12.10     0.00     0.00     0.00     0.00


GTYPE      NAME              EQ PARA  EQ PARB                          DIRECTIVITY VALUES                                  AVG

  2     155MM HOW (M109)      75.74    18.51      .63    .46    .29   1.00   1.45    .37   0.00    .39   1.45   1.00    .29    .46    .67
 22     81MM MORTAR           90.27    19.57     8.29   6.39   4.48   5.75   2.20   2.88   0.00   2.88   2.20   5.75   4.48   6.39   4.86
 10     DEMOLITION             0.00     0.00     0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 80     EXPERIMENTAL          83.78    13.91    17.80  13.91  10.02   6.46   2.97    .53   0.00    .53   2.97   6.46  10.02  13.91  10.84

.....   2 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE
```

Page B

Figure 18. Printed output from the Blast Noise Prediction computer program.

```
          .....      TARGET CARDS      .....

     FLAG    ID       X          Y        HT CORR

             TP1     27000.    25000.        0.
         *   TP2     32000.    25000.        0.

.....   0 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE
```

Page C

```
          .....      FIRING PT. SOURCE AND DEFINITION CARDS      .....

FLAG    ID       X          Y       HT CORR    G TYPE   DAYNO   NIGHTNO   MIN   MAX   T ID   FLAG   HGT

             FP1     29000.    23000.        0.
                                            80        0.      17.      3     4    TP1     0   100.0
  *                                         22      300.      25.      5     7    TP2     1     0.0
             FP2     35000.    20000.        0.
  *                                          2      150.      10.      4     5    TP2     0     0.0
             FP3     32000.    28000.        0.
  *                                         10      100.       0.      5     5            1     0.0

.....   0 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE

..... END OF INPUT PHASE:    2 ERROR/WARNING CONDITIONS DETECTED
```

Page D

Figure 18. (Cont'd)

```
NUMBER OF DATA BASE CARD IMAGES READ IS     21

NUMBER OF GUN TYPES READ IS      4

NUMBER OF TARGETS READ IS      2

NUMBER OF SOURCES READ IS      3


.....      DATA BASE TIME PERIOD:  30. DAY(S)

TOTAL DAY FIRINGS IS        550.00
TOTAL NIGHT FIRINGS IS       52.00

TOTAL PER DAY DAY FIRINGS IS         18.33
TOTAL PER DAY NIGHT FIRINGS IS        1.73

MINIMUM CHARGE NUMBER     3
MAXIMUM CHARGE NUMBER     7

MINIMUM CHARGE WEIGHT         .1 LBS
MAXIMUM CHARGE WEIGHT       15.0 LBS

TOTAL DAY CHARGE WEIGHT PER DAY        215.3 LBS
TOTAL NIGHT CHARGE WEIGHT PER DAY       17.7 LBS

MAXIMUM HEIGHT IS      100.00
MAXIMUM DEPTH IS         0.00


MAXIMUM X IS     35000.0 IN PAIR  (    35000.0 ,     20000.0 )

MAXIMUM Y IS     28000.0 IN PAIR  (    32000.0 ,     28000.0 )

MINIMUM X IS     27000.0 IN PAIR  (    27000.0 ,     25000.0 )

MINIMUM Y IS     20000.0 IN PAIR  (    35000.0 ,     20000.0 )

 FOR GRID SIZE    250.0, GRID DIMENSIONS =    32.0 X     32.0
```


Figure 18. (Cont'd).

CROSS-REFERENCE: TARGETS BY FIRING POINTS ; DAILY FIRINGS

TARGET ID	FPT ID		FPT ID		FPT ID	FPT ID	FPT ID	FPT ID	FPT ID
TP1	FP1	.6							
TP2	FP1	10.8	FP2	5.3					

Page F

CROSS-REFERENCE: TARGETS BY GUN TYPES; DAILY PROJECTILE CHARGE WEIGHT (LBS)

TARGET ID	GUN ID		GUN ID	GUN ID	GUN ID	GUN ID	GUN ID	GUN ID
TP1	80	6.0						
TP2	2	82.1						

Page G

CROSS-REFERENCE: GUN TYPES BY TARGETS; DAILY PROJECTILE CHARGE WEIGHT (LBS)

GUN ID	TAR ID		TAR ID	TAR ID	TAR ID	TAR ID	TAR ID	TAR ID
2	TP2	82.1						
22	***							
10	***							
80	TP1	6.0						

Page H

Figure 18. (Continued)

CROSS-REFERENCE: GUN TYPES BY FIRING POINTS; DAILY PROPELLENT CHARGE WEIGHT (LBS)

GUN ID	FPT ID		FPT ID	FPT ID	FPT ID	FPT ID	FPT ID	FPT ID
2	FP2	37.5						
22	FP1	2.0						
10	FP3	50.0						
80	FP1	4.1						

..... TIME FOR MAPPING SUBPROGRAM IS .079 SECONDS

Page I

..... BOUNDS .....

MINIMUM BOUNDARY = 14000. 0. MAXIMUM BOUNDARY = 50000. 39000.

BOUNDARY VALUES VERIFIED

..... TIME IN BOUNDS IS .002 .....

Page J

Figure 18. (Cont'd)

..... BASE .....

LINE CARDS

	X-Y START		X-Y END	
LINE	19000.	8000.	21000.	8000.
NEW LINE				
LINE	20000.	7000.	20000.	9000.
NEW LINE				
LINE	24000.	10000.	40000.	10000.
LINE	40000.	10000.	40000.	25000.
LINE	40000.	25000.	32000.	30000.
LINE	32000.	30000.	24000.	25000.
LINE	24000.	25000.	24000.	10000.

..... TIME IN BASE IS .018 .....

Page K

..... FORM-A CALCULATION .....

..... FOR TNT EQUIVALENT, FORM-A WILL USE MAXIMUM CHARGE ZONE

..... DATA BASE TIME PERIOD: 30. DAY(S)

NUMBER OF UNIQUE NOISE SOURCES COUNTED IS 6

TOTAL PER DAY DAY EXPLOSIONS IS 23.33
TOTAL PER DAY NIGHT EXPLOSIONS IS 2.63

..... TIME FOR FORM-A SUBPROGRAM IS .237 SECONDS

Page L

Figure 18. (Cont'd)

```
     .....     PUDDLE GRID     .....

*****  WARNING -- SPECIFIED BOUNDS (  14000.0,      0.0 ):(  50000.0,  39000.0 ) DO NOT CORRESPOND TO INTEGRAL GRID BOUNDS.
          MODIFIED BOUNDS WILL BE USED TO PRODUCE THE GRID AND TO DEFINE ANY PLOT UTILIZING THIS GRID

110

          START AT DATA BASE COORDINATES (  14000.0,      0.0 )

          STOP  AT DATA BASE COORDINATES (  50000.0,  40000.0 )

               INVERSION =   65.80   15.50   27.90

          CALCULATIONS FOR NEF WILL USE BOTH D + N OF DAY AND NIGHT CALCULATIONS


           GRID SIZE =  2000.0 ; DISTANCES IN METERS
```


Figure 18. (Cont'd).

	14000	16000	18000	20000	22000	24000	26000	28000	30000	32000	34000	36000	38000	40000	42000
40000	41.2	42.1	42.9	43.3	43.9	44.6	45.0	45.4	45.4	45.4	45.2	45.0	44.4	43.7	42.9
38000	42.0	43.0	43.8	44.7	45.1	45.7	46.1	46.6	46.6	46.7	46.5	46.2	45.5	44.8	44.1
36000	42.8	43.7	44.7	45.6	46.0	46.8	47.4	47.9	48.1	48.3	47.9	47.4	46.6	45.9	44.9
34000	43.4	44.5	45.5	46.4	47.3	47.8	48.7	49.5	49.8	49.9	49.6	48.9	47.9	46.8	45.8
32000	43.8	45.0	46.2	47.2	48.3	49.1	50.3	51.2	51.8	51.9	51.5	50.3	49.1	47.8	46.5
30000	43.8	45.1	46.7	47.9	49.3	51.1	52.3	53.4	54.7	57.6	54.2	51.9	50.3	48.7	47.1
28000	44.0	45.4	46.6	48.2	50.6	53.2	55.9	56.6	58.8	92.5	58.2	53.3	51.0	49.3	47.5
26000	44.1	45.6	46.8	48.5	51.1	55.5	65.4	65.5	61.3	70.3	60.4	54.2	51.7	49.6	47.9
24000	44.1	45.6	46.8	48.5	51.1	55.3	65.4	67.5	61.8	70.1	60.2	54.1	51.7	49.6	47.9
22000	43.7	45.1	46.3	47.9	50.0	52.7	55.7	57.6	56.8	56.7	56.3	54.7	51.5	49.5	47.8
20000	43.4	44.7	45.9	47.2	48.6	50.3	51.9	52.6	53.1	53.6	61.8	62.8	51.5	49.1	47.3
18000	42.9	44.1	45.3	46.4	47.3	48.4	49.6	50.2	50.9	51.4	54.1	52.8	49.6	47.9	46.5
16000	42.4	43.5	44.4	45.3	46.3	47.2	47.9	48.6	49.0	49.5	49.4	49.0	47.9	46.8	45.7
14000	41.7	42.6	43.6	44.5	45.3	46.0	46.6	47.1	47.5	47.7	47.5	47.2	46.4	45.6	44.7
12000	40.9	41.9	42.7	43.5	44.4	44.9	45.3	45.8	46.1	46.3	46.0	45.7	45.1	44.5	43.6
10000	40.1	40.9	41.8	42.5	43.1	43.8	44.2	44.6	44.8	44.8	44.6	44.4	43.8	43.2	42.3
8000	39.6	40.0	40.8	41.4	42.0	42.6	42.9	43.3	43.5	43.4	43.3	43.0	42.4	42.0	41.3
6000	39.1	39.5	39.9	40.3	41.0	41.5	41.7	41.9	42.2	42.0	41.9	41.6	41.2	40.8	40.2
4000	38.7	38.9	39.2	39.5	39.9	40.2	40.5	40.7	40.9	40.8	40.6	40.4	40.1	39.7	39.2
2000	38.3	38.5	38.7	38.9	39.1	39.2	39.4	39.6	39.7	39.6	39.5	39.3	39.1	38.9	38.7
0	38.0	38.1	38.3	38.6	38.6	38.8	38.9	39.0	38.9	38.8	38.9	38.8	38.6	38.5	38.3

Figure 18. (Cont'd)

	44000	46000	48000	50000
40000	42.1	41.1	40.2	39.3
38000	43.1	42.0	41.0	39.9
36000	44.0	42.9	41.7	40.6
34000	44.7	43.7	42.4	41.2
32000	45.4	44.3	42.9	41.5
30000	45.8	44.7	43.5	42.0
28000	46.3	44.9	43.8	42.2
26000	46.4	45.1	43.9	42.3
24000	46.5	45.1	43.9	42.3
22000	46.4	45.0	43.7	42.2
20000	46.0	44.7	43.4	42.0
18000	45.5	44.2	42.8	41.4
16000	44.5	43.3	42.1	40.9
14000	43.7	42.5	41.3	40.3
12000	42.6	41.6	40.7	39.6
10000	41.5	40.7	39.9	39.1
8000	40.4	39.8	39.2	38.7
6000	39.6	39.1	38.7	38.4
4000	38.9	38.7	38.4	38.1
2000	38.5	38.3	38.1	37.8
0	38.2	37.9	37.7	37.6

..... TIME FOR PUDDLING SUBPROGRAM IS .776 SECONDS

Page 0

Figure 18. (Cont'd)

```
.....     SCATTER     .....

THE SCATTER DIAGRAM WILL REPRESENT ..DAY+NIGHT.. DATA FOR:

        ...TARGETS
        ...FIRING PTS
        ...ALL GUN TYPES

BOUNDED BY (  14000.0,      0.0) - (  50000.0,  39000.0)

    ...MULTIPLIER =       2.0

    ...STANDARD DEVIATION =   300.000

    ... 30. DAYS DATA IN DATA BASE

OUTPUT FILE TAPE4 CONTAINS NASAPLOT PHS4 INPUT DATA REPRESENTING:

       2 TARGETS   :    12 SCATTER PTS.
       3 FIRING PTS:    41 SCATTER PTS.

   MULTIPLIER USED =       2.0

          .....     TIME IN SCATTER IS    .057 SECONDS
```


Figure 18. (Cont'd)

```
.....     LOCATOR      .....

   ..OPTIONS REQUESTED..

    TARGET
    FIRING POINT

     SIZE=  .14**     ANGLE=  0.00**
     STARS INDICATE DEFAULT VALUES

     ID CODE         X COORD.     Y COORD.     G CORR.     BOUNDS
..TARGET DATA..

     TP1             27000.       25000.          0.
     TP2             32000.       25000.          0.
..FIRING POINT DATA..

     FP1             29000.       23000.          0.
     FP2             35000.       20000.          0.
     FP3             32000.       28000.          0.

.....    .018 SECONDS IN LOCATOR  .....
```


Figure 18. (Cont'd).

```
                    .......      PLOT      .......

                    LOSITIB
21.26.55.   81/04/01.   PLOT  1

          FOLLOWING FILES WERE REQUESTED

               PGRID
               BASE
               LOCATOR

WARNING...PUDDLE GRID BOUNDS DO NOT MATCH SPECIFIED BOUNDS...

               PGRID VALUES USED          SPECIFIED BOUNDS
      XMIN        14000.00                  14000.00
      YMIN            0.00                      0.00
      XMAX        50000.00                  50000.00
      YMAX        40000.00                  39000.00

                VALUES USED BY PLOT

         **SCALE     =50000.0

         **PERCENT X=1.00          **PERCENT Y=1.00

           MAG       = .30         **PERC SMTH= .33

         **START     = 55          **STOP      = 75

         **L START   = 55          **L STOP    = 75

         **LABEL     = 1           **INCREMENT= 5

         **L INCREMT= 5              GRID SIZE= 2000.

          STARS INDICATE DEFAULT VALUES

          FOLLOWING CARDS WERE USER TEXT INPUT

          NO USER TEXT CARDS INPUT

          THIS PLOT IS   9 INCHES BY  10 INCHES

          ONE INCH IS EQUAL TO  4233. METERS

          IT CONSISTS OF  2 PAGES IN THE X DIRECTION AND  1 SECTIONS IN THE Y DIRECTION

            ..... TIME IN PLOT IS    .219 .....
```

Page R

Figure 18. (Cont'd).

```
                    .......      PLOT      .......

                    LDSITIB
21.26.56.   81/04/01.   PLOT  2

          FOLLOWING FILES WERE REQUESTED

              BASE
              SCATTER

               VALUES USED BY PLOT

        **SCALE     =50000.0

        **PERCENT X=1.00          **PERCENT Y=1.00

          MAG       = .30         **PERC SMTH= .33

        **START     = 55          **STOP      = 75

        **L START   = 55          **L STOP    = 75

        **LABEL     = 1           **INCREMENT= 5

        **L INCREMT= 5              GRID SIZE=    0.

         STARS INDICATE DEFAULT VALUES

         FOLLOWING CARDS WERE USER TEXT INPUT

         NO USER TEXT CARDS INPUT

         THIS PLOT IS   9 INCHES BY   9 INCHES

         ONE INCH IS EQUAL TO  4233. METERS

         IT CONSISTS OF  2 PAGES IN THE X DIRECTION AND  1 SECTIONS IN THE Y DIRECTION

           ..... TIME IN PLOT IS    .043 .....
```

Page S

```
                .....     STOP     .....


              NASAPLOT INPUT FILE COMPLETED
```

Page T

Figure 18. (Cont'd).

5 CALCULATION OF CDNL

General

Noise travels some distance from its point of origin (source) before dissipating. Therefore, to accurately evaluate the noise produced at a point, it is necessary to determine the level of sound produced in the entire area surrounding its origin. The size of the area **around** a noise-producing source which must be evaluated depends on the initial energy of the noise, i.e., a low-energy noise will affect a smaller area than a high-energy noise.

The Blast Noise Prediction program can evaluate the noise level of sound produced in an area around a noise-source and uses the CDNL measure to quantify these noise level units in decibels. The capability to quantify noise produced at a source is of particular value to Army planners who must evaluate and predict community response to the noise-producing activities of Army installations. To create CDNL values, the Blast Noise Prediction program uses a series of calculations which rely on a specific set of formulas and tables. These formulas incorporate data which must be provided by the user; therefore, raw noise-source data must be converted into a form suitable for submission to the computer. Once the raw data have been properly compiled, they can be turned over to the computer for processing.

The formulas require several user-supplied specifications:

1. The number and times of rounds (blasts) occurring during the day and night. A penalty of 10 dB is applied to night operations (2200 and 0700 hours).

2. The locations of both the firing point and the target point.

3. Weather information for the region being surveyed.

In addition, the user must specify the boundary coordinates for his area of interest and tell the Blast Noise Prediction program into what size blocks he wants the area to be broken up into for computational purposes. The program uses this information to divide the user's area into a grid of points, i.e., a matrix of X and Y coordinates. Each of these points is a given distance away from the noise source being evaluated since the calculations for the noise level incorporate distance. The Blast Noise Prediction program then calculates the noise level of each source at each given point. This calculation is repeated for each point. The values are stored and printed out by coordinates, and are used (at user discretion) to produce a reference table of the noise level at each given point. The user can also request the program to generate a paper plot showing the contours of the noise levels in the area around the source(s) being evaluated. The program creates these contours by joining points having the same noise-level values. (The user, however, must first tell the program which levels he wants plotted, e.g., 55 to 75 dB every 5 dB. The user can also request an outline of the installation or other relevant region. This additional information on the plot can serve as a visual reference for the noise levels.) Finally, these contours are used to predict the noise impact of Army artillery, armor, and demolition activities.[7]

The information tables produced by the TABGEN portion of the Blast Noise Prediction program provide a listing of decibel values for distances away from a blast produced by a 5-lb charge. (See Table 20)

The background on the information which Table 20 provides rests on theory for sound propagation in the atmosphere.[9] The speed of sound is a function of both wind and temperature; as these conditions change with altitude, sound waves are refracted or focused.

Figures 19 through 22 illustrate four simple cases of this phenomenon: (1) a negative sound velocity gradient, (2) a positive sound velocity gradient, (3) a positive sound velocity gradient which changes to a more sharply positive velocity gradient, and (4) a negative gradient followed by a positive gradient at a higher altitude.

[7] P. D. Schomer, et al., *Predicting Community Response to Blast Noise*, TR E-17/ADA773690 (CERL, December 1973).
[9] P. D. Schomer, et al., *The Statistics of Amplitude and Spectrum of Blasts Propagated in the Atmosphere*, Volumes I and II, TR N-13/ADA033473 and ADA033361 (CERL, November 1976).

In Case 1, sound is refracted upward, producing noise levels on the ground lower than those produced under uniform velocity or zero gradient conditions. For Case 2, sound rays are refracted downward, and the sound intensity on the ground is somewhat greater than that under uniform velocity gradient conditions. With combinations of these gradients, sound rays can travel over different paths and still arrive at an observation point simultaneously to produce a focus. In Case 3, separate groups of sound rays are created by two positive gradients -- the upper gradient is stronger than the lower. A weak focus, labeled F, is created at the points where both groups meet at the surface. In Case 4, sound is refracted upward in the lower negative gradient and downward in the upper positive gradient. The result is an increase of noise levels at the sharp focus in the region labeled F, and a reduction of noise levels in the silent zone between F and the blast site.

The probability of obtaining given amplitudes at various distances is a key statistic required for noise-impact prediction. Amplitude distributions have been created based on CERL blast data. Figure 23 shows a sample of such a distribution. Each such distribution is subdivided into four regions. The energy averages of the measured blasts within each region are calculated and plotted as a function of distance to produce the amplitude vs distance curves (Figures 24 and 25). The percentage of blasts lying in each range can be determined for each distribution and then related to distance, and an explanation developed to relate the statistics to environmental (e.g., atmospheric) conditions.

These regions, from highest to lowest, are called FOCUS, BASE, NEGATIVE, and EXCESS NEGATIVE. In addition, the lines separating the regions are called MEAN to distinguish the arithmetic mean from the line at the top of the region, which is labeled MAX, and the line at the bottom of the region, labeled MIN. It can be seen that FOCUS MIN and BASE MAX are the same line, i.e., the line between FOCUS MEAN and BASE MEAN. Thus, there are nine separate lines to be concerned with.

Statistics obtained from blast data are based on a 5-lb charge fired during the day with atmospheric conditions considered to be standard inversion factors.* Deviations from these basic conditions are accounted for by corrections added during the calculations.

Units

The amplitude is given in decibels and defined as

$$10 \log_{10}\left(\frac{P}{P_o}\right)^2 \qquad \text{[Eq 1]}$$

where

P_o = reference pressure of 20μPa

P = pressure in Pascals.

The distance between a noise source and the point at which its noise level is to be calculated using the X and Y coordinates read from a map is determined as follows:

$$distance = \left[(x_1 - x_2)^2 + (y_1 - y_2)^2\right]^{1/2} \qquad \text{[Eq 2]}$$

where

(x_1, y_1) = coordinates of the point

(x_2, y_2) = coordinates of the source.

If the map coordinates are in feet, they can be transformed to metric units by the conversion: 1 ft = 0.3048 m, 1 mile = 1609 m.

* Standard inversion factors are selected from the weather conditions at Fort Leonard Wood, MO.

1. Night correction -- if firings are at night, add a 10 dB penalty to compensate for increased human sensitivity to noise occurring at night.

2. Charge size correction -- The difference between a 5-lb open air explosion and the blast to be predicted must be found. If the blast is not created by a weapon, but is the result of an omnidirectional explosion, then Figure 26 is used. If it is a weapon, then the following equation is used:

$$Charge\ correction = A + B * \log_{10}(W * 16) - AVG - 119 \qquad \text{[Eq 3]}$$

where:

A, B, and AVG are found in Table 4.
W is the weight of the explosive in pounds.

3. Height correction -- the height or ground correction is used to compensate for the attenuating effects of the earth on sound wave propagation for explosions occurring above or below the ground.

a. If height > 0 then ground correction $= 0$ dB.

b. If $height < 0$, $depth = \frac{(height)}{(charge\ size)^{\frac{1}{3}}}$ [Eq 4]

where:

height is in feet.

charge size is in pounds.

If $2.24 \geq depth \geq 0$ then

$$Ground\ correction = \frac{depth}{-1.363} \qquad \text{[Eq 5]}$$

If $depth > 2.25$, then

$$Ground\ correction = \frac{(depth)(17.46)}{11.933} \qquad \text{[Eq 6]}$$

4. Gun angle correction -- The sound produced by a round fired by a weapon has a directivity pattern associated with it as a result of the physical characteristics of the weapon; noise produced by a demolition blast, however, is omnidirectional. Therefore, a correction factor must be added to account for directivity. This factor incorporates the angle between the direction in which the weapon muzzle is pointed and the point at which the calculation is being made (Figure 27). The correction factor can be found by looking it up in Table 4 for the appropriate gun type and closest angle, e.g., any angle between 15 and 45^{0} would be included under "30^{0}" in the table. There are still other variables to consider, but their effects are considered further on in the calculations.

V. Sound-Energy Exposure

At this stage, a table of all the corrected decibel values should be made. However, before the arithmetic operations (addition or subtraction) can be performed, the decibel values must be

I Data Needed

Before proceeding with the calculations, the following set of data must be readily available

1. Weapon type
2. Distance (in meters) from the noise source at which the decibel level is to be calculated
3. The time of firing, i.e., during the day (0700 to 2200 hours) or night (2200 to 0700 hours)
4. Weight of explosives in pounds (charge size or zone)
5. Height above or below ground (in feet) of the explosion
6. If a weapon, the angle of fire in relation to the point of calculation
7. Inversion factors for
   a. Surface
   b. 1 to 500 m
   c. 1 to 3000 m
8. Number of rounds fired
9. Number of days for which data were collected.

II. Blast Amplitudes

To find the appropriate C-weighted decibel values in the tables produced by TABGEN, the following calculations must be made: 100 $\log_{10}$ (distance in meters) - 199 = position in table counting across from left to right values for

1. Focus MAX
2. Focus MEAN
3. Base MAX
4. Base MEAN
5. Negative MAX
6. Negative MEAN
7. Excess Negative MAX
8. Excess Negative MEAN
9. Excess Negative MIN

The values listed above must be taken from Table 20. The user must be sure to choose either the day or night tables, depending on the data.

III. Percentages

The next set of values required are the percentages which are found in the same position in the tables as that calculated for the decibel values. There are four numbers, one for each of the regions FOCUS, BASE, NEGATIVE, and EXCESS NEGATIVE; these numbers are also differentiated as to day or night.

IV. Correction Factors

After the preceding initial values are obtained, a series of decibel correction factors are added to them, so that they correspond to the given data. These factors are a result of weapon type, charge size, right, height above or below ground, and angle of gun with respect to the receiver (point of calculation). After all the correction factors have been calculated, they are added together and then added to the number of decibels found initially. They are

transformed back to sound exposure in energy. Only levels above 85 dB are to be used in calculating the total SEL.* There are four separate cases which can be used for calculating the sound exposure, depending on the magnitude of the values in the table. Each region, FOCUS, BASE, NEGATIVE, and EXCESS NEGATIVE is considered separately. Before converting decibel values to energy, the user must first determine whether the corrected values for each region are greater than or equal to ≥ 85 dB.

Let

$$A = Mean - Min \qquad \text{[Eq 7]}$$

$$C = Max - Mean \qquad \text{[Eq 8]}$$

$$K = \frac{4.343(10^{\frac{A}{10}} - 1) - C}{A - 4.343(1 - 10^{-\frac{A}{10}})} \qquad \text{[Eq 9]}$$

Case I. *Max* ≥ 85? No. *Mean* ≥ 85? No. *Min* ≥ 85? No.

$$Sound\ Exposure = SE = 0 \qquad \text{[Eq 10]}$$

Case II. *Max* ≥ 85? Yes. *Mean* ≥ 85? No. *Min* ≥ 85? No.

$$F_1 = \frac{1.373 \times 10^9}{(KA + C)} \qquad \text{[Eq 11]}$$

$$F_2 = 10^{\frac{Max - 85}{10}} - 1 \qquad \text{[Eq 12]}$$

$$SE = F_1 * F_2 \qquad \text{[Eq 13]}$$

Case III. *Max* ≥ 85? Yes. *Mean* ≥ 85? Yes. *Min* ≥ 85? No.

$$F_1 = \frac{1.373 \times 10^9 K}{KA + C} \qquad \text{[Eq 14]}$$

$$F_2 = 1 - 10^{\frac{Max - 85}{10}} \qquad \text{[Eq 15]}$$

$$M = 10^{\frac{Mean}{10}} \qquad \text{[Eq 16]}$$

$$SE = M - F_1 F_2 \qquad \text{[Eq 17]}$$

*This is based on the Committee on Hearing, Bioacoustics, and Biomechanics Assembly (CHABBA) C-weighted impulse correction factor. *Environmental Protection Planning in the Noise Environment*, TM 5-803-2, Air Force Manual (AFM) 19-10, and Naval Publication (NAVFAC) P-970 (Departments of the Air Force, Army, and the Navy, 15 June 1978). *An Instantaneous Compatibility Zoning*, 2 CFR 2.6 (4 January 1977), and *Guidelines for Preparing Environmental Impact Statements*, Report of Working Group C9 (The National Research Council, CHABBA of Behavioral and Social Sciences, 1977).

Case IV. *Max* $\geq 85°$ *Yes. Mean* $\geq 85>$ *Yes. Min* $\geq 85°$ *Yes.*

$$SE = 10^{\frac{[illegible]}{10}} \qquad \text{[Eq 18]}$$

VI. Percentage Correction Factors

The tables created by TABGEN are under the conditions of standard percent/temperature inversion factors.* These are 74.2 percent at ground level; 8.6 percent at 0 to 500 m, and 18.67 percent at 0 to 3000 m. If these values differ for the area under consideration, the percentage values found in TABGEN are modified.

PC1 = ground or surface inversion factor

PC2 = 0 to 500 m

PC3 = 0 to 3000 m

If Day

$$Ratio = \frac{PC1 + PC2}{82.8} \qquad \text{[Eq 19]}$$

If night, and distance between source and point $\leq$ 2 miles:

$$Ratio\ R1 = \frac{PC1}{74.2} \qquad \text{[Eq 20]}$$

If night, and distance $\geq$ 10 miles

$$Ratio\ R2 = \frac{PC3}{2(18.67)} + 1/2 \qquad \text{[Eq 21]}$$

If night, and 2 $\leq$ distance $\leq$ 10.

$$Ratio = \frac{R2 - R1}{0.7}\ Log10\ \frac{(distance)}{2}\ miles + R_1 \qquad \text{[Eq 22]}$$

where

distance is in miles

The percentages taken from the day or night percentage vs distance/curves are identified as follows

F = % FOCUS
N = % NEGATIVE
B = % BASE
EN = % EXCESS NEGATIVE

$$F1 = new\ FOCUS\ factor = F\ x\ ratio \qquad \text{[Eq 23]}$$

$$B1 = new\ BASE\ factor = B\ x\ ratio \qquad \text{[Eq 24]}$$

$$\Delta = (B - B1) + (F - F1) \qquad \text{[Eq 25]}$$

*Research is underway to refine this portion of the prediction by including both temperature and wind effects.

$$N1 = new\ NEGATIVE\ factor = \frac{N}{N+EN} + \Delta + N, \text{ if } < 0 = 0 \qquad \text{[Eq 26]}$$

$$EN1 = new\ EXCESS\ NEGATIVE\ factor = \frac{EN}{N+EN} \times \Delta + EN, \text{ if } < 0 = 0. \qquad \text{[Eq 27]}$$

VII. Sound-Exposure Total

A. Total

At this point, the sound-exposure values for each region FOCUS, BASE, NEGATIVE, and EXCESS NEGATIVE found in Section V are multiplied by the corresponding percentages found in Section VI. The four resulting numbers are then summed to determine the total sound exposure.

$$SE_T = SE_F + SE_B + SE_N + SE_{EN} \qquad \text{[Eq 28]}$$

where

SE = SOUND EXPOSURE * PERCENTAGE

T = TOTAL

F = FOCUS

B = BASE

N = NEGATIVE

EN = EXCESS NEGATIVE

B. Rounds

Calculation thus far has been one round per day or night. This is the stage at which calculations include more than one round, if necessary. Multiple rounds are accounted for by dividing the total number of rounds from a given source by the total length of time (in days) over which firing was averaged to obtain a single value for number of rounds per day. This value is then multiplied by the total sound exposure calculated from that one source to the point.

$$SE_{NEW} = \frac{\left[SE_T\right]\ (number\ of\ rounds)}{(day)} \qquad \text{[Eq 29]}$$

where

SE_{NEW} = sound exposure for specified conditions

SE_T = sound exposure total from Eq 28.

The sound exposures thus calculated for day and night values are added together. If there is only one source, then this is the final sound exposure (SE_{EN}) for the point and the calculations proceed to Section VIII. If there are more sources, this sound-exposure value is an intermediate result. Very seldom, however, is there only one source. If there is only one firing point and one target point, there are two sources. (Note: since the noise at the target point is omnidirectional, just as for a demolition or explosion, there should be no gun-angle correction for it during the calculation.) The final sound exposure at a given point is the sum of the energies due to all sources at that point. Thus, all the

calculations from Section II to VII are repeated to determine the sound exposure due to each of the sources at the point.)

VIII. CDNL

The value for the final sound exposure is transformed into decibel units by a logarithmic transformation to obtain the SEL

$$SEL = 10 \log_{10} SE_{FN} \qquad \text{[Eq 30]}$$

where

SE_{FN} is the final total sound exposure from all sources.

To obtain the CDNL values, a constant is subtracted from this value. This constant is the logarithm of the number of seconds in a day and arises from the way the equations for CDNL are handled by the program.

$$CDNL = SEL - 49.365 \qquad \text{[Eq 31]}$$

Example 1

I Firing Data*

(I1) Demolition

(I2) Distance from source = 4000 m

(I3) Daytime

(I4) Charge size = 5 lb

(I5) Above ground 200 ft

(I6) Omnidirection explosion (no target)

(I7) Standard inversion factors

(I7a) 74.2 percent

(I7b) 8.6 percent

(I7c) 18.67 percent

(I8) One round

(I9) 1 day

Blast amplitude (II) and percentage (III) use a distance of 4000 m. Find the decibel values for the regions FOCUS, BASE, NEGATIVE, and EXCESS in the TABGEN tables. Position in table = 100 log 4000 - 199 = 161 = first column in ninth row. Table 21 lists all values.

(IV) Correction factors

Question	Answer	Decibel Correction
(a) Night ?	No	0
(b) Charge size ?	5 lb	0
(c) Height ?	In air	0
(d) Gun angle ?	Not applicable	0
	TOTAL	0 dB

* Input Questions from which values in the following pages are derived are denoted by (I), (II), etc.

Since the correction factors total 0 dB, the corrected decibel values are the same as those found initially from TABGEN.

$$(V)\ BASE\ is\ Case\ IV\ SE = 10^{\frac{100.4}{10}} = 1.10 \times 10^{10} \qquad \text{[Eq 18]}$$

$$(V)\ FOCUS\ is\ Case\ IV\ SE = 10^{\frac{92.3}{10}} = 1.62 \times 10^{9} \qquad \text{[Eq 18]}$$

(V) NEGATIVE is Case II

$$A = 82.9 - 77.2 = 5.7 \qquad \text{[Eq 7]}$$

$$C = 87.0 - 82.9 = 4.1 \qquad \text{[Eq 8]}$$

$$K = \frac{4.343(10^{\frac{4.1}{10}} - 1) - 4.1}{5.7 - 4.343(1 - 10^{\frac{4.1}{10}})} = 1.077 \qquad \text{[Eq 9]}$$

$$F_1 = \frac{1.373 \times 10^{9}}{(1.077)(5.7) + 4.1} = 1.341 \times 10^{8} \qquad \text{[Eq 14]}$$

$$F_2 = 10^{\frac{87.88}{10}} - 1 = 0.585 \qquad \text{[Eq 15]}$$

$$SE = (1.341 \times 10^{8})(0.585) = 7.845 \times 10^{7} \qquad \text{[Eq 7]}$$

(V) EXCESS NEGATIVE is Case I

$$SE = 0 \qquad \text{[Eq 10]}$$

(VIIA)

$$SE_I = (1.10 \times 10^{10})(0.041) = 4.51 \times 10^{8}$$

$$SE_B = (1.62 \times 10^{9})(0.219) = 3.55 \times 10^{8}$$

$$SE_N = (7.845 \times 10^{7})(0.385) = 3.02 \times 10^{7}$$

$$SE_S = 0$$

$$SE_I = 8.372 \times 10^{8} \qquad \text{[Eq 28]}$$

(VIIB) No round correction since number of rounds and number of days both = 1

$$SE_{1,N} = SE_1 \qquad \text{[Eq 32]}$$

(VIII) $SEL = 10 \log_{10} (8.362 \times 10^8) = 89.2$ [Eq 30]

$$CDNL = 89.2 - 49.365 = 39.9 \qquad \text{[Eq 31]}$$

Example 2

(I) 105-mm howitzer (M102)

(II) Distance from source = 1/2 mile

(III) Night

(IV) Charge zone 6, A = 83.78; B = 13.91; AVG = 10.84

(V) Not applicable

(VI) 90^0

(VII) Inversion factors

(VIIa) 93 percent

(VIIb) 2 percent

(VIIc) 5 percent

(VIII) 100 rounds

(IX) 2 days

(II and III) 1/2 mile = 804.5 m

Position in TABGEN table = $100 \log_{10} (804.5) - 199 = 91$ = eleventh column in fifth row. Table 21 lists the decibel values found in TABGEN.

(IV) Correction factors

		dB correction
(IV1) Nighttime ?	yes	10
(IV2) Charge size:	1.8656 lb	-25.5
(IV3) Height ?	Not applicable	0
(IV4) Gun angle ?	90^0	6.5
	TOTAL	-9.0

Add the correction factor to the initial values in TABGEN (Table 22).

(V) Sound exposure

$$F = 10^{\frac{111.5}{10}} = 1.41 \times 10^{11} \qquad \text{[Eq 18]}$$

$$B = 10^{\frac{104.6}{10}} = 2.88 \times 10^{10} \qquad \text{[Eq 18]}$$

$$N = 10^{\frac{94}{10}} = 2.82 \times 10^{9} \qquad \text{[Eq 18]}$$

EXCESS NEGATIVE is Case II

$$A = 84.3 - 77.3 = 7.0$$
$$C = 86.9 - 84.3 = 2.6$$

$$K = \frac{4.343(10^{\frac{2.6}{10}} - 1) - \frac{2.6}{10}}{7.0 - 4.393(1 - 10^{\frac{-10}{10}})} = 0.272 \qquad \text{[Eq 9]}$$

$$F_1 = \frac{1.373 \times 10^{9}}{(0.272)(7.0) + 2.6} = 3.05 \times 10^{8} \qquad \text{[Eq 14]}$$

$$F_2 = 10^{\frac{86.9 - 88}{10}} - 1 = 0.549 \qquad \text{[Eq 15]}$$

$$SE = (3.05 \times 10^{8})(0.549) = 1.67 \times 10^{8} \qquad \text{[Eq 17]}$$

(VI) PC1 = 93 PC2 = 2 PC3 = 5

$$\textit{Night, < 2 miles, } RI = \frac{93}{74.2} = 1.25 \qquad \text{[Eq 20]}$$

$$F1 = (6.1)(1.25) = 7.625 \textit{ percent} \qquad \text{[Eq 23]}$$

$$B1 = (39.0)(1.25) = 48.75 \textit{ percent} \qquad \text{[Eq 24]}$$

$$\Delta = (6.1 - 7.625 + (39.0 - 48.75) = -11.275 \qquad \text{[Eq 25]}$$

$$N1 = \frac{(39.7)}{54.9}(-11.275) + 39.7 = 31.55 \textit{ percent} \qquad \text{[Eq 27]}$$

$$EN1 = \frac{(15.2)}{54.9}(-11.275) + 15.2 = 12.08 \textit{ percent} \qquad \text{[Eq 27]}$$

(VIIA) $SE_F = (141 \times 10^{10})(0.0762) = 1.074 \times 10^{10}$ [Eq 28]

$SE_B = (2.88 \times 10^{10})(0.4875) = 1.404 \times 10^{10}$

$SE_N = (2.82 \times 10^{9})(0.3155) = 8.897 \times 10^{8}$

$SE_{FN} = (1.67 \times 10^{8})(0.1208) = 2.022 \times 10^{7}$

$SE_T = 2.569 \times 10^{10}$ [Eq 28]

(VIIB) $$\frac{100 \textit{ rounds}}{2 \textit{ day}} = 50 \textit{ rounds/day} \qquad \text{[Eq 30]}$$

$$SI = SI_{AN} - (2.569 \times 10^{-3})(500) - 1.285 \times 10^{-1} \quad \text{[Eq 30]}$$

(XIII)

$$SII = 10 \log_{10}(1.285 \times 10^{-1}) = 121.1\ dB \quad \text{[Eq 33]}$$

$$CDNI = 121.1 - 49.365 = 71.7\ dB \quad \text{[Eq 34]}$$

Table 21
Decibel Values from TABGEN for Example 1

		(II) Decibels	(III) Percent
I	MAX	105.4	4.1
	MEAN	100.4	
B	MIN MAX	96.8	21.9
	MEAN	92.1	
N	MIN MAX	87.0	38.7
	MEAN	82.9	
EN	MIN MAX	77.2	
	MEAN	73.0	35.5
	MIN	63.8	

Table 22
Corrected Decibel Values from TABGEN for Example 2

		(II) Decibels	(III) Percent	(IV) Corrected Decibel Values
	MAX	123.9	8	114.9
I	MEAN	120.5		111.5
	MIN MAX	118.9	52.8	109.9
B	MEAN	113.6		104.6
	MIN MAX	107.9	38.6	98.9
N	MEAN	103.5		94.5
	MIN MAX	95.9		86.9
EN	MEAN	93.3	7.8	84.3
	MIN	86.3		77.3

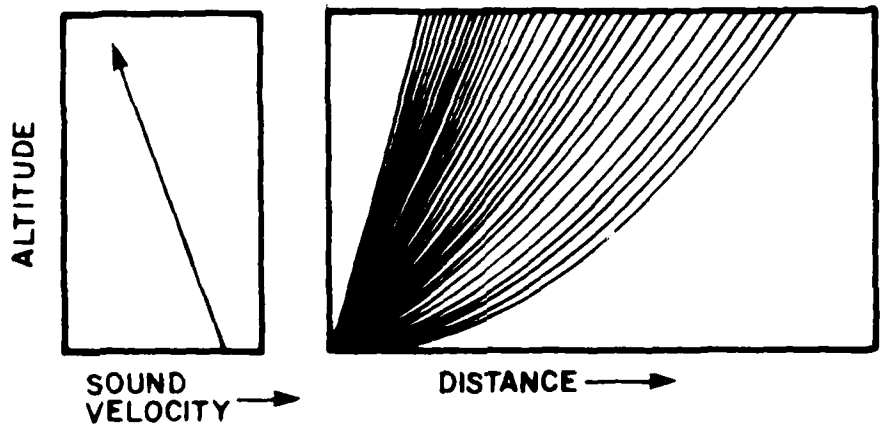


Figure 19 Negative sound velocity gradient

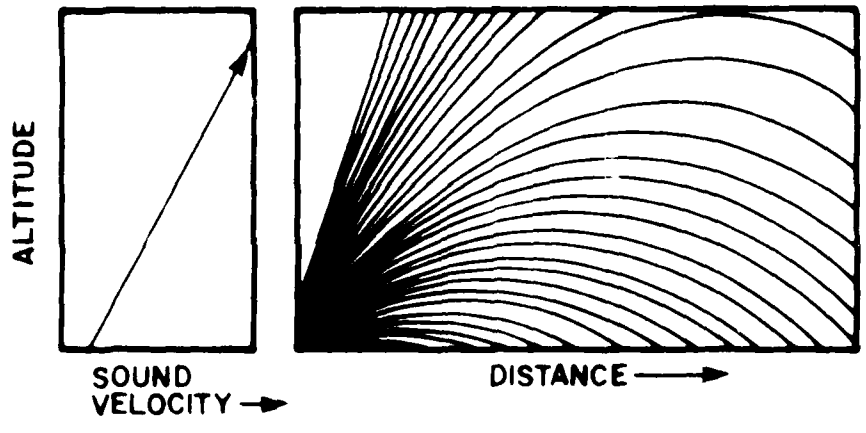


Figure 20 Positive sound velocity gradient

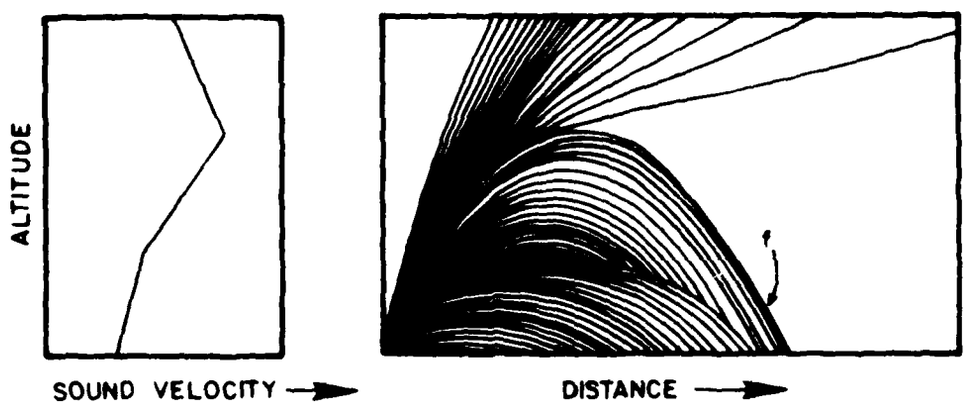


Figure 21 Sharply charged positive sound

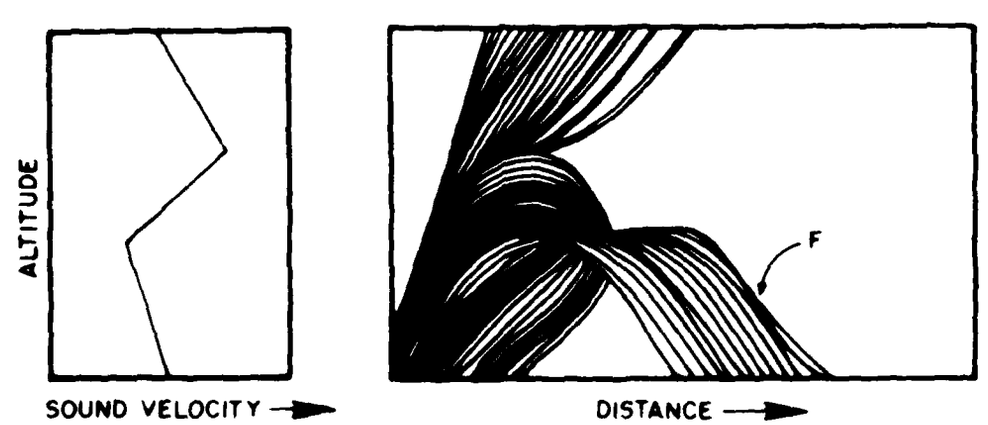


Figure 22

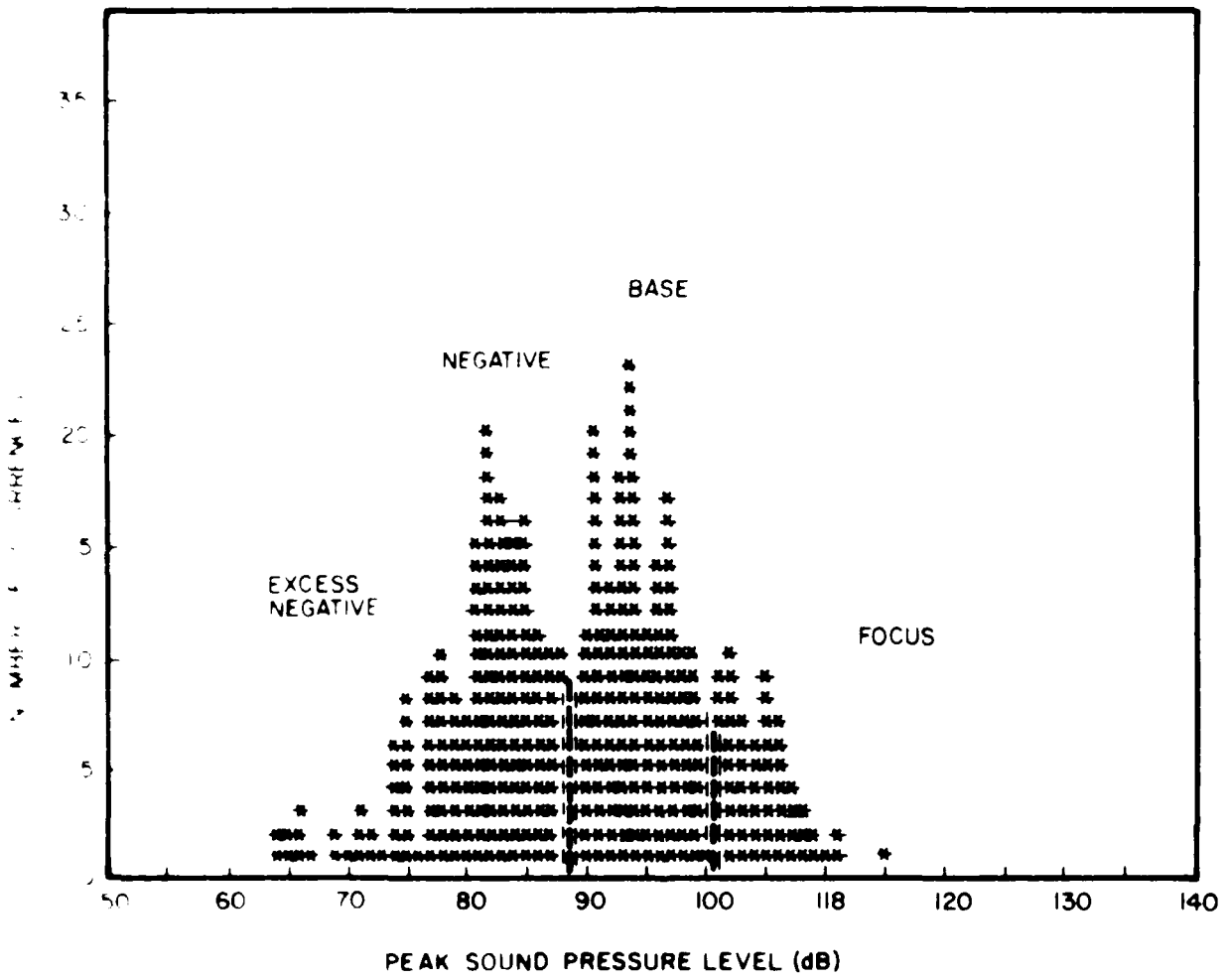


Figure 23 Sample amplitude description

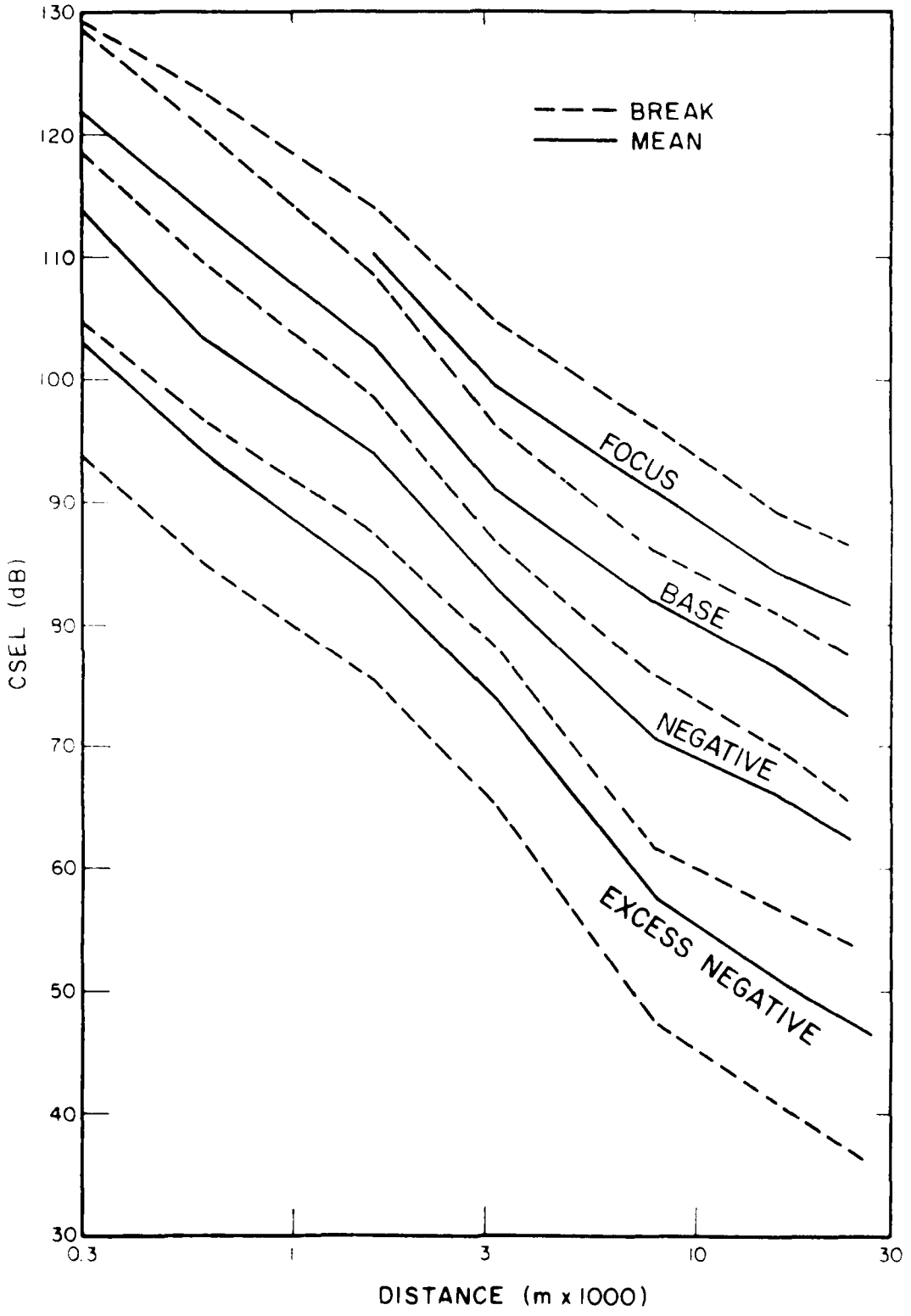


Figure 24 Means and break (day)

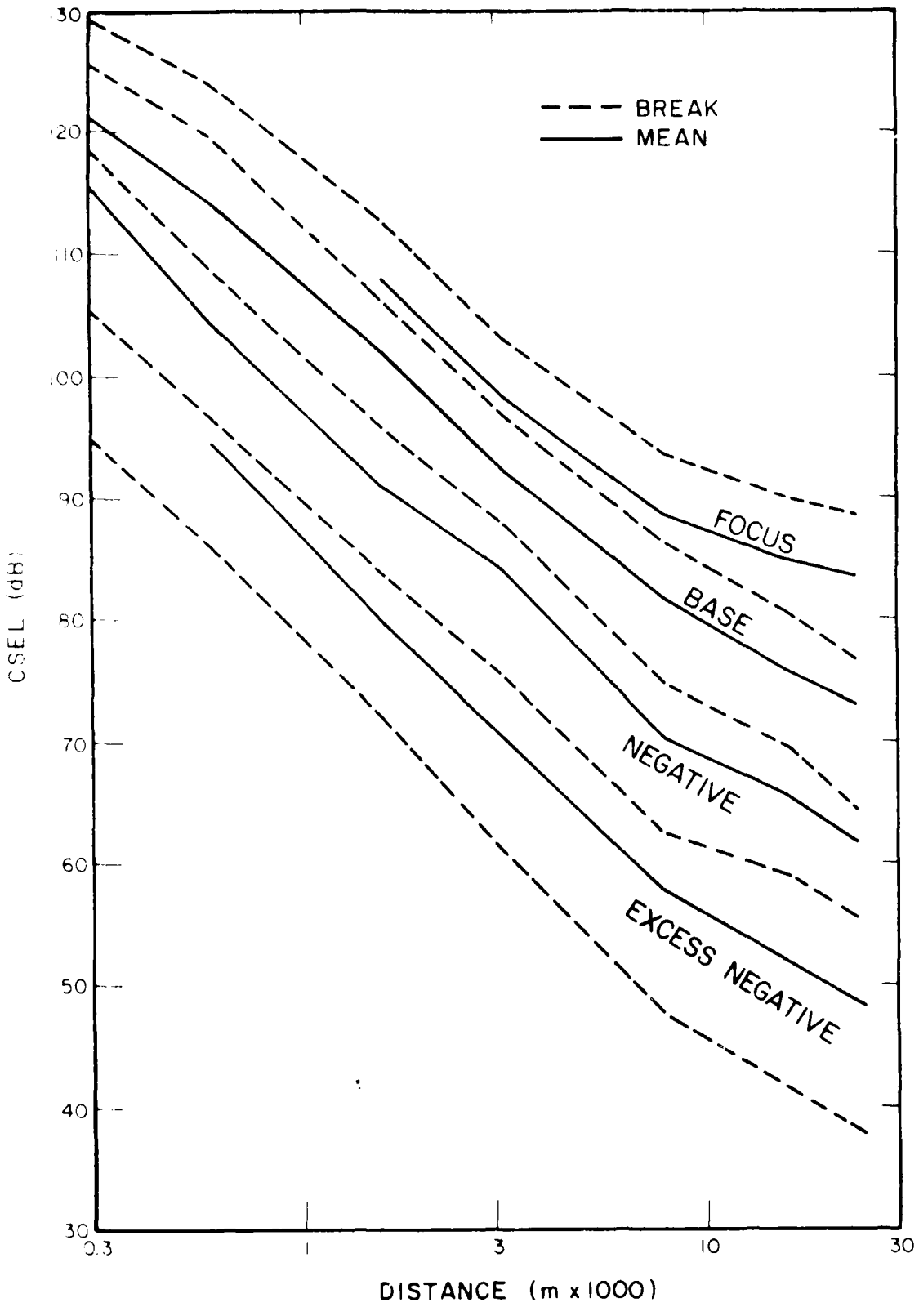


Figure 25 Means and break (night)

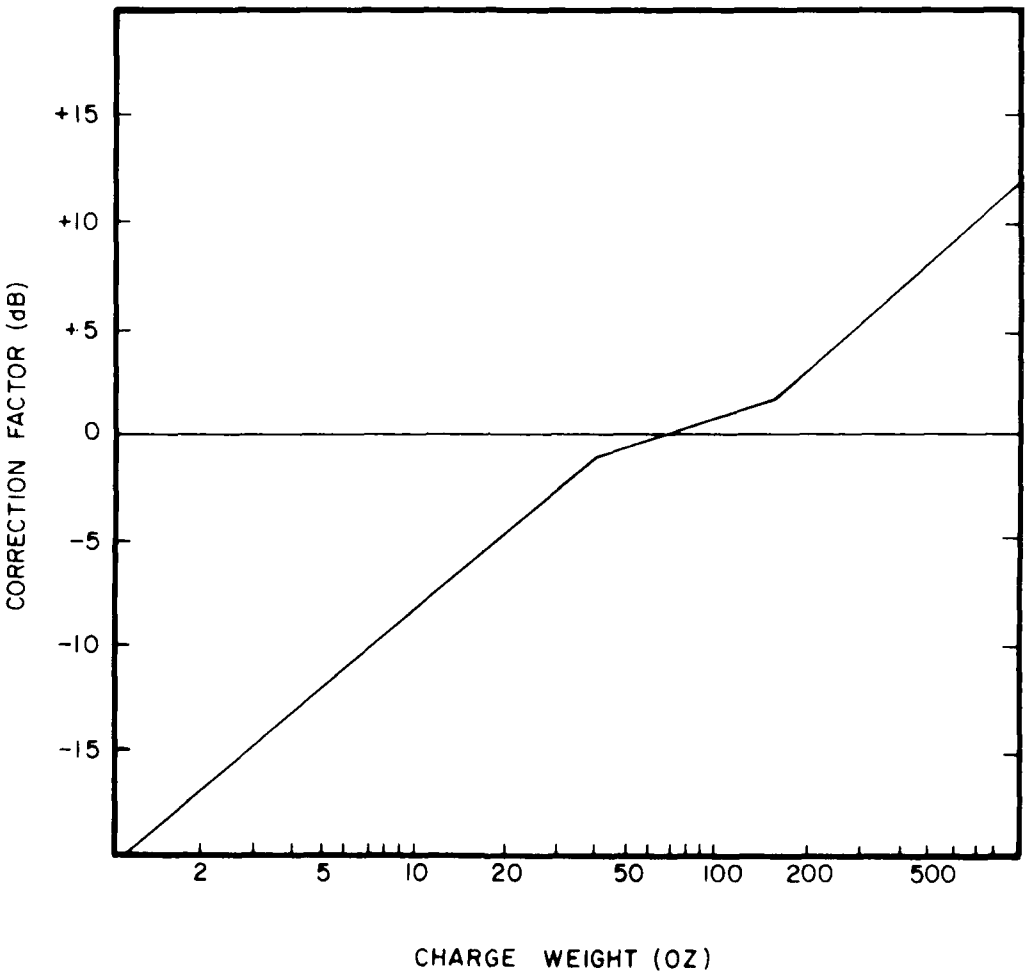


Figure 26 Charge size correction graph.

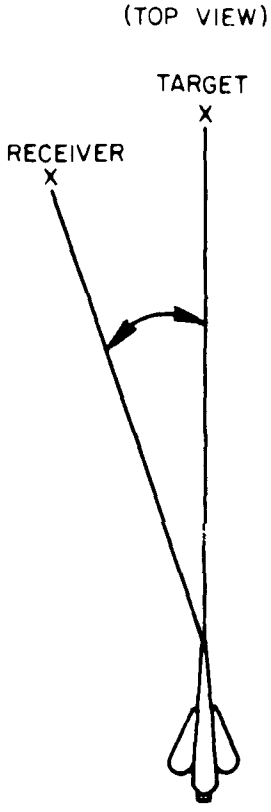


Figure 27 Angle illustrations.

APPENDIX:

BNOISE 3.2 SOURCE LISTING

```
      PROGRAM LOOK(INPUT=128,OUTPUT=128,TAPE5=INPUT,TAPE6=OUTPUT,
     1TAPE7=128,TAPE8=512,TAPE1=128,TAPE2=128,TAPE3=128,TAPE4=128,
     2 TAPE50=128,TAPE70=128,TAPE75=128,                              ZNEF   4
     3 TAPE77=128,TAPE51=128,TAPE55=128,                              ZNEF   5
     4 TAPE9)
C
C     THIS IS THE VARIABLES HEAD, WHICH REPRESENTS THE
C     HEAD WHICH IS THE ARRAY, WHICH REPRESENTS THE LINE PRINTER
      COMMON/VAR/HEAD(20),PLOT                                        ZNEF   6
C     ARRAY HEAD HOLDS THE NAMES OF THE DIFFERENT
C     VARIABLES CALCULATED BY THE MAIN PROGRAM.
      DIMENSION HEAD(20)                                              ZNEF   7
C     COMMON BLOCK MIMAX CONTAINS THE MAXIMUM AND MINIMUM
C     VALUES OF THE X AND Y GRID COORDINATES AND THE LOGICAL
C     FLAG MOS THAT CHECKS TO SEE IF THESE VALUES ARE ACCEPTABLE
      COMMON/MIMAX/XMIN,YMIN,XMAX,YMAX,MOS                            ZNEF   8
      LOGICAL MOS,LARGE                                               ZNEF   9
C     HL OR PLTOM CONTAINS INFORMATION WHICH IS COMPUTED
C     IN SUBROUTINE PLOT AND USED BY THE NASAPLOT PROGRAM
C     FOR CONTOUR MAKING.
      COMMON/PLOTOM/PLTOT,SXTABLE,SYTABLE,LARGE                       ZNEF  10
C     PLTOT IS THE NUMBER OF PLOTS REQUESTED
      INTEGER PLTOT                                                   ZNEF  11
C     BLOCK SHOS CONTAINS THE NUMBER OF SOURCES.  IT IS
C     USED IN FORMA, CALCNR, AND PGRID.
      COMMON /SHOS/ NSHOS
C     COMMON BLOCK FT CONTAINS INFORMATION CONCERNING
C     THE LOCATIONS OF THE TARGETS AND FIRING POINTS,
C     TOTAL NUMBER OF DAY AND NIGHT FIRINGS,(ALL OF WHICH
C     ARE DECLARED ARRAYS), THE GRID SIZE GRDSZ, AND THE
C     CNP, WHICH IS THE DB VALUE AT A GIVEN POINT.
      COMMON/FT/GRDSZ,CNP,XLOC,YLOC,DAYNO,DARKNO,TEMPB                ZNEF  13
C     TEMPB IS NEEDED TO ALLOW FOR SPACE IN THE MAPS SUBROUTINE
      DIMENSION TEMPB(7000),TEMPA(5000)

      DIMENSION XLOC(2000),YLOC(2000),DARKNO(2000),DAYNO(2000)        ZNEF  14
C     IN COMMON BLOCK GRID, NRCNR,EAS,RCNR,TEMP,AND DIST
C     ARE NO LONGER USED IN THE PROGRAM OR THE SUBROUTINES
C     ARRAY SDBAM STORES CAMAGE INFORMATION; ARRAYS ANGSIN,
C     AND ANGCOS STORE SINE AND COSINE VALUES FOR THE ANGLE
C     OF FIRING.
      COMMON/GRID/NRCNR,EAS,RCNR,DIST,SDBAM,          ANGCOS,ANGSIN
     1  ,TEMP(4000),TEMPA
C    TMPA IS NEEDED FOR EXTRA SPACE IN THE MAPS SUBROUTINE
      DIMENSION RCNR(10),DIST(10),SDBAM(2000),
     1ANGCOS(2000),ANGSIN(2000)                                       ZNEF  17
      COMMON/DEBUG/CHECK,READ,TAPRD                                   ZNEF  20
      COMMON/PARM/THRESH,PENITE,PPIP,IMP
C     LOGICAL FLAGS:  CHECK=FLAG FOR GROUND CORR FACTOR
C     ON NEF=1 CASE ; READ=FLAG FOR READIN,TAPRD=FLAG FOR READTB.
      COMMON/METER/METERS,IMETER,IBOTH                                ZNEF  21
      LOGICAL METERS                                                  ZNEF  22
C     DAYCNR AND DARKCNR ARE LOGICAL FLAGS THAT DENOTE
C     IF WE ARE COMPUTING DAYTIME OR NIGHTTIME DATA.
      COMMON/CALL/DAYCNR,DARKCNR                                      ZNEF  23
```

```
      LOGICAL DAYCNR,DRKCNR                                              ZNEF  24
C     THIS COMMON BLOCK(ANGLE) IS NO LONGER USED.
      COMMON/ANGLE/COSC,SINC                                             ZNEF  25
      DIMENSION COSC(72),SINC(72)                                        ZNEF  26
      LOGICAL CHECK,REED,TAHRD                                           ZNEF  27
C     STP IS A LOGICAL FLAG THAT IS SOMETIMES USED TO INVOKE THE
C     STOPP ROUTINE.
      LOGICAL STP                                                        ZNEF  29
C     KARD = TAPE 5(INPUT) AND KPRINT = TAPE 6(OUTPUT)
      DATA KARD/5/,KPRINT/6/                                             ZNEF  30
      DATA GRDSZ,EAS/5000.0,0.500/
C     INITIALIZE ARRAY HEAD TO MODULE NAMES
      DATA HEAD/10HMAP       ,10HFORM=A     ,10HPOINT     ,10HPUDDLE GRI,
     110HPLOT      ,10HBASE       ,10HSCATTER   ,
     210HSTOP      ,10HLOCATOR    ,10HBOUNDS    /,                        ZNEF  36
     3 NP/10/

C     INITIALIZE FLAGS AND COUNTERS
      STP=.FALSE.                                                        ZNEF  39
      REED=.FALSE.                                                       ZNEF  40
      TAHRD=.FALSE.                                                      ZNEF  41
      CHECK=.FALSE.                                                      ZNEF  42
      LARGE=.FALSE.
C
      DRKCNR=DAYCNR=.TRUE.                                               ZNEF  43
      BDS=.FALSE.                                                        ZNEF  44
      XMIN=0.                                                            ZNEF  45
      YMIN=0.                                                            ZNEF  46
      XMAX=0.                                                            ZNEF  47
      YMAX=0.                                                            ZNEF  48
      PLTCT=0                                                            ZNEF  49
      SXTABLE=0.                                                         ZNEF  50
      SYTABLE=0.                                                         ZNEF  51

C THE PROGRAM READS THE FIRST CARD OF THE MODULE INPUT, WHICH CONTAINS THE UNITS
C USED IN COMPUTATION(METERS OR FEET).  THE FIRST PAGE OF OUTPUT STATES
C "DISTANCE EXPRESSED IN METERS"
      READ(KARD,700)HOR,ICHECK,LCHECK,TI,PI,PPI,IMP                      ZNEF  59
C     IMPULSE FACTOR INSERTED BY PAUL SCHOMEN  10 JAN 80
      PPIP=10**(PPI/10)
C     IF THE UNIT METERS IS REQUESTED FOR USE, SET APPROPRIATE FLAG
      METERS=(HOR .EQ. 10HMETERS     )                                   ZNEF  60
C      CHECK FOR THE AVAILABILITY OF LARGE PAPER
      LARGE=(LCHECK .GT. 0)
C   SET PARAMETERS IF REQUESTED.
      THRESH=85.0
      PERITE=10.0
      IF(TI .NE. 0) THRESH=TI
      IF(PI .NE. 0) PERITE=PI
      CHECK=(ICHECK .GT. 0)                                              ZNEF  61
C     UNITS COULD BE IN FEET
      IMETER=10HFEET                                                     ZNEF  62
C     IF THE METERS FLAG IS TRUE, THEN WE USE METERS.
      IF (METERS) IMETER=10HMETERS                                       ZNEF  63
```

```
C     USING DAYTIME AND NIGHTTIME DATA
      IBOTH=1[illegible] THEN [illegible]                                    ZNEF  64
      WRITE(KPRINT,[illegible])[illegible]                                   ZNEF  65

C*    ECHO SPECIAL PARAMETERS FOR TESTING
      WRITE(KPRINT,810) THRESH,PENITE,PRIP,IMP


C THE ARRAY HEAD(15) CONTAINS THE NAMES OF THE MODULES.  THEREFORE, THE IF-GO-
C TO STATEMENT RELATES TO THAT TEST FOR EACH MODULE NAME.
  100 READ(KAR,700) HDR                                                  ZNEF  66
      IF(EOF(KAR).NE.0) GO TO 30                                         ZNEF  67
C     THIS LOOP READS EACH MODULE NAME AND THE MULTIPLE GO TO SENDS
C     THE PROGRAM TO THE APPROPRIATE CALL STATEMENT.
      DO 150 I=1,NP                                                      ZNEF  68
      IF (HDR .EQ. HEAD(I)) GO TO 200                                    ZNEF  69
  150 CONTINUE                                                           ZNEF  70
C     AN ILLEGAL CALL WAS ATTEMPTED
      WRITE(KPRINT,701) HDR                                              ZNEF  71
      STOP                                                               ZNEF  72

C     JUMP TO APPROPRIATE CALL ACCORDING TO THE VALUE OF I
  200 GOTO (210,220,225,230,240,250,260,310,320,330) , I


  210 CALL MAP                                                           ZNEF  75
      GO TO 100                                                          ZNEF  76
  220 CALL FORMA                                                         ZNEF  77
      GO TO 100                                                          ZNEF  78
  225 CALL POINT
      GO TO 100                                                          ZNEF  80
  230 CALL PGRID                                                         ZNEF  81
      GO TO 100                                                          ZNEF  83
  240 CALL PLOT                                                          ZNEF  84
      GO TO 100                                                          ZNEF  85
  250 CALL BASE                                                          ZNEF  86
      GO TO 100                                                          ZNEF  87
  260 CALL SCATTR                                                        ZNEF  88
      GO TO 100                                                          ZNEF  89

C CLOSE NASAPLOT INPUT FILE                                              ZNEF 114
  310 CALL STOPP                                                         ZNEF 115
      STP=.TRUE.                                                         ZNEF 116
      GO TO 100                                                          ZNEF 117
  320 CALL LOCATR                                                        ZNEF 118
      GO TO 100                                                          ZNEF 119
  330 CALL BOUNDS                                                        ZNEF 120
      GO TO 100                                                          ZNEF 121
  300 CONTINUE                                                           ZNEF 122
C CALL PLOT TERMINATION ROUTINE IF NOT PREVIOUSLY CALLED                 ZNEF 123
      IF(.NOT.STP)CALL STOPP                                             ZNEF 124
      STOP                                                               ZNEF 125
  700 FORMAT(A10,2I1,8X,3F10.0,I2)                                       ZNEF 126
  701 FORMAT(1H1,///,*.....ERROR..... NAME = 10H*,A10,* IS NOT A LEGAL CZNEF 127
     1ALL TO NEF MAIN PROGRAM.....*,//)                                  ZNEF 128
  800 FORMAT(1H1///T50,*.....    BNOISE3.2        .....*/////            ZNEF 132
     151X,*DISTANCES EXPRESSED IN *,A10)                                 ZNEF 133
```

```
C*   FORMAT FOR TEST ECHO
  810 FORMAT(///1H ,1X,*TIMES=*,5X,F5.1/1H ,10X,*PERMITE*,5X,F5.1/1H ,
175     1 1X,*PPI=*,E12.4/1H ,10X,*I=P*,10X,I2)
        END                                                    ZNEF 134
```

SYMBOLIC REFERENCE MAP (R=5)

ENTRY POINTS DEF LINE REFERENCES
11536 LCDR 1

VARIABLES	SN	TYPE		ALLOCATION								
3746	ANGCOS	REAL	ARRAY	GRID	REFS	44	47					
7666	ANGSIN	REAL	ARRAY	GRID	REFS	44	47					
4	BOS	LOGICAL		METRIC	REFS	18	19	DEFINED	85			
0	CHECK	LOGICAL		PARM	REFS	49	62	DEFINED	81	110		
1	CNR	REAL		FT	REFS	34						
0	COSC	REAL	ARRAY	ANGLE	REFS	60	61					
13562	DAMAND	REAL	ARRAY	FT	REFS	34	38					
0	DAYCNR	LOGICAL		CALC	REFS	57	58	DEFINED	84			
7642	DAYND	REAL	ARRAY	FT	REFS	34	38					
14	DIST	REAL	ARRAY	GRID	REFS	44	47					
1	DRKCNR	LOGICAL		CALC	REFS	57	58	DEFINED	84			
1	EAS	REAL		GRID	REFS	44	DEFINED	68				
0	GRDSZ	REAL		FT	REFS	34	DEFINED	68				
12015	HDR	REAL			REFS	102	130	133	DEFINED	98	125	
12024	HEAD	REAL	ARRAY		REFS	14	130	DEFINED	70			
12023	I	INTEGER			REFS	130	137	DEFINED	129			
2	IBUTH	INTEGER		METRIC	REFS	53	DEFINED	116				
12016	ICHECK	INTEGER			REFS	110	DEFINED	98				
1	IMETER	INTEGER		METRIC	REFS	53	117	DEFINED	112	114		
3	IMP	INTEGER		PARM	REFS	50	120	DEFINED	98			
0	KARD	INTEGER		IO	REFS	11	126	DEFINED	67	I/O REFS	98	125
1	KPRINT	INTEGER		IO	REFS	11	DEFINED	67	I/O REFS	117	120	133
3	LARGE	LOGICAL		PLOTCM	REFS	19	23	DEFINED	82	104		
12017	LCHECK	INTEGER			REFS	104	DEFINED	98				
0	METERS	LOGICAL		METRIC	REFS	53	54	114	DEFINED	102		
11702	NP	INTEGER			REFS	129	DEFINED	70				
0	NRCNR	INTEGER		GRID	REFS	44						
0	NSHCS	INTEGER		SHCS	REFS	28						
1	PERMITE	REAL		PARM	REFS	50	120	DEFINED	107	109		
12021	PI	REAL			REFS	2*109	DEFINED	98				
0	PLTCT	INTEGER		PLOTCM	REFS	23	25	DEFINED	90			
12022	PPI	REAL			REFS	100	DEFINED	98				
2	PPIP	REAL		PARM	REFS	50	120	DEFINED	100			
2	RCNR	REAL	ARRAY	GRID	REFS	44	47					
1	REED	LOGICAL		DEBUG	REFS	49	62	DEFINED	79			
26	SDMMM	REAL	ARRAY	GRID	REFS	44	47					
110	SINC	REAL	ARRAY	ANGLE	REFS	60	61					
12014	STP	LOGICAL			REFS	65	165	DEFINED	78	157		
1	SXTABLE	REAL		PLOTCM	REFS	23	DEFINED	91				
2	SYTABLE	REAL		PLOTCM	REFS	23	DEFINED	92				
2	TAPRD	LOGICAL		PARM	REFS	49	62	DEFINED	80			

VARIABLES	SN	TYPE									
13[illegible]	TEMP	REAL	ARRAY	[illegible]	REFS	44					
23446	TEMPA	REAL	ARRAY	[illegible]	REFS	36	44				
175 2	TEMPB	REAL	ARRAY	FT	REFS	34	36				
[illegible]	THRESH	REAL		[illegible]	REFS	5	120	DEFINED	106	108	
12[illegible]	TI	REAL			REFS	2*18	DEFINED	94			
2	XLOC	REAL	ARRAY	FT	REFS	34	38				
2	XMAX	REAL		[illegible]	REFS	16	DEFINED	82			
0	XMIN	REAL		[illegible]	REFS	16	DEFINED	86			
3722	YLOC	REAL	ARRAY	FT	REFS	34	38				
3	YMAX	REAL		[illegible]	REFS	18	DEFINED	89			
1	YMIN	REAL		[illegible]	REFS	18	DEFINED	87			

FILE NAMES	MODE
5	INPUT
254	OUTPUT
2060	TAPE1
7430	TAPE10
2334	TAPE2
3340	TAPE20
2610	TAPE3
3064	TAPE4
0	TAPE5
6700	TAPE51
7154	TAPE55
254	TAPE6
530	TAPE7
5144	TAPE70
4414	TAPE71
4670	TAPE72
5420	TAPE75
1004	TAPE8
5674	TAPE90
6150	TAPE91
6424	TAPE99

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES								
BASE		0	150								
BOUNDS		0	161								
EOF	REAL	1	126								
FORMA		0	142								
LOCATR		0	159								
MAP		0	140								
PGRID		0	146								
PLOT		0	148								
POINT		0	144								
SCATTR		0	152								
STOPP		0	156	165							

STATEMENT LABELS		DEF LINE	REFERENCES							
11601	100	125	141	143	145	147	149	151	153	158	160
			162								
0	150	131	129								
11616	200	137	130								
11635	210	140	137								
11640	220	142	137								
11643	225	144	137								

STATEMENT LABELS			DEF LINE	REFERENCES
11646	230		148	137
11651	240		149	137
11654	250		150	137
11657	260		152	137
11674	300		163	126
11662	310		156	137
11666	320		159	137
11671	330		161	137
11742	700	FMT	167	98 125
11746	701	FMT	168	133
11761	800	FMT	170	117
11773	810	FMT	174	120

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	EXITS
11611	150	I	129 131	2H	INSTACK	

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)							
IO	2	0 KARD	(1)	1 KPRINT	(1)				
BOUND	5	0 XMIN	(1)	1 YMIN	(1)	2 XMAX	(1)		
		3 YMAX	(1)	4 BDS	(1)				
PLOTCM	4	0 PLTCT	(1)	1 SXTABLE	(1)	2 SYTABLE	(1)		
		3 LARGE	(1)						
SRCS	1	0 NSRCS	(1)						
FT	15002	0 GRDSZ	(1)	1 CNR	(1)	2 XLOC	(2000)		
		2002 YLOC	(2000)	4002 DAYNO	(2000)	6002 DARKNO	(2000)		
		8002 TEMPB	(7000)						
GRID	15022	0 NRCNR	(1)	1 EAS	(1)	2 RCNR	(10)		
		12 DIST	(10)	22 SOBHH	(2000)	2022 ANGCOS	(2000)		
		4022 ANGSIN	(2000)	6022 TEMP	(4000)	10022 TEMPA	(5000)		
DEBUG	3	0 CHECK	(1)	1 REED	(1)	2 TABRD	(1)		
PARM	4	0 THRESH	(1)	1 PENITE	(1)	2 PPIP	(1)		
		3 IMP	(1)						
METRIC	3	0 METERS	(1)	1 IMETER	(1)	2 IBOTH	(1)		
CALC	2	0 DAYCNR	(1)	1 DRKCNR	(1)				
ANGLE	144	0 COSC	(72)	72 SINC	(72)				

STATISTICS

PROGRAM LENGTH	2067B	1079
BUFFER LENGTH	7747B	4071
CM LABELED COMMON LENGTH	727605	30192
600008 CM USED		

```
SUBROUTINE BASE      74 175  08/02 OPT=2                    FTN 4.8+ 5.0          07/12 09:12  PAGE  1

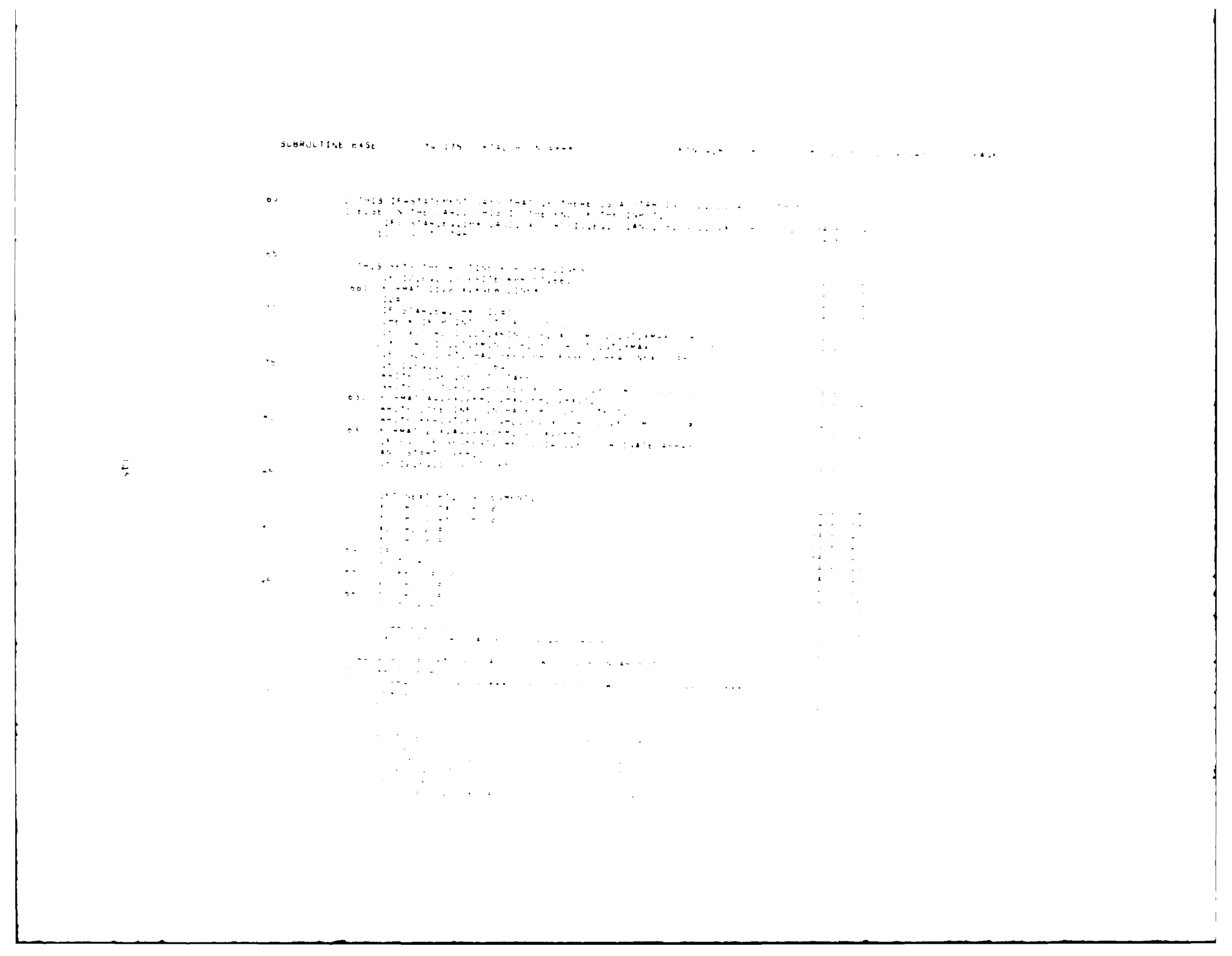
      SUBROUTINE BASE                                                          BASE   2
C * THIS SUBROUTINE CREATES THE ILLUSION OF THE BASE OR REGION BEING SET FOR
C WORKING WITH.  THE USER INPUT MAY CONTAIN LINE SEGMENTS FROM ANOTHER
C COORDINATE OF THE SPECIFIC  REGION.
C
C     THESE TWO ARRAYS ARE THE VALUES OF THE STARTING
C     AND ENDING POINTS FOR THE LINES BEING.
      DIMENSION XCOOR(2),YCOOR(2)                                              BASE   3
C     BLOCK HOLD CONTAINS BOUNDARY INFORMATION.
      COMMON/E  NE/XMIN,YMIN,XMAX,YMAX,BDS                                     BASE   4
C     BOUNDS FLAG.
      LOGICAL BDS                                                              BASE   5
C     KARD=INPUT; KPRINT=OUTPUT
      COMMON /IO/KARD,KPRINT                                                   BASE   6
C     IOUT=TAPE 2
      DATA IOUT/2/                                                             BASE   7
C     CDC FUNCTION TO COMPUTE TIME SPENT IN A PROGRAM
      CPTIME=SECOND(CP)                                                        BASE   8

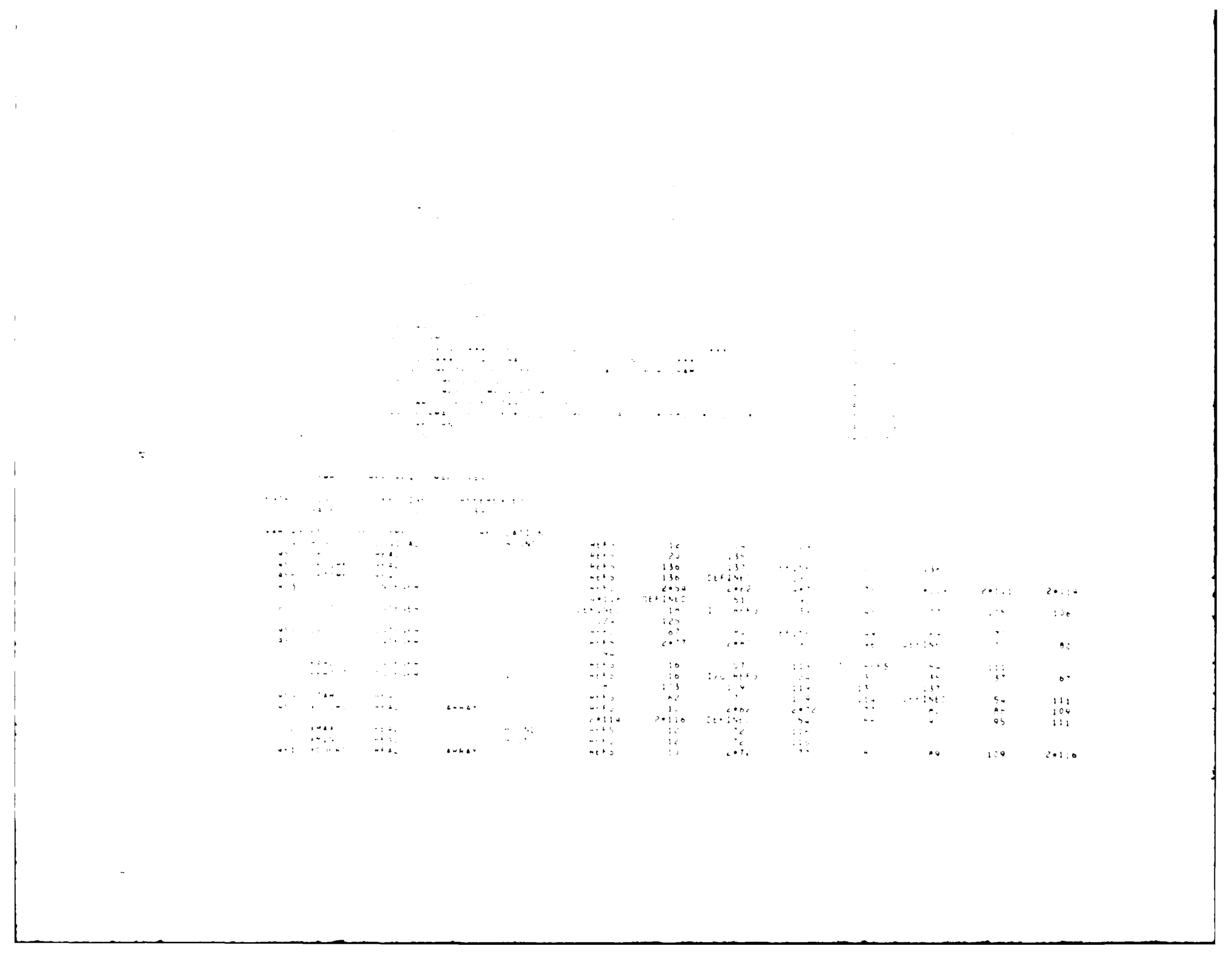

      WRITE(KPRINT,400)                                                        BASE   9
  400 FORMAT(1H1///35X,*.....     BASE      .....*//)                          BASE  10

C  IF THERE ARE NOBOUNDS IN THE INPUT MODULES, COMPLAIN.
      IF(BDS) GO TO 450                                                        BASE  11
      WRITE(KPRINT,470)
  470 FORMAT(*  ...ERROR.  NO BOUNDS CALL BEFORE BASE....*)
      STOP

C THIS PRINTS OUT THE HEADING "LINE CARDS", "X-Y START", "X-Y END"
  450 WRITE(KPRINT,592) 0                                                      BASE  12
  592 FORMAT(I1,42X,*LINE CARDS*)                                              BASE  13
      WRITE(KPRINT,593) 0                                                      BASE  14
  593 FORMAT(I1,29X,*X-Y START*,35X,*X-Y END*)                                 BASE  15
      REWIND IOUT                                                              BASE  16

C PHASE 4 PLOTS SPECIAL LINES AND TEXT ON THE MAP AND DRAWS A BOX AROUND THE
C MAP.
C     WRITE HEADER FOR PHASE 4
      WRITE(IOUT,590)                                                          BASE  17
  590 FORMAT(4HHMS4)                                                           BASE  18
C     I2 ACTS AS A FLAG TO TELL IF A SEGMENT HAS BEEN COMPLETED
C     (I2=1)
      I2=0                                                                     BASE  19
C     I SERVES AS COUNTER FOR STARTING AND ENDING PT. INFO.
  605 I=1                                                                      BASE  20
C     READ BASE=2 CARD WITH COORDS OF POINT IN SET DESCRIBING
C     A LINE SEGMENT.
  610 READ(KARD,620) XCOOR(I),YCOOR(I),STAR                                    BASE  21
  620 FORMAT(2F10.5,A1)                                                        BASE  22
C ERROR MESSAGE="NO EOF CARD: "JOB ABORTED"
      IF(EOF(KARD).NE.0.) GO TO 700                                            BASE  23
```





VARIABLES SN TYPE RELOCATION

				DEFINED	54	64	72	98	111
3	YMAX	REAL	R*4(2)	REFS	12	72	118		
1	YMIN	REAL	R*4(2)	REFS	12	72	118		

VARIABLES (SEE AS FILE NAMES, SEE AP 4)

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	57 111
SECOND	REAL	1	2 135

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES
SIGN	REAL	2	I*4*1	62 114

STATEMENT LABELS			DF LINE	REFERENCES
665	401	FMT	25	24
12	450		35	29
230	473	FMT	31	3
231	542	FMT	46	45
25	542	FMT	36	35
26	543	FMT	38	37
67	605		51	97
37	611		54	43
342	626	FMT	55	54 111
341	635	FMT	81	80
365	831	FMT	78	77
125	844		92	75
127	853		94	84
	883		96	94
311	901	FMT	68	67
133	711		103	72 118
351	715	FMT	104	103
127	717		109	116
367	720	FMT	110	109
129	795		119	57 113
414	741	FMT	120	119
2 2	746		130	114
465	747	FMT	131	130
214	748		135	62 126
417	749	FMT	138	137

LABEL	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
71		J	77 77	108	EXT REFS
1 5		J	80 80	104	EXT REFS
135	881	J	94 96	35	INSTALK

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)			
	5	0 XMIN (1)	1 YMIN (1)	2 XMAX (1)	
		3 YMAX (1)	4 BUS (1)		
IO	2	1 KA=1 (1)	1 KPRINT (1)		

STATISTICS

PROGRAM LENGTH	4676	311
LABELED COMMON LENGTH	74	2

0BLOCK CM USED

```
      SUBROUTINE B SET(MIN,MAX,GRID,N,SET)

      THIS SUBROUTINE IS USED TO TEST IF THE [illegible] ARE [illegible] THE
      GRID SIZE. IF NOT THEN THEY ARE MODIFIED UNTIL [illegible]
C     [illegible] THE GRID SIZE. IT ALSO SETS A FLAG (SET) TO SAY [illegible]
      HAVE [illegible]. THE NUMBER OF GRID POINTS BETWEEN [illegible]
      MAX IS [illegible] GIVEN IN [illegible] WHEN THE BOUNDS ARE CHANGED [illegible]
C     SMALLER AND THE MAX [illegible] BIGGER.
C
      REAL MIN,MAX,GRID,TOL
      LOGICAL SET
      DATA [illegible]
C
C     GET THE DIFFERANCE AND SEE IF A MULTIPLE OF GRID
      D=(MAX-MIN)/GRID
      N=D
      IF (ABS(D-N).LT.TOL) RETURN
C
C     NOT A MULTIPLE OF GRID SO MODIFY
C
      M=INT(MIN/GRID)
C     MAKE MIN SMALLER IF IT IS NEGATIVE SINCE FUNCTION FIX DOESN'T
      IF (MIN.LT.0.0) M=M-1
      MIN=M*GRID
C
C     TAKE CARE OF MAX      MAKE IT BIGGER IF IT IS POSITIVE
      M= INT(MAX/GRID)
      IF (MAX.GT.0.0) M=M+1
      MAX=M*GRID
C
      N=(MAX-MIN)/GRID
C     SET FLAG
      SET=.TRUE.
      RETURN
      END
```

```
      SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS      DEF LINE      REFERENCES
    3  BDSET           1          17          34

VARIABLES      SN  TYPE            RELOCATION
   37  D           REAL                                  REFS        16        17    DEFINED        15
    0  GRID        REAL                    F.P.          REFS        10        15        21        24        27        29        31
                                                        DEFINED        1
   40  M           INTEGER                               REFS        23        24        28        29    DEFINED        21        23
                                                           27        28
    0  MAX         REAL                    F.P.          REFS        10        15        27        28        31
                                                        DEFINED        1        29
    0  MIN         REAL                    F.P.          REFS        10        15        21        23        31
                                                        DEFINED        1        24
    0  .           INTEGER                 F.P.          REFS        17    DEFINED         1        16        31
    0  SET         LOGICAL                 F.P.          REFS        11    DEFINED         1        33


      SUBROUTINE BDSET       74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE     2

VARIABLES      SN  TYPE            RELOCATION
   36  TOL         REAL                                  REFS        10        17    DEFINED        12

INLINE FUNCTIONS    TYPE    ARGS          DEF LINE  REFERENCES
      ABS         REAL       1  INTRIN                  17
      INT         INTEGER    1  INTRIN                  21        27

STATISTICS
  PROGRAM LENGTH                  418       33
        60000B CM USED
```

```
      SUBROUTINE BOUNDS                                                 BOUNDS 2
C * THIS SUBROUTINE DEFINES THE AREA OF INTEREST FOR THE LOOK CALCULATIONS AND
C SETS THE UNITS OF THE AREA IN TERMS OF MAP COORDINATES USED FOR THE CREATION
C OF THE PLOT.

      COMMON/BOUND/XMIN,YMIN,XMAX,YMAX,BDS                              BOUNDS 3
      COMMON /IO/KARD,KPRINT                                            BOUNDS 4
      LOGICAL BDS                                                       BOUNDS 5
      CPTIME=SECOND(CP)                                                 BOUNDS 6

      WRITE(KPRINT,591)                                                 BOUNDS 7
  591 FORMAT(1H1///35X,*.....    BOUNDS    .....*//)                    BOUNDS 8
      BDS=.FALSE.                                                       BOUNDS 9

C THIS INFORMATION IS FOUND ON THE BDS-2 CARD
C XMIN= MINIMUM X COORDINATE
C YMIN= MINIMUM Y COORDINATE
      READ(KARD,600) XMIN,YMIN                                          BOUNDS10
C ERROR MESSAGE:  " MISSING INPUT CARD:  JOB ABORTED
      IF(EOF(KARD).NE.0.) GO TO 900                                     BOUNDS11

C THIS INFORMATION IS FOUND ON THE BDS-3 CARD
C XMAX= MAXIMUM X COORDINATE
C YMAX= MAXIMUM Y COORDINATE
      READ(KARD,600) XMAX,YMAX                                          BOUNDS12
      IF(EOF(KARD).NE.0.) GO TO 900                                     BOUNDS13
  600 FORMAT(2F10.0)                                                    BOUNDS14

C     WRITE OUT MIN AND MAX BOUNDS;OUTPUT FOR BOUNDS
      WRITE(KPRINT,599) XMIN,YMIN,XMAX,YMAX                             BOUNDS15
  599 FORMAT(20X,*MINIMUM BOUNDARY = *,2F8.0, 5X,*MAXIMUM BOUNDARY = *,2BOUNDS16
     1F8.0)                                                             BOUNDS17

C      MIN OR MAX ERROR TEST                                            BOUNDS18
      IF((XMAX.LE.XMIN).OR.(YMAX.LE.YMIN))GO TO 700                     BOUNDS19
C     BOUNDS VERIFIED--SET FLAG TRUE
      BDS=.TRUE.                                                        BOUNDS20

C VERIFICATION-" BOUNDARY VALUES VERIFIED
      WRITE(KPRINT,650)                                                 BOUNDS21
  650 FORMAT(1H0,19X,*BOUNDARY VALUES VERIFIED*)                        BOUNDS22
      GO TO 798                                                         BOUNDS23

C ERROR MESSAGE:"INCORRECT BOUNDARIES//NO BOUNDS SET"
  700 WRITE(KPRINT,705)                                                 BOUNDS24
  705 FORMAT(20X,*INCORRECT BOUNDARIES*//40X,*NO BOUNDS SET*)           BOUNDS25
      BDS=.FALSE.                                                       BOUNDS26
```

```
                C CALCULATION OF TIME SPENT IN BOUNDS SUBPROGRAM
      60          798  CPTIME1=SECOND(CP)                                    BOUNDS27
                       CPTIME=CPTIME1-CPTIME                                 BOUNDS28
                       WRITE(KPRINT,799) CPTIME                              BOUNDS29
                  799  FORMAT(1HO,20X,*..... TIME IN BOUNDS IS*,F8.3,* .....*)  BOUNDS30
                       RETURN                                                BOUNDS31
      65          C EOF EXIT                                                BOUNDS32
                    900 WRITE(KPRINT,901)                                   BOUNDS33
                    901 FORMAT(//* ERROR -- MISSING INPUT CARD; JOB ABORTED*)  BOUNDS34
                        STOP                                                BOUNDS35
                        END                                                 BOUNDS36
```

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SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

		DEF LINE	REFERENCES
1	BOUNDS	1	64

VARIABLES

	SN	TYPE	RELOCATION								
9	HCS	LOGICAL	BOUND	REFS	8	10	DEFINED	17	44	56	
167	CP	REAL		REFS	11	60					
166	CPTIME	REAL		REFS	61	62	DEFINED	11	61		
170	CPTIME1	REAL		REFS	61	DEFINED	60				
0	KARD	INTEGER	IO	REFS	9	25	31	I/O REFS	23	30	
1	KPRINT	INTEGER	IO	REFS	9	I/O REFS	15	36	48	54	62
					66						
2	XMAX	REAL	BOUND	REFS	8	36	42	DEFINED	30		
0	XMIN	REAL	BOUND	REFS	8	36	42	DEFINED	23		
3	YMAX	REAL	BOUND	REFS	8	36	42	DEFINED	30		
1	YMIN	REAL	BOUND	REFS	8	36	42	DEFINED	23		

VARIABLES USED AS FILE NAMES, SEE ABOVE

```
EXTERNALS          TYPE    ARGS        REFERENCES
      EOF          REAL      1              25          31
      SECOND       REAL      1              11          6[illegible]

STATEMENT LABELS                 DEF LINE    REFERENCES
   55  591      FMT                [illegible]      15
  110  599      FMT                [illegible]      36
   77  60[illegible]      FMT                3[illegible]      23          3[illegible]
  123  65       FMT                [illegible]      4[illegible]
   31  7[illegible]                      [illegible]      42
  133  705      FMT                [illegible]      5[illegible]
   34  798                          [illegible]      5[illegible]
  146  799      FMT                63          62
   43  90[illegible]                      [illegible]      25          31
  157  901      FMT                67          66

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
      BOUND          5              0 XMIN    (1)          1 YMIN    (1)          2 XMAX    (1)
                                    3 YMAX    (1)          4 BOS     (1)
      IC             2              0 KARD    (1)          1 KPRINT  (1)


      SUBROUTINE BOUNDS     74/175  OPT=2 ROUND=+-*/          FTN 4.8  508        80/10/30. 12.45.43        PAGE     3

STATISTICS
  PROGRAM LENGTH                 1719      121
  CM LABELED COMMON LENGTH         78        7
        600008 CM USED
```

```
      SUBROUTINE CALCNR(X,Y)                                            CALCNR 2
C                                                                       CALCNR 3
C *CALCNR CALCULATES THE LCDN VALUES FOR A GRID POINT X,Y.
C                                                                       CALCNR 5
C DATA USED:
C DISTANCE FROM NOISE SOURCE(METERS)
C DAY OR NIGHT FIRING
C CHARGE SIZE
C HEIGHT ABOVE OR BELOW GROUND
C ANGLE(IF IT IS A GUN)
C INVERSION FACTORS: SURFACE;0-500 METERS,0-3000 METERS
C NUMBER OF ROUNDS FIRED
C NUMBER OF DAYS DATA WAS COLLECTED


      INTEGER DAY
      COMMON/IO/KARD,KPRINT                                             CALCNR 6
C     BLOCK FACTI CONTAINS INVERSION FACTORS
      COMMON/FACTI/RINV1,RINV2,RINV3
      COMMON /SRCS/ NSRCS
      COMMON/FT/GRDSZ,CNR,XLOC,YLOC,DAYNO,DARKNO                        CALCNR 9
      DIMENSION XLOC(2000),YLOC(2000),DARKNO(2000),DAYNO(2000)          CALCNR10
C     BLOCK GRID CONTAINS UNUSED VARIABLES(SEE ZNEF)
      COMMON/GRID/NRCNR,EAS,RCNR,DIST,SDBWH,              ANGCOS,ANGSIN
C     BLOCK CONTR CONTAINS GUN TYPE TABLE, INFO FOR GUN CONTOURS
C     (IN INPUT) AND VALUE FOR THE LIMIT OF THE GUN TYPE TABLE.
      COMMON/CONTR/IDGUN,CONTOR
      DIMENSION IDGUN(50),CONTOR(50,15)
      DIMENSION RCNR(10),DIST(10),SDBWH(2000),
     1ANGCOS(2000),ANGSIN(2000)                                         CALCNR13
C     ARRAY GUNT(IN COMMON BLOCK GUN) CONTAINS ID'S FOR
C     WEAPONS ARRANGED BY SUBROUTINE FORMA.
      INTEGER GUNT(2000)                                                CALCNR14
      COMMON /GUN/GUNT                                                  CALCNR15
      COMMON/METRIC/METERS,IMETER,IBOTH                                 CALCNR18
      LOGICAL METERS                                                    CALCNR19
      COMMON/CALC/DAYCNR,DRKCNR                                         CALCNR20
      LOGICAL DAYCNR,DRKCNR                                             CALCNR21
      COMMON/DEBUG/CHECK,REED,TABRD                                     CALCNR23
      COMMON/PARM/THRESH,PENITE,PPIP,IMP
      LOGICAL CHECK,REED,TABRD                                          CALCNR24
C     BLOCK TABL1 CONTAINS INFO FROM PROGRAM TABGEN
      COMMON /TABL1/ CBV(301,9,2),PERV(301,4,2),ENV(1501)    ,
     1 CSCF(601) ,FON1(301,4,2),FON2(301,4,2),FTWO(151,2)
C                                                                       CALCNR27
C FON1  FOR CASE ONE          DIST; F H N F; DAY  NIGHT
C FON2 THE IS FOR CASE TWO        DIST;  FHNE; DAT  NIGHT
C
C
C     X = X-AXIS VALUE IN TRUE DISTANCES
C     Y = Y-AXIS VALUE IN TRUE DISTANCES
      CNSDAY=CNSNI=0.0                                                  CALCNR31
C                                                                       CALCNR32
```

```
C     CALCULATE THE [illegible] DIRECTION (NEW ANGLE) WITH RESPECT TO THE FIRICALCNR33
C     DIRECTION AND GRID-COORDINATE, THE TOTAL OVERPRESSURE DB FACTOR.  CALCNR34
C                                                                       CALCNR35
C CALCULATE DISTANCE AND ANGLE OF NOISE SOURCE
      DO 1 IS=1,NSRCS                                                   CALCNR36
C     CALCULATE X,Y DISTANCES
      DX=X-XLOC(IS)                                                     CALCNR42
      DY=Y-YLOC(IS)                                                     CALCNR43
C     DISTANCE FORMULA
      A=DX*DX+DY*DY                                                     CALCNR44
      D=SQRT(A)

C IF UNITS ARE IN FEET, CHANGE TO METERS
      IF(.NOT.METERS)D=D/3.28                                           CALCNR46
      IF(D.EQ.0..OR.ANGCOS(IS).EQ.999.)GO TO 34                         CALCNR47


C     ANGLE PHI IS THE ANGLE OF DIRECTIVITY SOUGHT.  ANGLE ALPHA IS THE
C     ANGLE FROM REFERENCE POINT TO X,Y COORDINATES.  ANGLE THETA IS THE
C     ANGLE FOR WHICH SINE AND COSINE CALCULATIONS HAVE ALREADY BEEN MADE.
C     THE FORMULAS USED IN CALCULATING ANGLE PHI WILL BE AS FOLLOWS:
C     SIN(PHI)=SIN(ALPHA-THETA) AND COS(PHI)=COS(ALPHA-THETA), WHICH BY
C     TRIGNOMETRIC SUBSTITUTION YIELDS:
C     SIN(PHI)=SIN(ALPHA)COS(THETA)-SIN(THETA)COS(ALPHA) AND
C     COS(PHI)=COS(ALPHA)COS(THETA)+SIN(ALPHA)SIN(THETA)
C     SIN(ALPHA)=DY/D AND COS(ALPHA)=DX/D;
C     SIN(THETA)=ANGSIN(IS) AND COS(THETA)=ANGCOS(IS)
C     THEREFORE, THE FINAL FORMULAS WILL BE:
C     SIN(PHI)=(DY/D)*ANGCOS-(DX/D)*ANGSIN;
C     COS(PHI)=(DX/D)*ANGCOS+(DY/D)*ANGSIN.

      SINPHI=(DY/D)*ANGCOS(IS)-(DX/D)*ANGSIN(IS)
      COSPHI=(DX/D)*ANGCOS(IS)+(DY/D)*ANGSIN(IS)

C
C     TO COMPUTE THE ANGLE PHI, WE WILL USE THE ARCTANGENT FUNCTION
C     WITH DX(PHI)=COSPHI AND DY(PHI)=SINPHI.
C     CALCULATE PHI IN DEGREES
      PHI=ATAN2(SINPHI,COSPHI)*180.0/3.1415926


C CALCULATION OF DIRECTIVITY CORRECTION DBDEG.
C     FIND GUN TYPE IN GUN TYPE TABLE FROM FORMA(LIMIT=50)
C     USE INDEX FROM IDGUN TO FIND ROW IN CONTOR
      IROW=GUNT(IS)

C     FIND COLUMN IN CONTOR TO LOCATE CORRECTION FACTOR
      ITEMP=((PHI-180)/30)-0.5
      IF(PHI.LE.0)I=(-ITEMP)-6
      IF(PHI.GT.0.)I=6-ITEMP
      IF(I.EQ.12)I=0
      ICOL=I+3

      DBDEG = CONTOR(IROW,ICOL)
      GO TO 32
   34 DBDEG=0.0                                                         CALCNR66
```

```
                C     COMBINE ANGLE CORR AND CHANGE CORR                                    CALCNR67
                      VERPRE=CHNFS+SCRAM(IS)
                C CALCULATE VERPRESSURE FOR FLAT BASE,FOCUS,NEGATIVE GRADIENT CURVE.
                C                                                                           CALCNR68
                C     CALCULATE VERPRESSURE FOR FOR BASE CURVE, FOCUS, AND NEGATIVE         CALCNR69
                C     GRADIENT CURVE.                                                       CALCNR70
                C                                                                           CALCNR71
                C                                                                           CALCNR72
                C     DISTANCE IS KEPT BETWEEN 100 AND 100000.
                      IF(D.LT.100.) D=100.
                      IF(D.GT.100000.)D=100000.                                             CALCNR74
                C     FORMULA TO CALCULATE POSITION IN TANGEN TABLE
                      DI=ALOG10(D) *10. -19.) + 0.5
                C
                      DO 1 DAY= 1,2
                C     TEST IF DAY IS JUST DAY OR JUST NIGHT
                      CNT=1.
                      IF ( DAY.EQ.1.AND.JDAYCNT)   CNT=DAYCNT(IS)
                      IF ( DAY.EQ.2.AND.JNHCNT)  CNT  = DAWNCNT(IS)
                      IF (CNT.EQ. 0.0 ) CNT= 1
                C CONVERT DI VALUES TO SECOND EXPOSURE
                      DO 3 M= 1,4
                C     LOOP THRU  4 M N  EXPES
                C
                C     SET UP AN  ADD IN CHANGE CURV AND ANGLE CORRECTION
                      DMAX=CHNFS( M*2-1 , DAY) +  VERPRE
                      DMAX = DMAX( DI , M*2 ,  DAY) +  VERPRE
                      DMIN=  DMAX( DI , M*2+1 , DAY) +  VERPRE


                C     ASSUME  BASE  I    N EXPOSURE
                      EN=1.
                C     TEST FOR  DIFFERENT CASES
                C     ADD IN VALUE FOR  TANGEN AND  ANGLE CORRECTION
                C     FA * A1 + F2
                      IF THRESH( DI , DMAX,  3, DAY =
                        IF  THRESH( DI ,  MAX) .GT.  1.0
                      IF THRESH( DI ,  DI,  1, DAY 1
                        IF  THRES( DI ,  DI ) .GT. 1 1
                      IF THRESH( DI ,  DMAX,  2, DAY  2
                        IF  THRES( DI ,  DMAX) .GT.  1.0
                      THRESH(I) = DMAX( DI
                C
                      DAY= 2
                C  TEST FOR  DIFFERENT CASES
                      IF(  THRESH( DI ,  DMAX,  3, DAY) *
                     1    DMAX( DI ,  DMAX) .GT. THRESH( DI ,M,DAY) *
                     2    DMAX( DI ,  DMAX) * THRESH( DI ,M+1,DAY),1)
                        IF  THRES( DI ,  DI,  1, DAY,DMAX,DMAX,DMIN,EN
                     *  DMAX( DI ,  DI ,  DI )
                C
                      DAY= 1
                      EN= EN / ( 1.0 + FLOAT( IFIX ( 1.0*  DAY-THRESH ) * 10.0) ,2)
                        IF  THRES( DI ,  DI,  2, DAY, DAY, DMAX,DMAX,DMIN,EN
```

```
                      GO TO 1 -
                C     CASE 1
  175           101   EN = EXP( ALOG( SEA *1. , -240.5...
                      IF(CHECK,*) WRITE(KPRINT,9...) CASE,DAY,NRAY,DMAN,DMIN,EN
                C     CASE 1 IS NOW DIRECTLY AVAIL...
                C      SET IMP ...= 0 INDICATE A FACT ...LY IF IMP WAS INPUT AS NONZERO ...
                C     THE *MP***** CARD.
  180           1 -   IF(IMP.E... ) GOT 12
                C     IMPLIED FACT ... REPETITION ... OF DA... SUMMER 10 JAN 80
                C     1.**9.25 = 1.**9 * 1.**(1/4) = 1.**9 * SQRT(SQRT(10)) = 1.7782794
                C      E=1.**9,EN ...=1.7782794100)
                C      1.=10**10.25 ...=1.7782794100 ... BY SIMILAR DERIVATION)
  185                 C1=1.7782794...
                      C10=1.7782794100
                C     IF(EN.LE.10**9.25) EN=EN ANL GOT, 120
                      IF(EN.LE. 1) GOTO 120
                C     IF(EN.GE.1.**10.25) EN=EN*1. ANL ... TO 120
  19                  IF(EN...T.C10) GOTO 110
                      EN=EN*10
                      GOTO 122

                C     (1.**9.25 .LT. EN .LT. 10**10.25)  IS TRUE AT THIS POINT
  195           C     EN=EN * 10**(ALOG10(EN)-9.25)  BY THE FOLLOWING METHOD...
                C     10**(ALOG10(EN)-9.25) = (10**ALOG10 (EN)) / (10**9.25)
                C                           = EN / 10**9.25 = EN / C1
                      110   EN=EN*EN/C1

  2..           122   IF (DAY.EQ.2) GOTO 105
                C     ADD IN REPETITION COUNT
                      CNSDAY= CNSDAY + PERV(LD,M,1) * EN *  CNT
                      GOTO 3
                      105   CNSNI  = CNSNI + PERV(LD,M,2) * EN * CNT * PPIP
  215
                      3     CONTINUE
                      1     CONTINUE


  219
                      TCNSDAY=0.
                      TCNSNI=0.
                      IF (CHECK.AND. CNSDAY.GT. 0.0) TCNSDAY=10.0* ALOG10(CNSDAY)
                      IF (CHECK.AND.CNSNI.GT.0.0) TCNS.I= 10.0*ALOG10(CNSNI)
  215                 IF (CHECK) WRITE(KPRINT,...) TCNSDAY,TCNSNI
                C "POWER OF DAY SUM" TCNSDAY, "POWER OF NIGHT SUM", "TCNSNI"
                      IF (CNSDAY .EQ.0.) .AND. CNSNI .EQ. 0.0) GOTO 20
                C     CONVERT IT T... AS LOG
                C     FINAL SOUND EXPOSURE CONVERTED BACK TO DECIBEL UNITS
  220                 CNN=  10.0 *  ALOG10 (CNSDAY+ CNSNI) - 49.3651374
                      RETURN                                                          CALCN167

                   20 CONTINUE                                                        CALCN168
                      CNN=-99.                                                        CALCN169
  225           C WARNING...FOR X=*_,Y=*_, BOTH DAY AND NIGHT CUMULATIVE NOISE SUMS=0; NEF SET
                C TO -99.*

                      WRITE(KPRINT,8...)X,Y                                           CALCN170
```

```
                    RETURN                                                          CALCN171
  230          800  FORMAT(10X,*POWER OF DAY SUM *,F6.2,* POWER OF NIGHT SUM *,F6.2)  CALCN175
               801  FORMAT(//10X,*..... WARNING .....F R X =*,F7.2,*, Y =*,F7.2,      CALCN176
                  1*, BOTH DAY + NIGHT CUMULATIVE NOISE SUMS = 0; NEF SET TO -99.*)  CALCN177
                    END                                                             CALCN178
```

SYMBOLIC REFERENCE MAP (R=3)

```
ENTRY POINTS      DEF LINE      REFERENCES
   3  CALCNR          1          221        229

VARIABLES      SN  TYPE            RELOCATION
  451  A           REAL                          REFS        68    DEFINED      67
 3746  ANGCOS      REAL        ARRAY    GRID     REFS        25         30      72        89        90
 7666  ANGSIN      REAL        ARRAY    GRID     REFS        25         30      89        90
    0  CHECK       LOGICAL              DEBUG    REFS        40         42     165       171       176       213       214
                                                  215
    1  CNR         REAL                 FT       REFS        22    DEFINED     220       224
  444  CNSDAY      REAL                          REFS       202      2*213     217       220    DEFINED        53       202
  445  CNSNI       REAL                          REFS       204      2*214     217       220    DEFINED        53       204
  465  CNT         REAL                          REFS       136        202     204    DEFINED       133       134       135
   62  CONTOR      REAL        ARRAY    CONTR    REFS        28         29     111
  454  COSPHI      REAL                          REFS        96    DEFINED      90
22157  CSCF        REAL        ARRAY    TABL1    REFS        44
  452  D           REAL                          REFS        71         72    2*89      2*90       126       127       129
                                                DEFINED       68         71     126       127
13562  DARKNO      REAL        ARRAY    FT       REFS        22         23     135
  443  DAY         INTEGER                       REFS        17        134     135       143       144       145       163
                                                  165       170        171     176       200    DEFINED       131
    0  DAYCNR      LOGICAL              CALC     REFS        38         39     134
 7642  DAYNO       REAL        ARRAY    FT       REFS        22         23     134
  462  DBDEG       REAL                          REFS       116    DEFINED     111       113
    0  DBV         REAL        ARRAY    TABL1    REFS        44        143     144       145
   14  DIST        REAL        ARRAY    GRID     REFS        25         30
  467  DMAX        REAL                          REFS       154        165     170       171       176
                                                DEFINED      143
  470  DMEAN       REAL                          REFS       158        163     165       171       175       176
                                                DEFINED      144
  471  DMIN        REAL                          REFS       156        163     165       171       176
                                                DEFINED      145
    1  DRKCNR      LOGICAL              CALC     REFS        38         39     135
  447  DX          REAL                          REFS      2*67         89      90    DEFINED        64
  450  DY          REAL                          REFS      2*67         89      90    DEFINED        65
  473  D1          REAL                          REFS       188        198  DEFINED       185
  474  D10         REAL                          REFS       190    DEFINED     186
    1  EAS         REAL                 GRID     REFS        25
  472  EN          REAL                          REFS       165        171     176       188       190       191      2*198
                                                  202       204    DEFINED     149       163       170       175       191
                                                  196
17222  ENV         REAL        ARRAY    TABL1    REFS        44        163     175
23310  FUN1        REAL        ARRAY    TABL1    REFS        44        163
30060  FUN2        REAL        ARRAY    TABL1    REFS        44        170
34630  FTWO        REAL        ARRAY    TABL1    REFS        44        163     170
```

```
      SUBROUTINE CALCNR      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE     6

VARIABLES      SN  TYPE              RELOCATION
    0  GRDSZ      REAL                  FT          REFS      22
    0  GUNT       INTEGER    ARRAY      GUN         REFS      34       35       102
  461  I          INTEGER                           REFS     108      109   DEFINED      106       107       108
    2  IBOTH      INTEGER               METRIC      REFS      36
  461  ICLL       INTEGER                           REFS     111   DEFINED      109
    0  IDGUN      INTEGER    ARRAY      CONTR       REFS      28       29
    1  IMETER     INTEGER               METRIC      REFS      36
    3  IMP        INTEGER               PARM        REFS      41      180
  456  IROW       INTEGER                           REFS     111   DEFINED      102
  446  IS         INTEGER                           REFS      64       65        72      2*89      2*90       102       116
                                                     134     135   DEFINED       62
  457  ITEMP      INTEGER                           REFS     106      107   DEFINED      105
    0  KARD       INTEGER               IO          REFS      18
    1  KPRINT     INTEGER               IO          REFS      18   I/O REFS      165       171       176       215       228
  464  LD         INTEGER                           REFS     143      144       145       163       165       170       171
                                                     176     202      204   DEFINED      129
  466  M          INTEGER                           REFS     143      144       145       163       165       170       171
                                                     176     202      204   DEFINED      139
    0  METERS     LOGICAL               METRIC      REFS      36       37        71
    0  NRCNR      INTEGER               GRID        REFS      25
    0  NSRCS      INTEGER               SRCS        REFS      21       62
  463  OVERPR     REAL                              REFS     143      144       145   DEFINED      116
    1  PENITE     REAL                  PARM        REFS      41
12452  PERV       REAL       ARRAY      TABL1       REFS      44      202       204
  455  PHI        REAL                              REFS     105      106       107   DEFINED       96
    2  PPIP       REAL                  PARM        REFS      41      204
    2  RCNR       REAL       ARRAY      GRID        REFS      25       30
    1  REED       LOGICAL               DEBUG       REFS      40       42
    0  RINV1      REAL                  FACTI       REFS      20
    1  RINV2      REAL                  FACTI       REFS      20
    2  RINV3      REAL                  FACTI       REFS      20
   26  SUBWH      REAL       ARRAY      GRID        REFS      25       30       116
  453  SINPHI     REAL                              REFS      96   DEFINED       89
    2  TABRD      LOGICAL               DEBUG       REFS      40       42
  475  TCNSUAY    REAL                              REFS     215   DEFINED      211       213
  476  TCNSNI     REAL                              REFS     215   DEFINED      212       214
    0  THRESH     REAL                  PARM        REFS      41      154       156       158       163       170
    0  X          REAL                   F.P.       REFS      64      228   DEFINED         1
    2  XLOC       REAL       ARRAY      FT          REFS      22       23        64
    0  Y          REAL                   F.P.       REFS      65      226   DEFINED         1
 3722  YLOC       REAL       ARRAY      FT          REFS      22       23        65
       VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS          TYPE    ARGS        REFERENCES
       ALOG10     REAL       1 LIBRARY     129       213       214       220
       ATAN2      REAL       2 LIBRARY      96
       SQRT       REAL       1 LIBRARY      68

INLINE FUNCTIONS   TYPE    ARGS        DEF LINE  REFERENCES
       IFIX       INTEGER    1  INTRIN              2*163       170       175

STATEMENT LABELS              DEF LINE   REFERENCES
  244  1                        207        62       131       136
  236  3                        206       139       203
  302  20                       223       217
   70  32                       116       112
   67  34                       113        72
```

STATEMENT LABELS

			DEF LINE	REFERENCES		
202	101		175	154		
170	103		170	157		
211	104		181	154	167	172
231	105		204	20		
221	110		194	190		
223	120		200	180	188	192
375	450	FMT	230	215		
402	501	FMT	231	228		
332	420	FMT	166	165	171	176

LOOPS

LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
14	I	62 207	236H	EXT REFS	NOT INNER
116	I	131 207	132H	EXT REFS	NOT INNER
142	K	139 206	102H	EXT REFS	

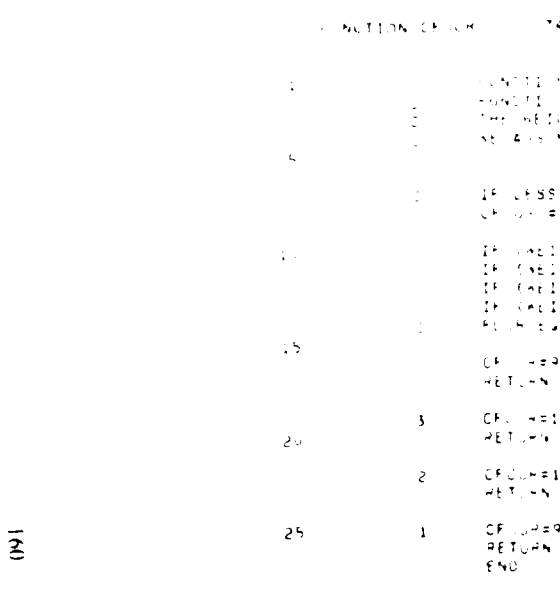
COMMON BLOCKS

	LENGTH	MEMBERS + RIBS NAME(LENGTH)					
IO	2		KARC (1)	1 KPRINT (1)			
FACTI	3		MINV1 (1)	1 RINV2 (1)		2 RINV3 (1)	
SHOS	1		NSHOS (1)				
FT	4002		GRDSZ (1)	1 CNR (1)		2 XLOC (2000)	
		2002	YLOC (2000)	4002 DAYNO (2000)		6002 DARKNO (2000)	
GRID	6022		GRCNR (1)	1 EAS (1)		2 RCNR (10)	
		12	DIST (10)	22 SOBJM (2000)		2022 ANGCOS (2000)	
		4022	ANGSIN (2000)				
CONTR	800		IDGLM (50)	50 CONTOM (750)			
GUI	2007		GUNT (2000)				
METRIC	3		METERS (1)	1 IMETER (1)		2 IBOTH (1)	
CALC	2		DAYCNR (1)	1 DARKCNR (1)			
DEBUG	3		CHECK (1)	1 REED (1)		2 TABRC (1)	
PARM	4		THRESH (1)	1 PENITE (1)		2 PPIP (1)	
		3	IMP (1)				
TABLE	15346		PHI (5418)	5418 PERV (2408)		7826 ENV (1501)	
		9327	COEF (6 1)	9928 FUN1 (2408)		12336 FUN2 (2408)	
		14744	PIV (302)				

STATISTICS

PROGRAM LENGTH	532B	346
CM LABELED COMMON LENGTH	76227B	31888

60000B CM USED



```
FUNCTION CFOUR        74/175  [illegible]

      FUNCTION [illegible]
      FUNCTION [illegible]
      THE WEIGHT [illegible]
      [illegible]

      IF LESS THAN [illegible]
      CFOUR = [illegible]

      IF (WEIGHT.[illegible]) RETURN
      IF (WEIGHT.[illegible]) [illegible] 1
      IF (WEIGHT.[illegible]) [illegible] 2
      IF (WEIGHT.[illegible]) [illegible] 3
      FLOW EQUATIONS ARE USED BECAUSE [illegible]

      CFOUR=96.34+11.3*ALOG10(WEIGHT)
      RETURN

    3 CFOUR=104.73+7.5*ALOG10(WEIGHT)
      RETURN

    2 CFOUR=112.67+3.33*ALOG10(WEIGHT)
      RETURN

    1 CFOUR=98.0+12.48*ALOG10(WEIGHT)
      RETURN
      END
```

SYMBOLIC REFERENCE MAP (R=3)

```
ENTRY POINTS      DEF LINE      REFERENCES
   4  CFOUR          1          1[illegible]        17        2[illegible]        23        26

VARIABLES      SN  TYPE            RELOCATION
  53  CFOUR       REAL                                DEFINED        8        16        19        [illegible]        25
   0  WEIGHT      REAL                    F.P.         REFS        1[illegible]        11        [illegible]        [illegible]        [illegible]        [illegible]        22
                                                          25    DEFINED        1

EXTERNALS           TYPE    ARGS        REFERENCES
      ALOG10      REAL        1 LIBRARY      16        19        22        25

STATEMENT LABELS                DEF LINE    REFERENCES
   33  1                           25          11
   26  2                           22          12
   21  3                           19          13

STATISTICS
  PROGRAM LENGTH                    54[illegible]        44
        600008 CM USED
```

```
      SUBROUTINE PUTXR(XARRAY,MDIM,NDIM,N1,N2,AID1,AID2,DAYS,XREF,IJ)
      COMMON/IO/KARD,KPRINT
      DIMENSION XARRAY(MDIM,NDIM),AID1(1),AID2(1),XREF(2)
      DATA STARS/3H***/
      DO 20 I=1,N1
      XREF(1)=AID1(I)
      K=2
      DO 10 J=1,N2
      IF(IJ.EQ.1)X=XARRAY(I,J)
      IF(IJ.EQ.2)X=XARRAY(J,I)
      IF(X.LE.0.)GO TO 10
      XREF(K)=AID2(J)
      XREF(K+1)=X/DAYS
      K=K+2
   10 CONTINUE
      K=K-1
      IF(K.GT.1)GO TO 15
      XREF(2)=STARS
      K=2
   15 WRITE(KPRINT,50)(XREF(N),N=1,K)
   20 CONTINUE
      RETURN
   50 FORMAT(/4X,A3,2X,7(3X,A3,F8.1,2X)/(9X,7(3X,A3,F8.1,2X)))
      END
```

```
      SYMBOLIC REFERENCE MAP  [illegible]

ENTRY POINTS      DEF LINE      REFERENCES
   [illegible]  [illegible]          1          [illegible]

VARIABLES      [illegible]  TYPE          [illegible]
      A1.1      REAL      ARRAY     [illegible]      [illegible]
      A1.2      REAL      ARRAY     [illegible]      [illegible]
      DAYS      REAL                [illegible]      [illegible]
   [illegible]  [illegible]  INTEGER                  [illegible]
      IO        INTEGER             [illegible]      [illegible]
   [illegible]  [illegible]  INTEGER                  [illegible]
   [illegible]  [illegible]  INTEGER                  [illegible]
                                                      [illegible]
   [illegible]  KARD      INTEGER             [illegible]
   [illegible]  KPRINT    INTEGER             [illegible]
   [illegible]  MDIM      INTEGER             [illegible]
   [illegible]  [illegible]  INTEGER                  [illegible]
      NDIM      INTEGER             [illegible]      [illegible]
   [illegible]  N1        INTEGER             [illegible]      [illegible]
   [illegible]  N2        INTEGER             [illegible]      [illegible]
   [illegible]  STARS     REAL                       [illegible]
   [illegible]  [illegible]  REAL                       [illegible]
   [illegible]  XARRAY    REAL      ARRAY     [illegible]      [illegible]
   [illegible]  XREF      REAL      ARRAY     [illegible]      [illegible]
                                                      1[illegible]
      VARIABLES USED AS FILE NAMES, SEE ABOVE


      SUBROUTINE PUTXR      [illegible]/175  [illegible]  FTN 4.[illegible]  508      [illegible]/30. 12.45.43      PAGE    2

STATEMENT LABELS              DEF LINE    REFERENCES
   41  [illegible]                  [illegible]          [illegible]
   50  15                        [illegible]        [illegible]
   [illegible]  [illegible]                  21          5
   72  [illegible]      FMT             23          2

LOCKS  LABEL    INDEX     FROM-TO     LENGTH    PROPERTIES
   17  2[illegible]      1          5 21       [illegible]          [illegible] NOT INNER
   33  1         [illegible]          [illegible]  [illegible]  INSTALL

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
      IO            2                KARD    (1)                  1 KPRINT (1)

STATISTICS
  PROGRAM LENGTH                 114[illegible]      [illegible]
  CM LABELED COMMON LENGTH         2[illegible]       2
        60000B CM USED
```

```
      SUBROUTINE FORMA                                                  FORMA  2
C THIS SUBROUTINE [illegible] TAKES INPUT FROM THE DATA BASE CONSISTING OF
C AN ID NUMBER AND LOCATION COORDINATES FOR EACH FIRING POINT.
C ALSO INCLUDED ARE DEFINITION CARDS FOR ALL THE NOISE SOURCES AT
C THAT SITE, GIVING NOW TYPE, NUMBER OF DAY AND NIGHT FIRINGS,
C MAXIMUM AND MINIMUM CHARGE ZONES, TARGET ID OR AN INDICATION
C THAT THE SOURCE IS OMNIDIRECTIONAL, AND HEIGHT FOR EACH FIRING;
C (2) CALCULATES THE SIZE AND COSINE OF THE NOISE DIRECTION
C (999.0 FOR OMNIDIRECTIONAL SOURCES, INCLUDING TARGETS), DB CHARGE
C CORRECTION FACTORS FOR TNT WEIGHT (DBWT) AND HEIGHT (DBHT)
C (FOUND IN ARRAY SDBWH); (3) OUTPUTS A TABLE WITH AN ENTRY FOR EACH
C UNIQUE NOISE SOURCE, EACH UNIQUE FIRING POINT-TARGET/HEIGHT-CHARGE
C OR TARGET-CHARGE COMBINATION, A TARGET ALSO BEING A SOURCE OF OMNIDIRECTIONAL
C NOISE WHEN HIT FOR EACH ENTRY, FORMA ACCUMULATES THE NUMBER OF DAY
C AND NIGHT FIRINGS WITH THAT CHARGE FROM (FIRING PT,) OR TOWARD
C (TARGET) THAT LOCATION.


      COMMON/IO/KARD,KPRINT                                             FORMA  3
      COMMON /SRCS/ NSRCS
      COMMON/FT/GRDSZ,CNR,XLOC,YLOC,DAYNO,DARKNO                        FORMA  5
      DIMENSION XLOC(2000),YLOC(2000),DARKNO(2000),DAYNO(2000),NAME(100)
      COMMON/GRID/NRCNR,EAS,RCNR,DIST,SDBWH,                ANGCOS,ANGSIN
      DIMENSION RCNR(10),DIST(10),SDBWH(2000),
     1ANGCOS(2000),ANGSIN(2000)                                         FORMA  9
      COMMON /DEBUG/ CHECK,REED,TABRD
      COMMON/CONTR/IDGUN,CONTOR
      DIMENSION IDGUN(50),CONTOR(50,15)
      LOGICAL CHECK,REED,TABRD
      INTEGER GTYPE                                                     FORMA 12
      INTEGER GUNT(2000)                                                FORMA 13
      COMMON /GUN/GUNT                                                  FORMA 14
      LOGICAL FIRST                                                     FORMA 15
      COMMON /TABL1/ DBV(301,9,2) , [illegible] , ENV(1501) ,
     1 CSCF(601) ,FCN1(3 1,4,2),F [illegible] ,FTN (151,2)
C     CHARGE ARRAY CONTAINS THE [illegible] CHARGES OF TNT
C     FOR EACH WEAPON.
C     TCHARGE ARRAY CONTAINS THE [illegible] CHARGE FOR EACH WEAPON
      DIMENSION [illegible]
C     [illegible] TARGETS
      [illegible]                                                       FORMA 17
      [illegible] ,ANGSIN(1))                                           FORMA 18
C     [illegible] ARRAY [illegible] NAME
C     [illegible]
      [illegible]                                                       FORMA 19
C     [illegible] ARE INITIALIZED
C     [illegible]
      [illegible]                                                       FORMA 20
      [illegible]                                                       FORMA 21
C     [illegible]
      [illegible] CHARGE ZONE [illegible]                               FORMA 22
      [illegible]                                                       FORMA 23

      [illegible]
      [illegible]                                                       FORMA 24
```

```
      C     TABLE LIMIT
            DATA ITABLIM/5
            DATA IMISSING/-9999999./                                    FORMA 25

            CALL SPECIAL(1HS)                                           FORMA 26
      C IF TARGETS MISSING ALREADY HERE, MISS A CALL WEALTH.
            IF (.NOT.TARGS) CALL MEALTH
      C     INITIALIZE
            TARGS=.FALSE.
            XMAX=YMAX=-99999999.                                        FORMA 27
            XMIN=YMIN=99999999.                                         FORMA 28
      C     HEADING FOR FORMA
            WRITE(KPRINT,701)                                           FORMA 29
            ASSIGN 211 TO JUMP                                          FORMA 31
            NDX=1                                                       FORMA 32

      C READ FORM-A-2 CARD (AVERAGING TECHNIQUE, GROUND CORRECTION,
      C AND REMIND INHIBIT FLAG).
            READ(KARD,603) IFUNC,X2,NOMIND                              FORMA 33
            IF(X2.GT.0.)GMCLMR=X2                                       FORMA 34
            IF(NOMIND .EQ. 0) REMIND IN1

      C ASSIGN THE GO-TO STATEMENT FOR EACH TECHNIQUE.
            IF (IFUNC .EQ. 1HMAX       ) GO TO 91                       FORMA 35
            IF (IFUNC .EQ. 1HMAVE      ) GO TO 92                       FORMA 36
            IF (IFUNC .EQ. 1HCAVE      ) GO TO 93                       FORMA 37
            GO TO 99                                                    FORMA 38
         91 ASSIGN 211 TO JUMP                                          FORMA 39
      C     NDX IS THE INDEX USED WHEN WRITING THE HEADING FOR
      C     THE AVERAGING TECHNIQUE.
            NDX=1                                                       FORMA 40
            GO TO 99                                                    FORMA 41
         92 ASSIGN 212 TO JUMP                                          FORMA 42
            NDX=2                                                       FORMA 43
            GO TO 99                                                    FORMA 44
         93 ASSIGN 213 TO JUMP                                          FORMA 45
            NDX=3                                                       FORMA 46
      C WRITE HEADING ABOUT TECHNIQUE USING CHAT ARRAY.
         99 WRITE(KPRINT,609)(CHAT(NDX,I),I=1,5)                        FORMA 47


      C     READ GUN TYPE TABLE                                         FORMA 48
            I=1                                                         FORMA 49
         50 READ(IN1,ERR=[illegible])IDENT(I),TLNAME(I),((CNAME(J,I),J=1,10),NAME(2*I-1),
           1IFLAG,(COUNTUP(I,J),J=1,15)
      C     IF END OF FILE STOP
            IF(EOF(IN1).EQ.0.) GO TO 500                                FORMA 51
      C     IF "NO" MORE TARGETS
            IF(IFLAG.EQ.IMISS)GO TO 60                                  FORMA 52
      C     COUNT GUN TYPES
            I=I+1                                                       FORMA 53
      C     IF TABLE OVERFLOWS, THEN STOP.
            IF(I.GE.ITABLIM) GO TO 55
```

```
115                 WRITE(*PP=I,7,7) I
                    STOP
                C   READ TARGETS (PUT FIGURES * IN COL 1 PROCEED WITH SOURCES      FORMA 56
                C   NTYPES=NUMBER OF GUN TYPES IN DATA BASE
                    DO NTYPES=1                                                    FORMA 57
120
                    I=1                                                            FORMA 58
                    NTARG=0                                                        FORMA 59
125             C   READ TARGETS
                100 READ(IN1,900) IFLAG,J,XLOC(I),YLOC(I),PHCORR                   FORMA 61
                C   IF END OF FILE, STOP
                    IF(E_F(IN1).NE.0.) GO TO 500                                   FORMA 62
                C   COUNT TARGET CARDS
130                 NTARG=NTARG+1                                                  FORMA 63
                C   STORE TARGET ID IN IDTRG ARRAY
                    IDTRG(I)=J                                                     FORMA 64
                C   IF NO PHCORR GIVEN, IT TAKES A DEFAULT VALUE
                    IF(PHCORR.EQ.0.)PHCORR=PHCORR                                  FORMA 65
135             C   CHECK TO SEE IF TARGET IS WITHIN SPECIFIED BOUNDS
                    IF (XLOC(I) .GT. XMAX) XMAX=XLOC(I)                            FORMA 66
                    IF (XLOC(I) .LT. XMIN) XMIN=XLOC(I)                            FORMA 67
                    IF (YLOC(I) .GT. YMAX) YMAX=YLOC(I)                            FORMA 68
                    IF (YLOC(I) .LT. YMIN) YMIN=YLOC(I)                            FORMA 69
140             C   INITIALIZE ARRAY IDTYPE WITH A NEGATIVE NUMBER TO DENOTE
                C   A TARGET.
                    IDTYPE(I)=-I                                                   FORMA 70
                C   INITIALIZE GUNT TO 0.
                    GUNT(I)=0                                                      FORMA 71
145             C   INITIALIZE SORAM TO DESIGNATE A TARGET NEVER ACCESSED
                    SORAM(I)=-100.                                                 FORMA 72
                    HCORR(I)=PHCORR                                                FORMA 73
                C   IF NOT REAL POINT CARDS
                    IF (IFLAG .EQ. 1HP) GO TO 200                                  FORMA 74
150                 I=I+1
                C   IF TOO MANY, THEN STOP
                    IF(I .LE. IDIM1(1)) GO TO 110
                    WRITE(*PP=I,7,799) I
                    STOP
155

                C   COUNT PP CARDS
                200 I=I+1                                                          FORMA 76
160             C PIMING POINT CARDS.
                C   READ PP=1 CARD
                    READ(I1,901) XLOC(I),YLOC(I),PHCORR                            FORMA 77
                C   IF END OF FILE, IMPLIED END OF DATA.
                    IF(E_F(I1).NE.0.) GO TO 300                                    FORMA 78
165             C   IF PHCORR = BLANK PHASE A VALUE THAT GIVE IT DEFAULT
                    IF(PHCORR.EQ.0.)PHCORR=PHCORR                                  FORMA 79
                C   CHECK TO SEE IF PP IS WITHIN SPECIFIED BOUNDS
                    IF (XLOC(I) .GT. XMAX) XMAX=XLOC(I)                            FORMA 80
                    IF (XLOC(I) .LT. XMIN) XMIN=XLOC(I)                            FORMA 81
170                 IF (YLOC(I) .GT. YMAX) YMAX=YLOC(I)                            FORMA 82
                    IF (YLOC(I) .LT. YMIN) YMIN=YLOC(I)                            FORMA 83
```

```
C     IPTR POINTS TO THE BEGINNING OF DEF. CARDS FOR THIS FIRING PT.
      IPTR=1                                                            FORMA 84
      FIRST=.TRUE.                                                      FORMA 85

C FP-2 CARDS
  210 READ(IN1,600) IFLAG,GTYPE,DAY,DARK,MIN,MAX,ID,KFLAG,HGT           FORMA 86
      IF(EOF(IN1).NE.0.) GO TO 300                                      FORMA 88
C     SEE IF GUN TYPE IS IN TABLE
      DO 201 IT=1,NTYPES                                                FORMA 89
      IF(GTYPE.EQ.IDGUN(IT))GO TO 202                                   FORMA 90
  201 CONTINUE                                                          FORMA 91
C     UNDEFINED GUN TYPE                                                FORMA 92
      WRITE(KPRINT,705)ITYPE,XLOC(IPTR),YLOC(IPTR)                      FORMA 93
      STOP                                                              FORMA 94
C     SET POINTER TO THE LOCATION IN GUN TYPE TABLE
C     ITYPE IS NOW SUBSCRIPT INTO GUN TABLE

  202 ITYPE=IT                                                          FORMA 95
      IF(ID.NE.IBLNK)GO TO 204                                          FORMA 96
      IF(KFLAG.EQ.1)GO TO 203                                           FORMA 97
      WRITE(KPRINT,708)XLOC(IPTR),YLOC(IPTR)                            FORMA 98
      STOP                                                              FORMA 99
C     HIT FLAG SET

  203 ID=0                                                              FORMA100
      GO TO 207                                                         FORMA101
  204 CONTINUE                                                          FORMA102
C     CHECK TO SEE IF THIS IS A LEGITIMATE TARGET
      DO 205 IT=1,NTAR                                                  FORMA103
      IF(ID.EQ.IDTRG(IT)) GO TO 206                                     FORMA104
  205 CONTINUE                                                          FORMA105

C     UNDEFINED TARGET                                                  FORMA106
      WRITE(KPRINT,704)ID,XLOC(IPTR),YLOC(IPTR)                         FORMA107
      STOP                                                              FORMA108
C     UPON LOCATING THE TARGET ID, SET A POINTER TO THE LOCATION

  206 ID=IT                                                             FORMA109
  207 CONTINUE                                                          FORMA110

C IN THIS SECTION, THE SUBROUTINE JUMPS TO WHICHEVER METHOD OF AVERAGING IT
C IS GOING TO USE ACCORDING TO THE CARD DIRECTIVE.  IT CALCULATES THE EQUIVALENT
C TNT WEIGHTS, WITH THE INFORMATION STORED IN ARRAY CHARGE.
      GO TO JUMP,(211,212,213)                                          FORMA111
C     AVE. TECHNIQUE MAX
  211 CONTINUE                                                          FORMA112
      IAVE=MAX0(MIN,MAX)                                                FORMA113
      GO TO 214                                                         FORMA114
C     AVE. TECHNIQUE IAVE
  212 CONTINUE                                                          FORMA115
       AVE=(MIN+MAX)*.5                                                 FORMA116
      IAVE=AVE                                                          FORMA117
      IF((AVE-IAVE).GT..01)IAVE=IAVE+1                                  FORMA118
      GO TO 214                                                         FORMA119
C     AVE. TECHNIQUE CAVE
```

```
                213  CONTINUE                                                  FORMA120
230                  CHAR=(CHARGE(MIN,ITYPE)+CHARGE(MAX,ITYPE))*.5             FORMA121
                     GO TO 216                                                 FORMA122
                214  CONTINUE                                                  FORMA123
                     CHAR=CHARGE(IAVE,ITYPE)                                   FORMA124
                 216 CONTINUE                                                  FORMA125
235                  TCHAR=TCHARG(ITYPE)                                       FORMA126

               C     IF FIRST DEFINITION CARD FOR (XLOC,YLOC) PROCESS          FORMA127
                     IF (FIRST) GO TO 250                                      FORMA128
240
               C     CHECK FOR OLD TARGET (ALSO OMNI)                          FORMA129
                     IF(ID.EQ.0)GO TO 217                                      FORMA130

               C     OLD TARGET SO CHECK TO SEE IF IT IS A DUPLICATE
245                  DO 215 IOLD=IPTR,I                                        FORMA131
               C     SAME TARGET, CHARGE, AND GUN; UPDATE
                     IF (IDTYPE(IOLD).EQ.ID.AND.SOBWM(IOLD).EQ.CHAR.AND.       FORMA132
                    1 GUNT(IOLD).EQ.ITYPE)  GOTO 220                           FORMA133
                 215 CONTINUE                                                  FORMA134
250
                     GO TO 219                                                 FORMA135

               C     SEE IF TARGET IS SAME
                   217 DO 218 IOLD=IPTR,I                                      FORMA136
255            C     OMNI AND GUN
                     IF(SOBWM(IOLD).EQ.CHAR.AND.HEIGHT(IOLD).EQ.HGT)GO TO 220  FORMA137
                   218 CONTINUE                                                FORMA138

260                219 CONTINUE                                                FORMA139
               C     NEW TARGET,NEW CHARGE,OR NEW HEIGHT FOUND FOR (X,Y)       FORMA140
                     I=I+1                                                     FORMA141
                     XLOC(I)=XLOC(IPTR)                                        FORMA142
                     YLOC(I)=YLOC(IPTR)                                        FORMA143
265                  SOBWM(I)=CHAR                                             FORMA144
                     GUNT(I)=ITYPE                                             FORMA145
                     IDTYPE(I)=ID                                              FORMA146
                     DAYNO(I)=DAY                                              FORMA147
                     DARKNO(I)=DARK                                            FORMA148
270                  HEIGHT(I)=HGT                                             FORMA149
                     HCORR(I)=PHCORR                                           FORMA150

               C     NO HIT AT TARGET; ALL DONE
               C     IF OMNI SOURCE DONE                                       FORMA151
275                221 IF (KFLAG .EQ. 1) GO TO 240                            FORMA152

               C     ON FIRST ACCESS TO A TARGET SET TCHARGE                   FORMA153
                     IF (SOBWM(IO) .LT. 0) GO TO 270                           FORMA154
               C     LINK TO TARGETS OF SAME TYPE BUT DIFFERENT CHARGE         FORMA155
280                  IOLD=IO                                                   FORMA156
                 222 IF (SOBWM(IOLD) .EQ. TCHAR.AND.HEIGHT(IOLD).EQ.HGT)GO TO 225  FORMA157
                     IF (IABS(ITYPE) .LT. IABS(GUNT(IOLD))) GO TO 227          FORMA158
                     IOLD=IABS(GUNT(IOLD))                                     FORMA159
                     GO TO 222                                                 FORMA160
285
```

```
  225 CONTINUE                                                          FORMA161
C     UPDATE OLD [illegible]                                            FORMA162
      DAYNO(IOLD)=DAYNO(IOLD)+DAY                                       FORMA163
      DARKNO(IOLD)=DARKNO(IOLD)+DARK                                    FORMA164
      GO TO 240                                                         FORMA165

C     NEW TARGET-CHARGE-HEIGHT [illegible]                              FORMA166
C PROCESSES FP-2 CARDS
  227 I=I+1                                                             FORMA167
      IDTYPE(IOLD)=-I                                                   FORMA168
      IDTYPE(I)=-I                                                      FORMA169
      SUBWH(I)=TCHAR                                                    FORMA170
      GUNT(I)=ITYPE                                                     FORMA171
      XLOC(I)=XLOC(I)                                                   FORMA172
      YLOC(I)=YLOC(I)                                                   FORMA173
      HCORR(I)=HCORR(I)                                                 FORMA174
      HEIGHT(I)=HGT                                                     FORMA175
      DAYNO(I)=DAY                                                      FORMA176
      DARKNO(I)=DARK                                                    FORMA177
      GO TO 240                                                         FORMA178

  220 CONTINUE                                                          FORMA179
C     UPDATE OLD CHARGE OF SOURCE                                       FORMA180
      DAYNO(IOLD)=DAYNO(IOLD)+DAY                                       FORMA181
      DARKNO(IOLD)=DARKNO(IOLD)+DARK                                    FORMA182
      GO TO 221                                                         FORMA183

C     TOO MANY SOURCES
  240 IF (I .GE. 2000) GO TO 510                                        FORMA184
C GO BACK AND READ NEW FP-1 CARD.
C     STAR * INDICATES END OF FP-2 CARDS FOR A PARTICULAR FIRING PT.
      IF (IFLAG .EQ. 1H*) GO TO 200                                     FORMA185
      GO TO 210                                                         FORMA186

C     SET FIRST SOURCE ACCESS                                           FORMA187
C     STORE ALL INFORMATION OF FP-2 INTO APPROPRIATE ARRAYS
  250 CONTINUE                                                          FORMA188
      IDTYPE(I)=ID                                                      FORMA189
      DAYNO(I)=DAY                                                      FORMA190
      DARKNO(I)=DARK                                                    FORMA191
      GUNT(I)=ITYPE                                                     FORMA192
      SUBWH(I)=CHAR                                                     FORMA193
      HEIGHT(I)=HGT                                                     FORMA194
      HCORR(I)=HCORR                                                    FORMA195
      FIRST=.FALSE.                                                     FORMA196
      GO TO 221                                                         FORMA197

C     SET FIRST TARGET ACCESS                                           FORMA198
  270 CONTINUE                                                          FORMA199
      SUBWH(ID)=TCHAR                                                   FORMA200
      HEIGHT(ID)=HGT                                                    FORMA201
      DAYNO(ID)=DAY                                                     FORMA202
      DARKNO(ID)=DARK                                                   FORMA203
      GO TO 240                                                         FORMA204
```

```
  300  CONTINUE                                                          FORMA205
C      NUMBER OF SOURCES
       NSRCS=I-1                                                         FORMA206
C FORMA-2 DIRECTIVE CARD.
C      NUMBER OF DAYS CARD
       READ(KARD,607) DAYS                                               FORMA229
       IF(EOF(KARD).NE.0.) DAYS=0.0                                      FORMA230
       IF (DAYS .LE. 0.0) DAYS = 1.0                                     FORMA231
       DAYN=0.0                                                          FORMA232
       WRITE(KPRINT,610) DAYS                                            FORMA233
       DARKN=0.0                                                         FORMA234

C      BEGIN TO COMPRESS DATA
       DO 420 I=1,NSRCS                                                  FORMA235
C      IF GUN, CALCULATE ANGLE AT WHICH IT IS POINTING
       IF (IDTYPE(I).GT.0)  GOTO 410                                     FORMA236
C      FOR OMNIDIRECTIONAL FIRINGS, ANGSIN=ANGCOS=999.0
       ANGSIN(I)=999.0                                                   FORMA237
       ANGCOS(I)=999.0                                                   FORMA238
       GOTO 420                                                          FORMA239

  410  CONTINUE                                                          FORMA240
C      CALCULATE THE ANGLE OF FIRING TOWARDS A TARGET
C      CALCULATE DISTANCE FROM GUN TO TARGET
       A = XLOC(IDTYPE(I))-XLOC(I)                                       FORMA241
       B=  YLOC(IDTYPE(I))-YLOC(I)                                       FORMA242
       C = SQRT(A*A+B*B)                                                 FORMA243
       IF (C.NE.0)  GOTO 405                                             FORMA244
       WRITE(KPRINT,710) XLOC(I),YLOC(I)                                 FORMA245
  710   FORMAT(//T15,*.....  WARNING   GUN IS POINTING AT SELF* ,         FORMA246
     1   *...  LOCATION  (*,F8.0,*,*,F8.0,*)*)                           FORMA247
C      MAKE IT OMNIDIRECTIONAL
       ANGSIN(I)=999.0
       ANGCOS(I)=999.0
       GO TO 420
C      GET SINE AND COSINE OF THE ANGLE
  405  ANGSIN(I)=B/C                                                     FORMA248
       ANGCOS(I)=A/C                                                     FORMA249
  420  CONTINUE                                                          FORMA250


       I=0
  400  I=I+1
C      IF SDBAM<0 THEN ITEM IS A TARGET  NEVER ACCESSED
       IF(SDBAM(I).GT.0.)GO TO 401                                       FORMA253
  402  IF(SDBAM(NSRCS).GT.0.)GO TO 403                                   FORMA254
       NSRCS=NSRCS-1                                                     FORMA255
       IF(NSRCS.GT.I)GO TO 402                                           FORMA256
       NSRCS=I-1                                                         FORMA257
       GO TO 404

  403  CONTINUE                                                          FORMA259
C      SWITCH BOTTOM ELEMENTS WITH PRESENT ELEMENTS
       XLOC(I)=XLOC(NSRCS)                                               FORMA260
```

```
      [illegible]                                                       FORMA261
      [illegible]                                                       FORMA262
      [illegible]                                                       FORMA263
      [illegible]                                                       FORMA264
      [illegible]                                                       FORMA265
      [illegible]                                                       FORMA266
      [illegible]                                                       FORMA267
      [illegible]                                                       FORMA268
      [illegible]                                                       FORMA269
      [illegible]                                                       FORMA270
      [illegible]                                                       FORMA271

  401 CONTINUE                                                          FORMA272
C     FOR GREATER THAN ONE DAY CALCULATION DAYNO MUST BE DIVIDED BY     FORMA273
C        NUMBER OF DAYS                                                 FORMA274
      DAYNO(I)=DAYNO(I)/DAYS                                            FORMA275
      DARKNO(I)=DARKNO(I)/DAYS                                          FORMA276
      DAYN=DAYN+DAYNO(I)                                                FORMA277
      DARKN=DARKN+DARKNO(I)                                             FORMA278
C                                                                       FORMA287

C     CALCULATE THE CORRECTION FACTOR DB OF WEIGHT                      FORMA288
C CHECK FOR DONI: IF SO, FIND DIFF FROM 5 LBS. OF C-4
      IF(ANGSIN(I).EQ.999.0) GO TO 4021

C     IF GUN USED, FIND IT IN THE TABLE
      K=GUNT(I)
      IF(K .GT. 0) GO TO 4020
C     GUN NOT FOUND
      WRITE(KPRINT,4011)
 4011 FORMAT(//T10,*.....ERROR.....GUN NOT FOUND IN GUN TYPE TABLE...JOB
     1 ABORTED.....*//)
      STOP

C     FIND EQUATION PARAMETERS FOR C-4 IN ARRAY CONTOR
 4020 PARAMA=CONTOR(K,1)
      PARAMB=CONTOR(K,2)
      AVG=CONTOR(K,15)
C     CALCULATE INNER RING ENERGY LEVEL
      A=PARAMA+(PARAMB*ALOG10(SDBWH(I)*16))
C     FIND DIFF FROM 5 LBS OF C-4
      DBWT=A-119.0-AVG
      GO TO 4022

C      FOR DONI
 4021 DBWT=CFOUR(SDBWH(I)*16)-119.0


 4022 DBHI=0.0
C CORRECTION FOR GROUND LEVEL OR BELOW OMNIDIRECTIONAL SOURCES          FORMA292
      IF(ANGSIN(I).NE.999..OR.HEIGHT(I).GT.0.)GO TO 425                 FORMA293
      H100=SDBWH(I)/100.                                                FORMA294
      DBHI=-HCORR(I)+AMIN1(H100,HCORR(I))                               FORMA295
      IF(HEIGHT(I).EQ.0.)GO TO 425                                      FORMA296

C     CALCULATE THE DB FOR BELOW THE GROUND                             FORMA297
```

```
      DEPTH = ABS(HEIGHT(I)/SDBWH(I)**.333333333)                       FORMA298
      DEP1 = DEPTH/(-1.362)                                             FORMA299
      DEP2 = (DEPTH+17.462)/(-11.933)                                   FORMA300
      IF (DEPTH .GE. 0.0 .A. DEPTH .LE. 2.25) TD=10.0**DEP1             FORMA301
      IF (DEPTH .GT. 2.25) TD=10.0**DEP2                                FORMA302
      DBHI=20.0*ALOG10(TD)+DBHI                                         FORMA303

C     ADD HEIGHT AND WEIGHT/WEAPON CORRECTION FACTORS IN SDBWH
  425 SDBWH(I)=DBWT+DBHI                                                FORMA304

      IF(NSRCS.EQ.I)GO TO 4000
C     ANY MORE SOURCES?
      IF(I.LT.NSRCS) GO TO 400


C "NUMBER OF UNIQUE NOISE SOURCES COUNTED IS.."
 4000 WRITE(KPRINT,700) NSRCS
C "TOTAL PER DAY DAY FIRING IS..."
C "TOTAL PER DAY NIGHT FIRING IS..."
      WRITE(KPRINT,721) DAYN,DARKN                                      FORMA307

      ENTRY FORMA2                                                      FORMA308
C WRITE ALL OF THIS OUT TO TAPE8.
      WRITE(IOUT) NSRCS,DAYS
      WRITE(IOUT) XLOC                                                  FORMA310
      WRITE(IOUT) YLOC                                                  FORMA311
      WRITE(IOUT) SDBWH                                                 FORMA312
      WRITE(IOUT) ANGSIN                                                FORMA313
      WRITE(IOUT) ANGCOS                                                FORMA314
      WRITE(IOUT) DAYNL                                                 FORMA315
      WRITE(IOUT) DARKNU                                                FORMA317
      REWIND IOUT                                                       FORMA319
      REED=.TRUE.                                                       FORMA320

C COMPUTE TIME IN FORMA.
      CALL SECOND(T99)                                                  FORMA321
      T99=T99-T100                                                      FORMA322
      WRITE(KPRINT,900) T99                                             FORMA323
      RETURN                                                            FORMA324


C "ERROR.. ALL SOURCES ARE TARGETS...NUMBER OF SOURCES COUNTED ARE..."
  500 WRITE(KPRINT,702) I                                               FORMA325
      RETURN                                                            FORMA326
C "ERROR...NUMBER OF SOURCES WILL EXCEED SPACE.  NUMBER OF SOURCES
C NOW IS..."
  510 WRITE(KPRINT,703) I                                               FORMA327
      CALL EXIT                                                         FORMA328
C "ERROR...EOF ENCOUNTERED WHILE PROCESSING GOV TYPE DATA".
  520 WRITE(KPRINT,706)                                                 FORMA329
      STOP                                                              FORMA330
```

```
[illegible]                                                                    FORMA334
[illegible]                                                                    FORMA335
[illegible]                                                                    FORMA336
[illegible]
[illegible]                                                                    FORMA346
[illegible]                                                                    FORMA349
[illegible]                                                                    FORMA350
[illegible]                                                                    FORMA351
[illegible]                                                                    FORMA352
[illegible]                                                                    FORMA353
[illegible]                                                                    FORMA354
[illegible]                                                                    FORMA355
[illegible]                                                                    FORMA356
[illegible]                                                                    FORMA357
[illegible]                                                                    FORMA358
[illegible]                                                                    FORMA359
[illegible]                                                                    FORMA360
[illegible]                                                                    FORMA361
[illegible]                                                                    FORMA362
[illegible]                                                                    FORMA363
[illegible]                                                                    FORMA364
[illegible]                                                                    FORMA365
[illegible]                                                                    FORMA366
[illegible]                                                                    FORMA367
[illegible]                                                                    FORMA368
[illegible]                                                                    FORMA369
[illegible]                                                                    FORMA370
[illegible]                                                                    FORMA371
[illegible]                                                                    FORMA372
[illegible]                                                                    FORMA373
```

SYMBOLIC REFERENCE MAP (R=3)

```
ENTRY POINTS      DEF LINE      REFERENCES
   1  FORMA           1
 752  FORMA2        481        [illegible]      [illegible]

VARIABLES      SN  TYPE          RELOCATION
 1662  A          REAL                          REFS     2*371      382      442   DEFINED      369      440
 3746  ANGCOS     REAL      ARRAY     [illegible]   REFS       24       25       43      405      488
                                                 DEFINED     363      378      382      405
 7666  ANGSIN     REAL      ARRAY     [illegible]   REFS       24       25       43      404      424      451      487
                                                 DEFINED     362      377      381      404
 1652  AVE        REAL                          REFS      225      226   DEFINED      224
 1670  AVG        REAL                          REFS      442   DEFINED      438
 1663  B          REAL                          REFS     2*371      381   DEFINED      370
 1664  C          REAL                          REFS      372      381      382   DEFINED      371
 1653  CHAR       REAL                          REFS      247      256      265      328   DEFINED      230      233
 2045  CHARGE     REAL      ARRAY                REFS       40     2*230      233   DEFINED      105
 3175  CHAT       REAL      ARRAY                REFS       46       99   DEFINED       52
```

```
VARIABLES      SN  TYPE          RELOCATION
     0  CHECK     LOGICAL          DEBUG      REFS      27      30
     1  CNR       REAL             FT         REFS      22
    62  CONTOR    REAL     ARRAY   CONTR      REFS      28      29     436     437     438
                                              DEFINED   135
 22157  CSCF      REAL     ARRAY   TABL1      REFS      35
  1641  DARK      REAL                        REFS     269     289     304     310     326     339
                                              DEFINED   178
  1661  DARKN     REAL                        REFS     418     478  DEFINED    354     418
 13562  DARKNC    REAL     ARRAY   FT         REFS      22      23     289     310     407     416     418
                                                49  DEFINED    269     289     304     310     326     339
                                                407     416
  1640  DAY       REAL                        REFS     268     288     303     309     325     338
                                              DEFINED   176
  1660  DAYN      REAL                        REFS     417     478  DEFINED    352     417
  7642  DAYNJ     REAL     ARRAY   FT         REFS      22      23     288     309     406     415     417
                                                489 DEFINED    268     288     303     309     325     338
                                                406     415
  1657  DAYS      REAL                        REFS     351     353     415     416     483
                                              DEFINED   349     350     351
  1672  DBHI      REAL                        REFS     462     466  DEFINED    449     453     462
     0  DBV       REAL     ARRAY   TABL1      REFS      35
  1671  DBWT      REAL                        REFS     466  DEFINED    442     446
  1674  DEPTH     REAL                        REFS     458     459   2*460     461  DEFINED    457
  1675  DEP1      REAL                        REFS     460  DEFINED    458
  1676  DEP2      REAL                        REFS     461  DEFINED    459
    14  DIST      REAL     ARRAY   GRI        REFS      24      25
     1  EAS       REAL             GRI        REFS      24
 17222  ENV       REAL     ARRAY   TABL1      REFS      35
  1616  FIRST     LOGICAL                     REFS      34     239  DEFINED    174     331
 23310  FUN1      REAL     ARRAY   TABL1      REFS      35
 30060  FUN2      REAL     ARRAY   TABL1      REFS      35
 34630  FTWO      REAL     ARRAY   TABL1      REFS      35
  1042  GHCORR    REAL                        REFS     134     166  DEFINED     50      80
     0  GRDSZ     REAL             FT         REFS      22
  1615  GTYPE     INTEGER                     REFS      31     182  DEFINED    178
     0  GUNT      INTEGER  ARRAY   GUN        REFS      32      33     247     403     427
                                              DEFINED   144     266     298     327     403
  7126  HCORR     REAL     ARRAY               REFS      49     301     409   2*453  DEFINED     50     147
                                                271     301     330     409
  3206  HEIGHT    REAL     ARRAY               REFS      49     256     281     408     451     454     457
                                              DEFINED    50     270     302     329     337     408
  1646  HGT       REAL                        REFS     256     270     281     302     329     337
                                              DEFINED   176
  1673  H1/0      REAL                        REFS     453  DEFINED    452
  1631  I         INTEGER                     REFS      99   5*105     112     114     115     119   2*126
                                                132   2*136   2*137   2*138   2*139   2*142     144     146
                                                147     150     152     153     159   2*162   2*168   2*169
                                              2*172   2*171     173     245     254     262     263     264
                                                265     266     267     268     269     270     271     294
                                                295   2*296     297     298     299     300     301     302
                                                303     304     314     324     325     326     327     328
                                                329     330     346     360     362     363   2*369   2*370
                                              2*373     377     378     381     382     388     390     393
                                                394     399     400     401     402     403     404     405
                                                406     407     408     409   2*415   2*416     417     418
                                                424     427     440     446   2*451     452   2*453     454
                                              2*457     466     468     470     503     507
```

VARIABLES		TYPE			DEFINED							
					294	354	381	384				
1651	IAVE	INTEGER			REFS	2*266	283	DEFINED				426
1046	IBUMP	INTEGER			REFS	191	DEFINED	69				
1043	ID	INTEGER			REFS	191	212	216	246	247	267	278
						284	324	325	326	336	337	338
					339	DEFINED	178	191	211			
0	IDUMX	INTEGER	ARRAY		REFS	24	24	182	DEFINED	193		
1656	IDXLO	INTEGER			REFS	2*241	2*242	283	2*248	2*249	295	
					DEFINED	281	283					
3113	IDTRA	INTEGER	ARRAY		REFS	40	272	DEFINED	41			
3746	IDTYPE	INTEGER	ARRAY	5410	REFS	42	43	247	281	283	361	369
					377	402	DEFINED	142	281	295	296	324
					402							
1633	IFLAG	INTEGER			REFS	119	149	317	DEFINED	125	126	178
1626	IFNL	INTEGER			REFS	84	85	86	DEFINED	79		
1043	INI	INTEGER			REFS	178	128	169	179	DEFINED	57	
					I/O REFS	81	105	126	162	178		
1655	IOLD	INTEGER			REFS	3*247	2*256	2*309	2*310	DEFINED	245	254
1044	IOUT	INTEGER			DEFINED	57	I/O REFS	483	484	485	486	487
					488	489	490	491				
1637	IPTR	INTEGER			REFS	2*185	2*193	2*206	245	254	263	264
					DEFINED	173						
1647	IT	INTEGER			REFS	142	190	212	215	DEFINED	181	201
1045	ITABLIM	INTEGER			REFS	114	152	DEFINED	54			
1650	ITYPE	INTEGER			REFS	185	2*231	233	235	247	266	298
					327	DEFINED	140					
1632	J	INTEGER			REFS	2*185	136	DEFINED	2*185	186		
3624	JUMP	INTEGER			REFS	217	DEFINED	73	88	93	96	
1665	K	INTEGER			REFS	428	436	437	438	DEFINED	427	
0	KAMO	INTEGER		IN	REFS	23	359	I/O REFS	24	349		
1645	KFLAG	INTEGER			REFS	192	275	DEFINED	178			
1	KPRINT	INTEGER		IN	REFS	20	I/O REFS	72	94	115	153	185
					193	206	353	373	430	475	478	497
					503	507	510					
1643	MAX	INTEGER			REFS	220	224	230	DEFINED	178		
1642	MIN	INTEGER			REFS	220	224	230	DEFINED	178		
1701	NAME	INTEGER	ARRAY		REFS	23	DEFINED	195				
1625	NDX	INTEGER			REFS	99	DEFINED	74	91	99	97	
7666	NOPER	INTEGER	ARRAY	GRID	REFS	42	43					
1639	NUMIND	INTEGER			REFS	81	DEFINED	79				
0	NROW	INTEGER		GRID	REFS	24						
0	NSRCS	INTEGER		SRCS	REFS	21	358	391	392	393	399	400
					401	402	403	404	405	406	407	408
					409	410	468	470	475	483		
					DEFINED	346	392	394	410			
1635	NTAB	INTEGER			REFS	130	201	DEFINED	124	130		
1634	NTYPES	INTEGER			REFS	181	DEFINED	119				
1666	PARAMA	REAL			REFS	440	DEFINED	436				
1667	PARAMB	REAL			REFS	440	DEFINED	437				
12852	PERM	REAL	ARRAY	TABLE	REFS	35						
1636	PHOURP	REAL			REFS	134	147	166	271	330		
					DEFINED	126	134	162	166			
2	RDMM	REAL	ARRAY	GRID	REFS	24	25					
1	REFS	LOGICAL		DEBUG	REFS	27	30	DEFINED	492			
26	SDMM	REAL	ARRAY	GRID	REFS	24	25	247	256	278	281	390
					391	401	440	446	452	457	486	

```
VARIABLES      SN  TYPE            RELOCATION
                                                  DEFINED    146     265     297     328     336     401     466
    2  TABRC      LOGICAL              DEBUG       REFS      27      30      66  DEFINED      68
 1654  TCHAR      REAL                             REFS     281     297     336  DEFINED     235
 3031  TCHARG     REAL        ARRAY                REFS      40     235  DEFINED     105
 1677  TD         REAL                             REFS     462  DEFINED     460     461
 1617  T100       REAL                             REFS      64     496
 1700  T99        REAL                             REFS     495     496     497  DEFINED     496
    2  XLOC       REAL        ARRAY    FT          REFS      22      23   2*136   2*137   2*168   2*169     185
                                                    193     206     263     299   2*369     373     399     484
                                                  DEFINED    126     162     263     299     399
 1620  XMAX       REAL                             REFS     136     168  DEFINED      69     136     168
 1622  XMIN       REAL                             REFS     137     169  DEFINED      70     137     169
 1627  X2         REAL                             REFS    2*80  DEFINED      79
 3722  YLOC       REAL        ARRAY    FT          REFS      22      23   2*138   2*139   2*170   2*171     185
                                                    193     206     264     300   2*370     373     400     485
                                                  DEFINED    126     162     264     300     400
 1621  YMAX       REAL                             REFS     138     170  DEFINED      69     138     170
 1623  YMIN       REAL                             REFS     139     171  DEFINED      70     139     171
       VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS          TYPE    ARGS        REFERENCES
       ALOG10      REAL      1 LIBRARY    440      462
       CFOUR       REAL      1            446
       EOF         REAL      1            108      128     164     179     350
       EXIT                  0            508
       READTH                0             66
       SECOND                1             64      495
       SQRT        REAL      1 LIBRARY    371

INLINE FUNCTIONS   TYPE    ARGS        DEF LINE  REFERENCES
       ABS         REAL      1  INTRIN              457
       AMIN1       REAL      0  INTRIN              453
       IABS        INTEGER   1  INTRIN              282     283
       MAX0        INTEGER   0  INTRIN              220

STATEMENT LABELS                DEF LINE   REFERENCES
   73  50                          105       114
  135  60                          119       110
   35  91                           88        84
   40  92                           93        85
   43  93                           96        86
   45  99                           99        87      92      95
  142  1                           126       152
  207  200                         159       149     317
    0  201                         183       181
  264  202                         190       182
  300  203                         197       192
  302  204                         199       191
    0  205                         203       201
  316  206                         210       202
  317  207                         211       198
  243  21                          178       318
  321  211                         219        73      88     217
  325  212                         223        93     217
  336  213                         229        96     217
  345  214                         232       221     227
    0  215                         249       245
```

STATEMENT LABELS			DEFINED	REFERENCES		
331	416		254	331		
372	417		154	416		
	418		255	252		
4 4	419		[illegible]	351		
407	42		8 7	207	4 0	
423	421		27	311	55	
432	422		241	274		
442	425		255	241		
447	427		254	242		
474	443		314	475	247	55 [illegible] 361
5 1	45		3[illegible]8	434		
514	47		335	272		
523	5		344	164	177	
612	4		345	47		
637	4 1		410	39		
611	4 2		351	333		
615	4 3		347	341		
572	4 5		341	372		
552	413		346	346		
576	423		345	354	364	379
737	425		446	451	464	
1010	5		5 3	128		
1013	510		5 7	314		
1017	52		51	198		
1321	60	FMT	514	126		
1325	601	FMT	515	162		
1330	602	FMT	516	178		
1335	603	FMT	517	79		
1340	604	FMT	524	105		
1345	605	FMT	514	349		
1347	606	FMT	520	99		
1357	610	FMT	523	353		
1366	700	FMT	524	475		
1375	701	FMT	525	72		
1404	702	FMT	526	503		
1420	703	FMT	526	507		
1435	704	FMT	53	206		
1451	705	FMT	532	185		
1465	706	FMT	534	510		
1477	707	FMT	536	115		
1510	708	FMT	535	193		
1526	709	FMT	54	153		
1210	710	FMT	373	373		
1537	721	FMT	542	478		
1552	90	FMT	544	497		
745	4020		475	395	446	
1226	4011	FMT	431	430		
655	4020		436	422		
671	4021		446	424		
677	4022		447	443		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
53		I	99 99	1 H		EXT REFS
110		J	105 105	1 H		EXT REFS
253	201	IT	181 183	2 H	INSTACK	EXITS
395	205	IT	201 203	2 H	INSTACK	EXITS
362	215	IDLO	245 249	7 H	INSTACK	EXITS

```
      SUBROUTINE FORMA      74/175   FT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE    15

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
  377  21H       1 LO       254 257        5       INSTACK     EXITS
  545  42        I          358 383       34                   EXT REFS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       1              2              0 KARD    (1)                1 KPRINT (1)
       SRCS           1              0 NSRCS   (1)
       FT          8002              0 GRLSZ   (1)                1 CNR    (1)                2 XLOC    (2000)
                                  2002 YLOC    (2000)          4002 DAYNO   (2000)          6002 DARKNO (2000)
       GRID        6022              0 NRCNR   (1)                1 EAS    (1)                2 RCNR    (10)
                                    12 DIST    (10)              22 SOBWH   (2000)          2022 ANGCOS (2000)
                                  4022 ANGSIN  (2000)
       LEHOG          3              0 CHECK   (1)                1 REED   (1)                2 TABRD   (1)
       CONTR        800              0 IDGEN   (50)              50 CONTOR (750)
       GUN         2000              0 GUNT    (2000)
       TABL1      15046              0 PBV     (5416)          5418 PERV   (2408)          7826 ENV    (1501)
                                  9327 CSCF    (601)           9928 FUN1   (2408)         12336 FUN2   (2408)
                                 14744 FTW     (302)

EQUIV CLASSES    LENGTH     MEMBERS - BIAS NAME(LENGTH)
NRCNR   ANGCOS     2000              0 IDTYPE (2000)
NRCNR   ANGSIN     2000              0 NOPER  (2000)

STATISTICS
  PROGRAM LENGTH                 13046B    5670
  CM LABELED COMMON LENGTH       76204B   31876
        60000B CM USED
```

```
      [illegible]                                                       LOC    2
      [illegible]
      [illegible]
C * LABELS [illegible] TARGET="X" FIRING [illegible]=" "
      [illegible]                                                       LOC    3
      [illegible] FOR FIRING
C     [illegible] WHICH [illegible] CARDS.
      [illegible]                                                       LOC    4
C     FLAGS FOR [illegible] INPUT
      LOGICAL TARG,FPT,NAM,LOC                                          LOC    5
C     ARRAY SET [illegible] DEFAULT VALUES
      DIMENSION STARS(2)                                                LOC    6
C     IN1=TAPE 7  IOUT=TAPE 3
      DATA IN1/7/,IOUT/3/                                               LOC    7
      STARS(1)=2H      $ STARS(2)=2H                                    LOC    8
      CPTIME=SECOND(0)                                                  LOC    9


C WRITE TITLE OF MODULE "LOCATOR"
      WRITE(KPRINT,25)                                                  LOC   10
   25 FORMAT(1H1,20X,*.....      LOCATOR       .....*)                  LOC   11

      REWIND IOUT                                                       LOC   12

C PHASE 4 PLOTS SPECIAL LINES AND TEXT ON THE MAP AND DRAWS A BORDER ON THE MAP.
      WRITE(IOUT,10)                                                    LOC   13
   10 FORMAT(4HPHS4)                                                    LOC   14
C                                                                       LOC   15
C        READ SPECIFICATION CARD                                        LOC   16
C                                                                       LOC   17
C THIS IS INFORMATION FOUND ONTHE LOC-2 CARD,
      READ(KARD,20)CHOICE,NAME,LOCATE  ,SIZE,ANGLE                      LOC   18
   20 FORMAT(3A10,2F10.0)                                               LOC   19
C                                                                       LOC   20
C        SPECIFICATION CARD CHECKS                                      LOC   21
C                                                                       LOC   22
C THIS IF-LOOP CHECKS TO SEE IF A DEFAULT VALUE IS NEEDED FOR THE VARIABLE
C SIZE OR IF THERE IS ONE GIVEN BY THE USER,
      IF(SIZE.NE.0) GO TO 27                                            LOC   23
      SIZE=.14                                                          LOC   24
      STARS(1)=2H**                                                     LOC   25


C THIS IF-LOOP CHECKS FOR THE DEFAULT FOR THE VARIABLE ANGLE
C IF A DEFAULT VALUE IS USED, IT IS DENOTED IN THE OUTPUT BY STARS.
   27 IF(ANGLE.NE.0.) GO TO 29                                          LOC   26
      ANGLE=0.0                                                         LOC   27
      STARS(2)=2H**                                                     LOC   28


C TARG,FPT,NAM, AND LOC ARE ALL LOGICAL VALUE TO SEE WHICH VALUES WERE
C SUBMITTED BY THE USER FOR THE TARGET, FIRING PT., NAME, AND LOCATE VARIABLES.
   29 TARG=((CHOICE.EQ.3HALL).OR.(CHOICE.EQ.6HTARGET))                  LOC   29
      FPT=((CHOICE.EQ.3HALL).OR.(CHOICE.EQ.6HFIRING))                   LOC   30
      NAM=(NAME.EQ.4HNAME)                                              LOC   31
      LOC=(LOCATE  .EQ.8HLOCATION)                                      LOC   32
```

```
      C                                                                 LOC   33
      C HEADING" PTIONS REQUESTED"
      C         PRINT REPORT HEADING AND OPTIONS REQUESTED              LOC   34
      C                                                                 LOC   35
            WRITE(KPRINT,30)                                            LOC   36
       30   FORMAT(1H0,23X,*..OPTIONS REQUESTED..*/)                    LOC   37
            IF((TARG).OR.(FPT)) GO TO 34                                LOC   38
      C MESSAGE"NO OPTIONS REQUESTED-JOB ENDED"
            WRITE(KPRINT,32)                                            LOC   39
       32   FORMAT(1H0,23X,*NO OPTIONS REQUESTED - JOB ENDED*)          LOC   40
            REWIND IOUT                                                 LOC   41
            GO TO 250                                                   LOC   42

      C THIS IF-STATEMENTS WRITE THE OPTIONS
       34   IF(TARG)WRITE(KPRINT,35)10HTARGET                           LOC   43
            IF(FPT) WRITE(KPRINT,35) 20HFIRING POINT                    LOC   44
            IF(NAM)  WRITE(KPRINT,35)10HNAME                            LOC   45
            IF(LOC)WRITE(KPRINT,35) 10HLOCATION                         LOC   46
       35   FORMAT(25X,2A10)                                            LOC   47
            WRITE(KPRINT,40) SIZE,STARS(1),ANGLE,STARS(2)               LOC   48
       40   FORMAT(1H0,25X,5HSIZE=,F5.2,A2,5X,6HANGLE=,F6.2,A2)         LOC   49

      C MESSAGE "STARS INDICATE DEFAULT VALUES"
            WRITE(KPRINT,45)                                            LOC   50
       45   FORMAT(26X,*STARS INDICATE DEFAULT VALUES*)                 LOC   51
            WRITE(KPRINT,36)                                            LOC   52
       36   FORMAT(1H0,24X,7HID CODE,8X,8HX COORD.,5X,8HY COORD.,5X,7HG CORR.,
           15X,6HBOUNDS)
      C     TEST IF BOUNDS SET?  NO THEN STOP
            IF(BDS) GO TO 80
            WRITE(KPRINT,85)
       85   FORMAT(*  ...NO BOUNDS CALL BEFORE LOCATOR...*)
            STOP
      C                                                                 LOC   54
      C         READ GUN TYPES                                          LOC   55
      C                                                                 LOC   56
       80   REWIND INI                                                  LOC   57
      100   READ(INI,110)STAR                                           LOC   58
      110   FORMAT(A1)                                                  LOC   59
            IF(EOF(INI).NE.0) GO TO 260                                 LOC   60
            IF(STAR.NE.1H*) GO TO 100                                   LOC   61
      C IF WE HAVE A TARGET,PLACE AN 'X' ON THE POINT HEADING-"TARGET DATA"
      C                                                                 LOC   62
      C         READ TARGET CARDS                                       LOC   63
            IF(TARG) GO TO 140                                          LOC   64
      C     FLUSH TARGET CARDS
      120   READ(INI,130) STAR                                          LOC   65
      130   FORMAT(A1)                                                  LOC   66
            IF(EOF(INI).NE.0) GO TO 260
            IF(STAR.NE.1H*) GO TO 120                                   LOC   67
            WRITE(KPRINT,135)                                           LOC   68
      135   FORMAT(1H0,23X,*TARGETS NOT REQUESTED*)                     LOC   69
            GO TO 205                                                   LOC   70
      C                                                                 LOC   71
      C         TARGET/FIRING POINT CARDS PRODUCED                      LOC   72
      C                                                                 LOC   73
```

```
  140   POINT=1H*                                                        LOC   74
        WRITE(KPRINT,141)                                                LOC   75
  141   FORMAT(     11X,*..TARGET DATA..*/)                              LOC   76
  145   READ(IN1,150) EOI,IDCODE,XPOS,YPOS,GCORR                         LOC   77
  150   FORMAT(A1,1X,A3,1X,3F6.0)                                        LOC   78
        IF(EOF(IN1).NE.0) GO TO 250                                      LOC   79
C       TEST IF POINT OUT OF BOUNDS  IF S  FLAG
        IF (XPOS.LT.XMIN.OR.XPOS.GT.XMAX)  GOTO 164
        IF (YPOS.LT.YMIN.OR.YPOS.GT.YMAX)  GOTO  164
        WRITE(KPRINT,160)IDCODE,XPOS,YPOS,GCORR                          LOC   81
  160   FORMAT(26X,A3,10X,F8.0,5X,F8.0,5X,F8.0)                          LOC   82

        GOTO  163
C       OUT OF BOUNDS DATA,  TELL USER
  164   WRITE(KPRINT,161)  IDCODE,XPOS,YPOS,GCORR
  161   FORMAT(26X,A3,5X,3(5X,F8.0),7X,3HOUT)
        GOTO 200

C       L IS AN INPUT VARIABLE TO NASAPLOT
  163   L=1                                                              LOC   83
        IF(NAM) GO TO 165                                                LOC   84
        IDCODE=3H                                                        LOC   85
        GO TO 166                                                        LOC   86
  165   L=5                                                              LOC   87
  166   IF(LOC) GO TO 180                                                LOC   88
        WRITE(IOUT,170)XPOS,YPOS,SIZE,ANGLE,POINT,IDCODE,L               LOC   89
  170   FORMAT(4HTEXT,2X,2F8.0,8X,2F8.3,2H 1,A1,1X,A3,19X,I2)            LOC   90
        GO TO 200                                                        LOC   91
  180   L=23                                                             LOC   92
        WRITE(IOUT,190)XPOS,YPOS,SIZE,ANGLE,POINT,IDCODE,XPOS,YPOS,L     LOC   93
  190   FORMAT(4HTEXT,2X,2F8.0,8X,2F8.3,2H 1,A1,1X,A3,1X,F8.0,1X,F8.0,1X,I
       12)

C       ARE WE DOING FIRING PTS?
  200   IF(POINT.EQ.1H0) GO TO 206
C       DOING TARGETS--IS IS THE LAST ONE?
        IF(EOI.NE.1H*) GO TO 145
C                                                                        LOC   96
C          FIRING POINT CARDS                                            LOC   97
C                                                                        LOC   98
C IF WE HAVE A FIRING POINT PLACE AN "0" ON THE POINT HEADING-FIRING POINT
C DATA"
  205   IF(.NOT.FPT) GO TO 240                                           LOC   99
        WRITE(KPRINT,210)                                                LOC  101
  210   FORMAT(     11X,*..FIRING POINT DATA..*/)                        LOC  102
        POINT=1H0                                                        LOC  103
        GO TO 145                                                        LOC  104

C       FLUSH OUT FIRING POINT INFO FOR THIS FIRING PT.
  206   READ(IN1,130) STAR
        IF(EOF(IN1).NE.0) GO TO 260
        IF(STAR.EQ.1H*) GO TO 145
        GO TO 206
  240   WRITE(KPRINT,245)                                                LOC  105
  245   FORMAT(1H0,23X,*FIRING POINTS NOT REQUESTED*)                    LOC  106
```

```
      C THIS COMPUTES THE TIME IN LOCATR SUBPROGRAM
       250  CPTIME1=SECOND(0)                                          LOC  107
            CPTIME1=CPTIME1-CPTIME                                     LOC  108
            WRITE(KPRINT,251)CPTIME1                                   LOC  109
       251  FORMAT(1H0,20X,*.....*,F8.3,* SECONDS IN LOCATOR  .....*)  LOC  110
            GO TO 300                                                  LOC  111
      C "ERROR-PREMATURE EOF ON DATA BASE FILE TAPE 3 NOT CREATED"
       260  WRITE(KPRINT,261)                                         LOC  112
       261  FORMAT(1H0,20X,35H** PREMATURE EOF ON DATA BASE FILE  ,   LOC  113
           1                                  22H**TAPE3 NOT CREATE LOC  114
           1D **)                                                      LOC  115
            REWIND IOUT                                                LOC  116
            STOP                                                       LOC  117
        300 RETURN                                                     LOC  118
            END                                                        LOC  119
```

SYMBOLIC REFERENCE MAP (R=3)

```
ENTRY POINTS      DEF LINE      REFERENCES
   1  LOCATR          1          186

VARIABLES      SN  TYPE            RELOCATION
  651  ANGLE       REAL                          REFS       47        77       140       144   DEFINED       33        48
    4  BDS         LOGICAL              BOUND    REFS        2         3        88
  645  CHOICE      REAL                          REFS     2*54      2*55   DEFINED       33
  644  CP          REAL                          REFS       16       173
  643  CPTIME      REAL                          REFS      174   DEFINED        16
  660  CPTIME1     REAL                          REFS      174       176   DEFINED      173       174
  652  EOI         REAL                          REFS      151   DEFINED       118
  640  FPT         LOGICAL                       REFS       10        64        73       157   DEFINED       55
  656  GCORR       REAL                          REFS      124       129   DEFINED       118
  653  IDCODE      INTEGER                       REFS      124       129       140       144   DEFINED      118       136
  231  IN1         INTEGER                       REFS       98       107       120       165   DEFINED       14
                                                I/O REFS    95        96       105       118       164
  232  IOUT        INTEGER                       DEFINED     14   I/O REFS       24        27        68       140       144
                                                  184
    0  KARD        INTEGER              IO       REFS        5   I/O REFS       33
    1  KPRINT      INTEGER              IO       REFS        5   I/O REFS       21        62        66        72        73
                                                   74        75        77        82        84        89       109       116
                                                  124       129       158       165       176       180
  657  L           INTEGER                       REFS      140       144   DEFINED      134       138       143
  642  LOC         LOGICAL                       REFS       10        75       139   DEFINED       57
  647  LOCATE      INTEGER                       REFS       57   DEFINED        33
  641  NAM         LOGICAL                       REFS       10        74       135   DEFINED       56
  646  NAME        INTEGER                       REFS       56   DEFINED        33
  636  POINT       INTEGER                       REFS        8       140       144       149   DEFINED      115       160
  650  SIZE        REAL                          REFS       40        77       140       144   DEFINED       33        41
  635  STAR        INTEGER                       REFS        8        99       108       166   DEFINED       96       105
                                                  164
  661  STARS       REAL         ARRAY            REFS       12      2*77   DEFINED      2*15        42        49
  637  TARG        LOGICAL                       REFS       10        64        72       103   DEFINED       54
    2  XMAX        REAL                 BOUND    REFS        2       122
```

VARIABLES	SN	TYPE	DIMENSION						
6	XMIN	REAL			REFS	2	122		
654	XPOS	REAL			REFS	2*122	124	124	14	2*140
					DEFINED	118				
3	YMAX	REAL			REFS	2	123		
1	YMIN	REAL			REFS	2	123		
655	YPOS	REAL			REFS	2*123	124	124	14	2*140
					DEFINED	118				

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES			
EXP	REAL	1	98	107	120	165
SECOND	REAL	1	14	173		

STATEMENT LABELS			DEF LINE	REFERENCES			
247	10	FMT	28	27			
262	20	FMT	34	33			
236	25	FMT	22	21			
22	27		47	40			
26	29		54	47			
270	30	FMT	63	62			
300	32	FMT	67	66			
54	34		72	64			
327	35	FMT	76	72	73	74	75
360	36	FMT	85	84			
340	40	FMT	78	77			
350	45	FMT	83	82			
102	80		95	86			
373	85	FMT	90	89			
104	100		96	99			
407	110	FMT	97	96			
114	120		105	108			
416	130	FMT	106	105	164		
423	135	FMT	110	109			
125	140		115	103			
433	141	FMT	117	116			
130	145		118	151	161	166	
450	150	FMT	119	118			
462	160	FMT	125	124			
475	161	FMT	130	129			
153	163		134	127			
150	164		129	122	123		
157	165		138	135			
160	166		139	137			
513	170	FMT	141	140			
164	180		143	139			
535	190	FMT	145	144			
167	200		144	131	142		
172	205		157	111			
177	206		164	149	167		
547	210	FMT	154	154			
206	240		166	157			
564	245	FMT	169	169			
210	250		171	89	120		
575	251	FMT	177	176			
216	260		180	98	107	165	
607	261	FMT	181	180			
223	300		186	178			

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)

BLOCK	5	0	XMIN (1)	1	YMIN (1)	2	XMAX (1)
		3	YMAX (1)	4	BDS (1)		
IO	2	0	KARG (1)	1	KPRINT (1)		

STATISTICS

PROGRAM LENGTH	674B	444
CM LABELED COMMON LENGTH	76	7

60000B CM USED

```
      SUBROUTINE MAP                                                    MAP    2
C                                                                       MAP    3
C     THIS SUBROUTINE PRODUCES A MAP OF THE POINTS                      MAP    4
C                                                                       MAP    5
      COMMON/FT/TXFPT
      COMMON/IO/KARD,KPRINT                                             MAP    7
      COMMON/GRID/GTXFPT
      DIMENSION IDGUN(50),CHARGE(11,50),IDTRG(50),IDFPT(300),NAME1(50),
     1 TCORDS(50,2),FCORDS(300,2),TXFPT(50,300),TXGT(50,50),GTXFPT(50,  MAP   10
     2  300)                                                            MAP   11
     3  ,ADGUN(50),ADTRG(50),ADFPT(300),XREF(2500),NAME2(50)
      EQUIVALENCE (ADGUN(1),IDGUN(1)),(ADTRG(1),IDTRG(1)),(ADFPT(1),    MAP   13
     1   IDFPT(1))                                                      MAP   14
      DIMENSION NUL(80),NTCOLS(50),NDCOLS(49)
      DIMENSION CONTUR(50,15)
      DIMENSION IN(3)                                                   MAP   21
      COMMON/DEBUG/CHECK,REED                                           MAP   22
      LOGICAL CHECK,REED                                                MAP   23
      LOGICAL REOF                                                      MAP   24
      LOGICAL PRNT                                                      MAP   25
      LOGICAL OVRFL,IMAGE,POS                                           MAP   26
      LOGICAL DUP                                                       MAP   27
      LOGICAL LU1                                                       MAP   28
C XREF FLAGS;0=NO TABLE;1= TABLE;2= INCOMPLETE TABLE DUE TO OVERFLOW    MAP   29
      INTEGER XTF,XTG,XGF                                               MAP   30
      INTEGER HDRRTN                                                    MAP   31
      DATA IBLNK/1H /                                                   MAP   32
      DATA IN/7,75,70/,DFILES/3/                                        MAP   33
C TABLE LIMITS,ETC.                                                     MAP   34
      DATA NUMTRG/50/,NUMGT/50/,NUMFPT/300/,NUMLIN/50/,NUMCHG/11/,      MAP   35
     1     BIGCHG/50./                                                  MAP   36
C BLANK CARD COLUMN MARS                                                MAP   37
      DATA NTCOLS/2,6,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,  MAP   38
     1  41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,   56,57,58,59,60, MAP   39
     2  61,62,63,64,65,66,67,68,69,70,71,72/,                          MAP   40
     3NDCOLS/2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,                MAP   41
     1  41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,   56,57,58,59,60, MAP   42
     2  61,62,63,64,65,66,67,68,69,70,71,72/                           MAP   43
      CALL SECOND(T100)                                                 MAP   44
C SET TAPE8 READ FLAG--WILL HAVE TO BE CREATED OR REREAD FOR FURTHER    MAP   45
C   PROCESSING, SINCE MAP USES ITS COMMON STORAGE                       MAP   46
      REED=.FALSE.                                                      MAP   47
      REOF=.FALSE.                                                      MAP   48
      WRITE(KPRINT,700)                                                 MAP   49
      NCARDS=0                                                          MAP   50
      NT=0                                                              MAP   51
      NS=0                                                              MAP   52
      NG=0                                                              MAP   53
      LINES=0                                                           MAP   54
      NERR=0                                                            MAP   55
      NLRG=-9999                                                        MAP   56
      NSML=9999                                                         MAP   57
      CHLRG=-999999999.                                                 MAP   58
      CHSML=999999999.                                                  MAP   59
      CHCUMD=0.                                                         MAP   60
      CHCUMN=0.
      DAYN=DARKN=0.0                                                    MAP   61
```

```
                  XLMG=YLMG=-99999999.0                                          MAP   62
                  XSML=YSML=99999999.                                            MAP   63
   60             MAMV=MMEL=1.0                                                  MAP   64
                  XTF=0                                                          MAP   65
                  XTG=0                                                          MAP   66
                  XGF=0                                                          MAP   67
               C CHECK FOR DATA BASE FILES--WILL PROCESS BASIC(OR OUTPUT FROM MERGE)-  MAP   68
   65          C       IN(1)= IF PRESENT;                                         MAP   69
               C     IF NOT WILL CHECK FOR (1) IN(2)=OUTPUT FROM SORT,            MAP   70
               C     (2) IN(3)=OUTPUT FROM CMBINE                                 MAP   71
                  DO 5 I=1,%FILES                                                MAP   72
                  IU=IN(I)                                                       MAP   73
   70             REWIND IU                                                      MAP   74
                  READ(IU,END=6)                                                 MAP   75
                  IF(EOF(IU).EQ.0.)GO TO 6                                       MAP   76
                5 CONTINUE                                                       MAP   77
               C NO INPUT FILE                                                   MAP   78
   75             WRITE(%PRINT,899)                                              MAP   79
                  STOP                                                           MAP   80
                6 IN1=IU                                                         MAP   81
                  REWIND IN1                                                     MAP   82
               C     READ MAP=2 CARD WITH FLAGS FOR CROSS-REFERENCE TABLES
   80          C     IFLAG IS A FLAG FOR PRINTING DATA BASE INFO
                  READ(%AMD,900) IFLAG,ITF,ITG,IGT,IGF,IUI                       MAP   83
               C     LUI IS A FLAG FOR PRINTING ERROR MESSAGE FOR EXTRANEOUS DATA
                  LUI=(IU).EQ.0)                                                 MAP   84
               C     PRINT FLAG PRNT FOR MAP MODULE OUTPUT
   85             PRNT=(IFLAG.GT.0)                                              MAP   85
               C     CHECK FOR CROSS-REFERENCE TABLE PRINTING
                  IF(ITF.GT.0)XTF=1                                              MAP   86
                  IF(ITG.GT.0.OR.IGT.GT.0)XTG=1                                  MAP   87
                  IF(IGF.GT.0)XGF=1                                              MAP   88
   90          C CLEAR XREF TABLES                                               MAP   89
                  IF(XTF.LE.0.AND.XGF.LE.0)GO TO 15                              MAP   90
                  DO 14 J=1,%NMPRT                                               MAP   91
                  DO 10 I=1,%NMTMG                                               MAP   92
               10 TXPRT(I,J)=0.0                                                 MAP   93
   95             DO 11 I=1,%NMGT                                                MAP   94
               11 GTXPRT(I,J)=0.0                                                MAP   95
               14 CONTINUE                                                       MAP   96
               15 IF(XTG.LE.0)GO TO 21                                           MAP   97
                  DO 16 I=1,%NMGT                                                MAP   98
  100             DO 16 I=1,%NMTMG                                               MAP   99
               16 TXGT(I,J)=0.0                                                  MAP  100
               21 CONTINUE                                                       MAP  101
               C                                                                 MAP  102
               C READ 3 D TYPE TABLE                                             MAP  103
  105          C                                                                 MAP  104
               C     WRITE HEADINGS FOR 3-D TYPE TABLE
                  WRITE(%PRINT,7241                                              MAP  105
                  %FILE='FALSE'                                                  MAP  106
                  %NAME=0                                                        MAP  107
  110             I=1                                                            MAP  108
                5 READ(IU,END=899)(NAME1(I),(NAME2(J,I),I=1,%NUMG),%AME1(I),%AME2(I),
                  1(FA(J,I),J=1,15)
                  IF(F(I,1).EQ.'END')GO TO 899                                   MAP  110
               C     CHECK DATA BASE TYPES
```

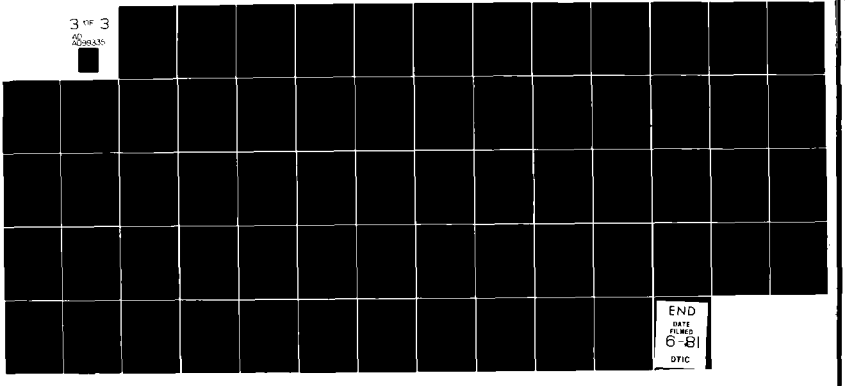
```
                      %CHARGE(0:3,1:3)
                C     COUNT THE STATES
                      %NSTATE=1                                                  MAP  112
                C     GO THROUGH EACH STATE AND CHECK FOR                        MAP  113
                      IF(I .GT. 1 .AND. I .LE. NSTATE)                           MAP  114
      125             1 IF(I.EQ.%NSTATE)                                         MAP  115
                     55 IF(CHARGE(J,I) .NE. CHARGE(J,1))                         MAP  116
                C     IF(FLAG .EQ. .TRUE.) WRITE(APRINT,725)IFLAG,I,(CHARGE(J,I),J=1,NUMCHG)  MAP  117
                      IMAGE=.FALSE.                                              MAP  118
      130       C CHECK CHARGE SIZE>                                             MAP  119
                      %BIG=                                                      MAP  120
                      CHG=1                                                      MAP  121
                      PUS=.FALSE.                                                MAP  122
                      DO 58 I=1,%NSTATE                                          MAP  123
      135             IF(CHARGE(J,I).GT.CHG)GO TO 58                           MAP  124
                C     CHARGE SIZE<                                             MAP  125
                     58 %BIG=%BIG+1                                              MAP  126
                      NEWNEW=NEW+1                                               MAP  127
                      GO TO 60                                                   MAP  128
      140       C     CHARGE SIZE>                                             MAP  129
                     59 PUS=.TRUE.                                               MAP  130
                      IF(CHARGE(J,I).LE.-1.0*CHG) GO TO 60                       MAP  131
                      LRG=LRG+1                                                  MAP  132
                      NEWNEW=NEW+1                                               MAP  133
      145             60 CONTINUE                                              MAP  134
                      IF(PUS.AND.(LRG+LRG).EQ. 1)GO TO 70                        MAP  135
                      IF(IMAGE)GO TO 65                                          MAP  136
                      WRITE(APRINT,725)IFLAG,I-%GUN(I), (CHARGE(J,I),J=1,NUMCHG)  MAP  137
                      IMAGE=.TRUE.                                               MAP  138
      150       C     NO POSITIVE CHARGES FOR THIS GUN TYPE                    MAP  139
                     65 IF(.NOT.PUS)WRITE(APRINT,731)                            MAP  140
                C     NEG CHARGES EXCEEDED                                     MAP  141
                      IF(%NG.GT.0)WRITE(APRINT,732)%NG                           MAP  142
                C     CHARGE SIZE TOO LARGE                                    MAP  143
      155             IF(LRG.GT.0)WRITE(APRINT,733)LRG,HIGCHG                  MAP  144
                     70 CONTINUE                                                 MAP  145
                C CHECK FOR SUM, I IF INST OCCURRENCE USED FOR TABLE             MAP  146
                      IF(I.EQ.1)GO TO 80                                         MAP  147
                      %TD=I-1                                                    MAP  148
                      ID=I-%GUN(I)                                               MAP  149
      160             DO 75 K=1,ID                                             MAP  150
                      IF(I-K.EQ.I-%GUN(K))GO TO 76                               MAP  151
                     75 CONTINUE                                                 MAP  152
                      GO TO 80                                                   MAP  153
                     76 IF(IMAGE)GO TO 77                                        MAP  154
                      WRITE(APRINT,725)IFLAG,I-%GUN(I),(CHARGE(J,I),J=1,NUMCHG)  MAP  155
                      IMAGE=.TRUE.                                               MAP  156
                C     DUPLICATE IN K GUN                                       MAP  157
                     77 WRITE(APRINT,734)                                        MAP  158
      165             NEWNEW=NEW+1                                               MAP  159
                      I=%T                                                       MAP  160
                     80 CONTINUE                                                 MAP  161
                C LAST GUN TABLE CHECK                                           MAP  162
                      IF(IFLAG.EQ.1HM)GO TO 90                                   MAP  163
      170             IF(I.GE.NUMGUN)GO TO 85                                    MAP  164
                      I=I+1                                                      MAP  165
```

```
                      GO TO 50                                                  MAP  160
                C TABLE  REMOVAL                                                MAP  161
                   95 IF(NVARS.LE.3) S                                          MAP  162
  175                 WRITE(KPRI,7?83) OUT                                      MAP  163
                      I=NOUT+1                                                  MAP  164
                      CVARS=.TRUE.                                              MAP  165
                C FLAG DIFFERENT FROM PREVIOUS OUTPUT TABLES                    MAP  166
                      IF(NTYPES.EQ.1)GO TO 96                                   MAP  167
  180                 IF(KASE.EQ.1)GO TO 96                                     MAP  168
                      GO TO 50                                                  MAP  169
                C END OF GAM TABLE EXIST                                        MAP  170
                   96 NTYPES=NTYPES-1                                           MAP  171
                      IF(.NOT. PRINT) GO TO 95
  185           C     WRITE HEADING FOR SECOND PART OF 3 TYPE TABLE FOR CONTOUR
                C     INFORMATION
                      WRITE(KPRI,7241)
                 7241 FORMAT(////T2,*OBJECTIVITY VALUES*,3X,*VARB*,10X,*EQ PARA*,2X,*EQ PARB*,2?X,
                     1*OBJECTIVITY VALUES*,3?X,*VARB*//)
  190           C     WRITE OUT NAME AND DESTRUCTION INFORMATION
                      DO 91 K=1,NTYPES
                         WRITE(KPRI,7251)(ICOM(M),NAME1(K),NAME2(K),
                     1(COMTOM(K,J),J=1,15)
                 7251 FORMAT(T4,A2,5X,2A10,2X,F4.2,4X,F5.2,3X,12F6.2,2X,F5.2)
  195              91 CONTINUE
                C PRINT ERROR/WARNING COUNT                                     MAP  172
                   95 WRITE(KPRI,7500)KERR                                      MAP  173
                      NERR=NERR+KERR                                            MAP  174
                      KERR=0                                                    MAP  175
  200           C                                                               MAP  176
                C READ TARGETS                                                  MAP  177
                C                                                               MAP  178
                      ANSI=.TRUE.                                               MAP  179
                C     WRITE HEADING FOR TARGET CARDS
  205                 WRITE(KPRI,6?)                                            MAP  180
                      WRITE(KPRI,714)                                           MAP  181
                      CVARS=.FALSE.                                             MAP  182
                C     READ TARGET CARDS
                      I=1                                                       MAP  183
  210              200 READ(IR,1,END=1)IFLAG,VARB(I),IQ,XLE(I),XL C,YLOC,PHICRP,  MAP  184
                     1(COL(J),J=5,5?)                                           MAP  185
                      IF(E_F(I,1),NE.?.)GO TO 299                               MAP  186
                C     COUNT TARGET CARDS WITH DATA IN BASE CASES
                      NCARDS=NCARDS+1                                           MAP  187
  215           C     COUNT TARGET CARDS
                      NTE=NT+1                                                  MAP  188
                C =0(BLANK) TO 1 FOR PRINTING.                                  MAP  189
                      IF(IQ.EQ.0)IQ=1                                           MAP  190
                      IF(XLOC.EQ.0.)XLOC=1.                                     MAP  191
  220                 IF(YLOC.EQ.0.)YLOC=1.                                     MAP  192
                      IF(PHICRP.EQ.0.)PHICRP=1.                                 MAP  193
                C                                                               MAP  194
                      IF(PRINT)WRITE(KPRI,715)IFLAG,VARB(I),IQ,XLE(I),XL C,YLOC,PHICRP,  MAP  195
                     1     (COL(J),J=5,5?)                                      MAP  196
  225                 IMAGE=PRINT                                               MAP  197
                C CHECK BLANK FIELDS                                            MAP  198
                      DO 210 J=1,50                                             MAP  199
                      IF(COL(J).NE.IMISS) GO TO 211                             MAP  200
```

```
      [illegible]
      [illegible]
      DATA [illegible]
      [illegible]
      [illegible]
      [illegible]
      ASSIGN [illegible] TO KERRTT
      GO TO 29991
  [illegible] IF([illegible]KERRINT,735) [illegible]
  [illegible] KERR=KERR+1
      [illegible]
      [illegible] TO 235
      IF(IMAGE) GO TO 222
      ASSIGN 222 TO KERRTT
      GO TO 29991
  [illegible] WRITE(KERRINT,736)
      KERR=KERR+1
C     [illegible] CHECK
  235 GO TO 29992
  231 CONTINUE
C     [illegible]
      IF(I.GT.1)GO TO 234
      IDTRG(1)=I
      TCORDS(1,1)=XLOC
      TCORDS(1,2)=YLOC
      GO TO 251
C IF [illegible] FIRST OCCURRENCE FOR TABLE
  234 NTC=I-1
      DO 240 J=1,NTC
      IF(I[illegible] TRG(J))GO TO 241
  240 CONTINUE
C UNIQUE ID
      IF([illegible] TO 245
      IDTRG(I)=I
      TCORDS(I,1)=XLOC
      TCORDS(I,2)=YLOC
      GO TO 245
C DUP
  241 IF(IMAGE)GO TO 242
      ASSIGN 242 TO KERRTT
      GO TO 29991
  242 WRITE(KERRINT,734)
      KERR=KERR+1
      IF(.NOT.[illegible])GO TO
C DUP. C [illegible] CONSIDERED SEPARATE FOR TABLE
  245 CONTINUE
      DO 246 J=1,NTC
      IF(XLOC.[illegible]TCORDS(J,1))GO TO 246
      IF(YLOC.EQ.TCORDS(J,2))GO TO 247
  246 CONTINUE
      GO TO 25
  247 IF(IMAGE)GO TO 248
      ASSIGN 248 TO KERRTT
      GO TO 29991
C     WARNING ABOUT DUPLICATE IDTS
  248 WRITE(KERRINT,737)
      KERR=KERR+1
C         LAST TRG CARD
```

```
                  25  IF(IFLAG.EQ.1HA)  GO TO 26                                    MAP  256
                      IF(IFLAG.EQ.1HT)  GO TO 26                                    MAP  257
                      I=I+1                                                         MAP  258
                      GO TO 2                                                       MAP  259
   30             C  TABLE  VERTICAL                                               MAP  260
                  26  IF(.NOT.LOG) GO TO 2                                         MAP  261
                      WRITE(IPEN,750)                                               MAP  262
                      I=.NOT.LOG                                                    MAP  263
                      WRITE(IPEN,*)                                                 MAP  264
   240            C  PLOT THE VERTICAL TABLE LINES                                 MAP  265
                      IF(X.GT.11.5) X=11.5                                          MAP  266
                      IF(X.LT.1.5) X=1.5                                            MAP  267
                      GO TO 2                                                       MAP  268
                  C**************** SET UP AXIS FOR IMAGE                          MAP  269
    5             2222  WRITE(IPEN,*) 'PA',IF,IA,',',L(1),',',L(2),XLOC,YLOC,PHCORR,  MAP  270
                     1          ',',L(3),',',L(4),5)                                MAP  271
                      IMAGE=.TRUE.                                                  MAP  272
                      GO TO '(',I2,',',I2,',',I2,',',I2,',',I2,',',I2,',',I2,')',(212,22,242,248,312,322,342,348)  MAP  273
                  C**************                                                   MAP  274
   305            C  ***  F FORMAT (AF) ITEM *                                     MAP  275
                     241  ITEM=MIN(L(1),L(2))                                     MAP  276
                  C  WRITE THE ALPHA STRING ITEM                                   MAP  277
                      WRITE(IPEN,*)I,',S',ITEM                                    MAP  278
                      IF(ITEM.EQ.0) GO TO 2                                       MAP  279
   310                ITEM=0                                                       MAP  280
                  C                                                               MAP  281
                  C  HEAD FIELD OF ALL FIELDS OF ONE LEVEL                        MAP  282
                  C                                                               MAP  283
                  C  HEAD FIELD OF GROUP                                          MAP  284
   315                ASSIGN 331 TO IAA(1)                                         MAP  285
                  C     WRITE HEAD(S) OF THE FIELDS FOUND                         MAP  286
                      WRITE(IPEN,*)I,',15)                                        MAP  287
                      WRITE(IPEN,*)I,',16)                                        MAP  288
                      GVNFLE=.FALSE.                                              MAP  289
   320                I=1                                                          MAP  290
                     300 ASSIGN 3 TO IAA(1)                                       MAP  291
                      GO TO(                                                      MAP  292
                      HEAD(I)=0 )IF(LA.EQ.L(1).AND.L(2).EQ.0)XLOC,YLOC,PHCORR,    MAP  293
                     1(LL(J),J=1,5)                                               MAP  294
   325                IF(I.EQ.1.AND.L(1).EQ.0) GO TO 2                             MAP  295
                  C     CLOSE OUT THE HEAD AND LABEL                              MAP  296
                      WRITE(IPEN,*)                                               MAP  297
                  C     WRITE FIRST FIELD OF THE GROUP                            MAP  298
                      GO TO 3                                                     MAP  299
   330            C  *** FIELD FORMAT (AF) ITEM *                                 MAP  300
                      IF(I.GT.1) GO TO 2                                          MAP  301
                      IF(XLOC.LT.1.5.AND.XLOC.NE.0.) XLOC=1.5                     MAP  302
                      IF(YLOC.LT.1.5.AND.YLOC.NE.0.) YLOC=1.5                     MAP  303
                      IF(PHCORR.LT.1.5.AND.PHCORR.NE.0.) PHCORR=1.5               MAP  304
   335                                                                            MAP  305
                      IF(PHCORR.GT.0.) GO TO 2                                    MAP  306
                      IF(L(1).EQ.0.AND.L(2).EQ.0) GO TO 2                         MAP  307
                     3  I=1                                                       MAP  308
                      IF(.NOT.IMAGE) WRITE(IPEN,*)I,',',IA,',',L(1),',',L(2),XLOC,YLOC,PHCORR,  MAP  309
                     1          ',',L(3),',',L(4),5)                             MAP  310
   340                IMAGE=.FALSE.                                                MAP  311
                  C  WRITE THE ALPHA STRING ITEM                                  MAP  312
                      WRITE(IPEN,*)I,',S',ITEM                                    MAP  313
```

AD-A099 335 CONSTRUCTION ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL F/G 20/1
BLAST NOISE PREDICTION, VOLUME II. BNOISE 3.2 COMPUTER PROGRAM --ETC(
MAR 81 L L LITTLE, V I PAWLOWSKA, D L EFFLAND
UNCLASSIFIED CERL-TR-N-98-VOL-2 NL



```
      GO TO 345
C        DIFF COORDS
C     DUP ID, DIFF. COORDINATES
  344 WRITE(KPRINT,754)
      KERR=KERR+1
      LINES=LINES+1
      IF(OVRFL)GO TO 345
C        GENERATED ID
      ID=SHIFT(-I,42)
      WRITE(KPRINT,755) ID
      LINES=LINES+1
      GO TO 343
C DUP. COORDS;WARNING,BUT CONSIDERED SEPARATE FOR TABLE
  345 CONTINUE
      DO 346 J=1,NTD
      IF(XLOC.NE.FCORDS(J,1))GO TO 346
      IF(YLOC.EQ.FCORDS(J,2))GO TO 347
  346 CONTINUE
      GO TO 350
  347 IF(IMAGE)GO TO 348
      ASSIGN 348 TO KPRNTT
      GO TO 29991
  348 WRITE(KPRINT,737)
      KERR=KERR+1
      LINES=LINES+1
  350 CONTINUE
C
C READ FIRING PT. DEF. CARDS
C
      ASSIGN 401 TO HDRRTN
  400 READ(IN1,603)IFLAG,(NUL(J),J=1,17),ITYPE,DAY,DARK,MIN,MAX,IDT,
     1KFLAG,HGT,(NUL(J),J=18,56)
      IF(EOF(IN1).NE.0.)GO TO 399
C     COUNT MORE DATA BASE CARDS
      NCARDS=NCARDS+1
C -0(BLANK) TO 0 FOR PRINTING
      IF(ITYPE.EQ.0)ITYPE=0
      IF(DAY.EQ.0.)DAY=0.
      IF(DARK.EQ.0.)DARK=0.
      IF(MIN.EQ.0)MIN=0
      IF(MAX.EQ.0)MAX=0
      IF(KFLAG.EQ.0)KFLAG=0
      IF(IDT.EQ.0)IDT=0
      IF(HGT.EQ.0.)HGT=0.
C
      IF(PRNT.AND.LINES.GE.NUMLIN)GO TO 99991
  401 CONTINUE
      IF(PRNT)WRITE(KPRINT,718)IFLAG,(NUL(J),J=1,17),ITYPE,DAY,DARK,MIN,
     1MAX,IDT,KFLAG,HGT,(NUL(J),J=18,56)
      LINES=LINES+1
      IMAGE=PRNT
C CHECK BLANK FIELDS
      DO 405 J=1,49
      IF(NUL(J).NE.IBLNK)GO TO 406
  405 CONTINUE
      GO TO 409
C DATA IN BLANK FIELD
```

```
  406   IF(.NOT. L01) GO TO 408
        IF(IMAGE)GO TO 407                                          MAP  418
        ASSIGN 407 TO KPRNTD                                        MAP  419
        GO TO 49991                                                 MAP  420
C       IF EXTRANEOUS DATA FLAG NOT ZERO,PRINT ERROR MESSAGE
  407   IF(L01)WRITE(KPRINT,735) NOCOLS(J)                          MAP  421
        LINES=LINES+1
  408   KERR=KERR+1                                                 MAP  422
C GUN TYPE                                                          MAP  424
  409 DO 410 IG=1,NTYPES                                            MAP  425
        IF(ITYPE.EQ.IDGUN(IG))GO TO 415                             MAP  426
  410 CONTINUE                                                      MAP  427
C UNDEFINED GUN TYPE                                                MAP  428
        IF(IMAGE)GO TO 411                                          MAP  429
        ASSIGN 411 TO KPRNTD                                        MAP  430
        GO TO 49991                                                 MAP  431
  411   WRITE(KPRINT,727)ITYPE,ID                                   MAP  432
        KERR=KERR+1                                                 MAP  433
        LINES=LINES+1                                               MAP  434
        IG=0                                                        MAP  435
  415 CONTINUE                                                      MAP  436
C FIRINGS                                                           MAP  437
        IF(DAY.LT.0..OR.DARK.LT.0.)GO TO 420                        MAP  438
        SHOTS=DAY+DARK                                              MAP  439
        IF(DUP)GO TO 419                                            MAP  440
        DAYN=DAYN+DAY                                               MAP  441
        DARKN=DARKN+DARK                                            MAP  442
  419 IF(SHOTS.GT.0.)GO TO 430                                      MAP  443
  420 SHOTS=0.                                                      MAP  444
        IF(IMAGE)GO TO 421                                          MAP  445
        ASSIGN 421 TO KPRNTD                                        MAP  446
        GO TO 49991                                                 MAP  447
C       NUMBER OF FIRINGS<=0
  421   WRITE(KPRINT,739)ID                                         MAP  448
        KERR=KERR+1                                                 MAP  449
        LINES=LINES+1                                               MAP  450
C CHARGE                                                            MAP  451
  430 IF(MIN.LT.NSML)NSML=MIN                                       MAP  452
        IF(MIN.LE.0.OR.MIN.GE.NUMCHG)GO TO 434                      MAP  453
        IF(IG.EQ.0)GO TO 440                                        MAP  454
C FIRST ELEMENT IN CHARGE=TARGET CHARGE,SO OFFSET BY 1              MAP  455
        CHG=CHARGE(MIN+1,IG)                                        MAP  456
        IF(CHG.LE.0.)GO TO 434                                      MAP  457
        IF(CHG.LT.CHSML)CHSML=CHG                                   MAP  458
        GO TO 440                                                   MAP  459
C INVALID CHARGE                                                    MAP  460
  434 IF(IMAGE)GO TO 435                                            MAP  461
        ASSIGN 435 TO KPRNTD                                        MAP  462
        GO TO 49991                                                 MAP  463
  435 KERR=KERR+1                                                   MAP  464
        IF(MIN.GT.0)GO TO 436                                       MAP  465
        NEG=NEG+1                                                   MAP  466
        GO TO 440                                                   MAP  467
C       CHARGE SIZE NO GOOD
  436   WRITE(KPRINT,740)ID                                         MAP  468
        LINES=LINES+1                                               MAP  469
  440 CHG=0.                                                        MAP  470
```

```
                IF(MAX.GT.MLRG)MLRG=MAX                                 MAP  471
515             IF(MAX.LE.0.OR.MAX.GE.NUMCHG)GO TO 444                  MAP  472
                IF(IG.EQ.0)GO TO 446                                    MAP  473
                CHG=CHANGE(MAX+1,IG)                                    MAP  474
                IF(CHG.LE.0.)GO TO 444                                  MAP  475
                IF(CHG.GT.CHLRG)CHLRG=CHG                               MAP  476
520             IF(.NOT.DUP) CHCUMD=CHCUMD+CHG*DAY                      MAP  477
                IF(.NOT. DUP) CHCUMN=CHCUMN+CHG*DARK
                GO TO 446                                               MAP  478
              C INVALID                                                 MAP  479
              444 IF(IMAGE)GO TO 445                                    MAP  480
525             ASSIGN 445 TO KPRNTD                                    MAP  481
                GO TO 9999                                              MAP  482
              445 KERR=KERR+1                                           MAP  483
                CHG=0.                                                  MAP  484
                IF(MAX.GT.0)GO TO 448                                   MAP  485
530             NEG=NEG+1                                               MAP  486
                GO TO 446                                               MAP  487
              448 WRITE(KPRINT,740)ID                                   MAP  488
                LINES=LINES+1                                           MAP  489
              446 IF(MIN.LE.MAX)GO TO 450                               MAP  490
535             IF(IMAGE)GO TO 447                                      MAP  491
                ASSIGN 447 TO KPRNTD                                    MAP  492
                GO TO 9999                                              MAP  493
              447 WRITE(KPRINT,741)ID                                   MAP  494
                KERR=KERR+1                                             MAP  495
540             LINES=LINES+1                                           MAP  496
              C HIT FLAG,TARGET ID                                      MAP  497
              C HIT FLAG MUST BE SET IF IDT BLANK                       MAP  498
                450  IF(IDT.NE.IBLNK)GO TO 460                         MAP  499
                IT=0                                                    MAP  500
545             IF(HFLAG.EQ.1)GO TO 470                                 MAP  501
                IF(IMAGE)GO TO 451                                      MAP  502
                ASSIGN 451 TO KPRNTD                                    MAP  503
                GO TO 9999                                              MAP  504
              C     BLANK TARGET ID
550           451 WRITE(KPRINT,728)ID                                   MAP  505
                KERR=KERR+1                                             MAP  506
                LINES=LINES+1                                           MAP  507
                GO TO 470                                               MAP  508
              C     FIND TARGET GIVEN IN TARGET ID TABLE
555           460 DO 465 IT=1,NTAR                                      MAP  509
                IF(IDT.EQ.IDTRG(IT))GO TO 468                           MAP  510
              465 CONTINUE                                              MAP  511
              C UNDEFINED TARGET ID                                     MAP  512
                IF (IMAGE)GO TO 467                                     MAP  513
560             ASSIGN 467 TO KPRNTD                                    MAP  514
                GO TO 9999                                              MAP  515
              467 WRITE(KPRINT,722)IDT,ID                               MAP  516
                KERR=KERR+1                                             MAP  517
                LINES=LINES+1                                           MAP  518
565             IT=0                                                    MAP  519
                GO TO 470                                               MAP  520
              C VALID TARGET CHANGE?                                    MAP  521
              468 IF(IG.LE.0)GO TO 470                                  MAP  522
                IF(CHG=0.
570             IF(HFLAG .EQ. 1) GO TO 470
```

```
                TCHG=CHARGE(1,IG)                                       MAP  523
                IF(TCHG.GT.0)GO TO 475                                  MAP  524
                TCHG=0.                                                 MAP  525
575
                IF(IMAGE)GO TO 469                                      MAP  526
                ASSIGN 469 TO KPRNTD                                    MAP  527
                GO TO 49991                                             MAP  528
580           C     NON POSITIVE TARGET CHARGE
              469 WRITE(KPRINT,757)ITYPE,ID                             MAP  529
                KERR=KERR+1                                             MAP  530
                LINES=LINES+1                                           MAP  531
              C HEIGHT                                                  MAP  532
585           470   IF(.NOT. DUP) CHCUMD=CHCUMD+TCHG*DAY
                    IF(.NOT. DUP) CHCUMN=CHCUMN+TCHG*DARK
                    IF(ABS(HGT).GT.999.)GO TO 475
                    IF(HGT.LT.HBEL)HBEL=HGT                             MAP  534
                    IF(HGT.GT.HABV)HABV=HGT                             MAP  535
590                 GO TO 480                                           MAP  536
              475 IF(IMAGE)GO TO 477                                    MAP  537
                    ASSIGN 477 TO KPRNTD                                MAP  538
                    GO TO 49991                                         MAP  539
              C     LARGE HEIGHT VALUE IN DEF. CARD FOR FIRING PT.
595           477 WRITE(KPRINT,742)ID                                   MAP  540
                KERR=KERR+1                                             MAP  541
                LINES=LINES+1                                           MAP  542
              C XREF TABLE ENTRIES                                      MAP  543
              480 IF(SHOTS.LE.0..OR.DUP)GO TO 490                       MAP  544
600             IF(IT.LE.0)GO TO 487                                    MAP  545
                IF(XTF.LE.0.OR.IFP.LE.0)GO TO 485                       MAP  546
              C TARGET X FIRING PT -- FIRINGS                           MAP  547
                TXFPT(IT,IFP)=TXFPT(IT,IFP)+SHOTS                       MAP  548
              C TARGETS X GUN TYPES -- FIRINGS*TARGET CHARGE            MAP  549
605           485 IF(IG.LE.0)GO TO 490                                  MAP  550
                IF(XTG.LE.0)GO TO 487                                   MAP  551
                TXGT(IT,IG)=TXGT(IT,IG)+ TCHG        *SHOTS             MAP  552
              C GUN TYPES X FIRING PT -- FIRINGS*CHARGE                 MAP  553
              487 IF(XGF.LE.0.OR.IFP.LE.0)GO TO 490                     MAP  554
610             GTXFPT(IG,IFP)=GTXFPT(IG,IFP)+CHG*SHOTS                 MAP  555
              C       LAST DEF CARD?                                    MAP  556
              490 IF(IFLAG.NE.1H*)GO TO 400                             MAP  557
              C     IF NEGATIVE CHARGES---WRITE ERROR MESSAGE
                IF(NEG.GT.0)WRITE(6,756)NEG,ID                          MAP  558
615             LINES=LINES+2                                           MAP  559
              C     CHECK FOR OVERFLOW
                IF(I.GE.NUMFPT)GO TO 491                                MAP  560
                I=I+1                                                   MAP  561
                GO TO 300                                               MAP  562
620           C TABLE OVERFLOW                                          MAP  563
              491 IF(OVRFL)GO TO 300                                    MAP  564
                WRITE(KPRINT,743)NUMFPT                                 MAP  565
                I=NUMFPT+1                                              MAP  566
                OVRFL=.TRUE.                                            MAP  567
625           C FLAG OVERFLOW FOR RELEVANT XREF TABLES                  MAP  568
                IF(XTF.EQ.1)XTF=2                                       MAP  569
                IF(XGF.EQ.1)XGF=2                                       MAP  570
```

```
      C NULL TABLE INDEX                                                    MAP  571
            IFP=0                                                           MAP  572
  630       GO TO 300                                                       MAP  573
      C**************PRINT DEF CARD IMAGE                                   MAP  574
      49991 WRITE(KPRINT,718)IFLAG,(NUL(J),J=1,17),ITYPE,DAY,DARK,MIN,MAX,  MAP  575
           1          INT,KFLAG,HGT,(NUL(J),J=18,56)                      MAP  576
            IMAGE=.TRUE.                                                    MAP  577
  635       GO TO KPRNTD,(407,411,421,435,445,447,451,469)                  MAP  578
      C*************                                                        MAP  579
      C****************** INTERNAL SUBROUTINES ********************        MAP  580
      C HEADER ROUTINE                                                      MAP  581
      99991 CONTINUE                                                        MAP  582
  640       WRITE(KPRINT,607)                                               MAP  583
            WRITE(KPPINT,7161)                                              MAP  584
            LINES=0                                                         MAP  585
            GO TO HDRTN,(301,401)                                           MAP  586
      C MAX,MIN COORDS CHECK                                                MAP  587
  645 99992 CONTINUE                                                        MAP  588
            IF(XLOC.LE.XLRG)GO TO 100                                       MAP  589
            XLRG=XLOC                                                       MAP  590
            YLRG1=YLOC                                                      MAP  591
        100 IF(YLOC.LE.YLRG)GO TO 105                                       MAP  592
  650       XLRG1=XLOC                                                      MAP  593
            YLRG=YLOC                                                       MAP  594
        105 IF(XLOC.GE.XSML)GO TO 115                                       MAP  595
            XSML=XLOC                                                       MAP  596
            YSML1=YLOC                                                      MAP  597
  655   115 IF(YLOC.GE.YSML)GO TO 120                                       MAP  598
            XSML1=XLOC                                                      MAP  599
            YSML=YLOC                                                       MAP  600
        120 GO TO MAXMIN,(231,331)                                          MAP  601
      C*************************************************************       MAP  602
  660 C END OF FIRING PT. CARDS                                             MAP  603
        500 IF(.NOT.OVRFL)I=I-1                                             MAP  604
            NSRCS=MIN0(I,NUMFPT)                                            MAP  605
      C PRINT ERROR/WARNING COUNT                                           MAP  606
            WRITE(KPRINT,730)KERR                                           MAP  607
  665       NERR=NERR+KERR                                                  MAP  608
      C                                                                     MAP  609
      C END OF INPUT PHASE                                                  MAP  610
      C                                                                     MAP  611
      C     TOTAL NUMBER OF DATA BASE ERRORS                                
  670       WRITE(KPRINT,744)NERR                                           MAP  612
            WRITE(KPPINT,607)                                               MAP  613
      C     TOTAL NUMBER OF DATA BASE CARDS                                 
            WRITE(KPRINT,701)NCARDS                                         MAP  614
      C     NUMBER OF GUN TYPES, TARGETS, AND FIRING POINTS                 
  675       WRITE(KPRINT,699)NG                                             MAP  615
            WRITE(KPRINT,702)NT                                             MAP  616
            WRITE(KPRINT,703)NS                                             MAP  617
            IF(NS.EQ.0)GO TO 299                                            MAP  618
            READ(KARD,505) DAYS                                             MAP  619
  680       IF(EOF(KARD).EQ.0.) GO TO 501                                   MAP  620
            DAYS=1.0                                                        MAP  621
            REOF=.TRUE.                                                     MAP  622
        501 CONTINUE                                                        MAP  623
      C     DATA BASE TIME PERIOD                                           
```

```
      WRITE(KPRINT,723)DAYS                                              MAP  624
C     TOTAL OF DAY FIRINGS AND TOTAL NIGHT FIRINGS
      WRITE(KPRINT,704)DAYN,DARKN                                        MAP  625
      DAYN=DAYN/DAYS                                                     MAP  626
      DARKN=DARKN/DAYS                                                   MAP  627
      WRITE(KPRINT,721)DAYN,DARKN                                        MAP  628
      CHCUMD=CHCUMD/DAYS                                                 MAP  629
      CHCUMN=CHCUMN/DAYS
C     CHARGE INFO
      WRITE(KPRINT,713)XSML,XLRG,CHSML,CHLRG,CHCUMD,CHCUMN               MAP  630
      IF(ABS(HABV).NE.0.0.OR.ABS(HBEL).NE.0.0)WRITE(KPRINT,705)HABV,HBEL MAP  631
      WRITE(KPRINT,708)XLRG,XLRG,YLRG1                                   MAP  632
      WRITE(KPRINT,709)YLRG,XLRG1,YLRG                                   MAP  633
      WRITE(KPRINT,710)XSML,XSML,YSML1                                   MAP  634
      WRITE(KPRINT,711)YSML,XSML1,YSML                                   MAP  635
      DX=ABS(XLRG-XSML)                                                  MAP  636
      DY=ABS(YLRG-YSML)                                                  MAP  637
C     READ NUMBER OF GRID SIZES TO BE TESTED
      READ(KARD,604) N                                                   MAP  638
      IF(EOF(KARD).NE.0.)GO TO 510                                       MAP  639
      DO 505 I=1,N                                                       MAP  640
C     READ GRID SIZES
      READ(KARD,605) GRDSZ                                               MAP  641
C     CALCULATE GRID DIMENSION
      DX1=DX/GRDSZ                                                       MAP  642
      DY1=DY/GRDSZ                                                       MAP  643
      WRITE(KPRINT,712)GRDSZ,DX1,DY1                                     MAP  644
  505 CONTINUE                                                           MAP  645
  510 CONTINUE                                                           MAP  646
C                                                                        MAP  647
C XREF TABLES                                                            MAP  648
C                                                                        MAP  649
C TARGETS X FIRING PTS                                                   MAP  650
C       ARRAY PROCESSING ORDER                                           MAP  651
C       BY COLUMN                                                        MAP  652
      IJ=1                                                               MAP  653
C       BY ROW                                                           MAP  654
      JI=2                                                               MAP  655
      IF(ITF.LE.0)GO TO 560                                              MAP  656
      WRITE(KPRINT,607)                                                  MAP  657
      IF(XTF.EQ.2)WRITE(KPRINT,746)                                      MAP  658
      WRITE(KPRINT,745)                                                  MAP  659
      CALL PUTXR(TXFPT,NUMTRG,NUMFPT,NTAR,NSHCS,ADTRG,ADFPT,DAYS,XREF,   MAP  660
     1           IJ)                                                     MAP  661
C TARGETS BY GUN TYPES AND VICE-VERSA                                    MAP  662
  560 IF(ITG.LE.0)GO TO 565                                              MAP  663
      WRITE(KPRINT,607)                                                  MAP  664
      IF(XTG.EQ.2)WRITE(KPRINT,746)                                      MAP  665
      WRITE(KPRINT,748)                                                  MAP  666
      CALL PUTXR(TXGT,NUMTRG,NUMGT,NTAR,NTYPES,ADTRG,ADGUN,DAYS,XREF,IJ)MAP  667
  565 IF(IGT.LE.0)GO TO 570                                              MAP  668
      WRITE(KPRINT,607)                                                  MAP  669
      IF(XTG.EQ.2)WRITE(KPRINT,746)                                      MAP  670
      WRITE(KPRINT,750)                                                  MAP  671
      CALL PUTXR(TXGT,NUMTRG,NUMGT,NTYPES,NTAR,ADGUN,ADTRG,DAYS,XREF,JI)MAP  672
C GUN TYPES X FIRING PT                                                  MAP  673
  570 IF(IGF.LE.0)GO TO 590                                              MAP  674
```

```
      WRITE(KPRINT,607)                                                 MAP  675
      IF(XGF.EQ.2)WRITE(KPRINT,746)                                     MAP  676
      WRITE(KPRINT,752)                                                 MAP  677
745   CALL PUTXR(GTXFPT,NUMGT,NUMFPT,NTYPES,NSHCS,ADGUN,ADFPT,DAYS,XREF,MAP  678
     1           IJ)                                                    MAP  679
  590 CONTINUE                                                          MAP  680
C     COMPUTE TIME IN MAP
      CALL SECOND(T99)                                                  MAP  681
750   T99=T99-T100                                                      MAP  682
      WRITE(KPRINT,900)T99                                              MAP  683
      RETURN                                                            MAP  684
C EOF EXITS                                                             MAP  685
  299 CONTINUE                                                          MAP  686
755   C TARGET CARDS                                                    MAP  687
      WRITE(KPRINT,719)                                                 MAP  688
      STOP                                                              MAP  689
  399 CONTINUE                                                          MAP  690
      C FIRING PT. CARDS                                                MAP  691
760   WRITE(KPRINT,720)                                                 MAP  692
      STOP                                                              MAP  693
C      GUN TABLE
  499 WRITE(KPRINT,729)
      STOP
765   600  FORMAT(6I1)                                                  MAP  697
  601 FORMAT(A1,A1,A3,A1,3F6.0,48A1)                                    MAP  698
  603 FORMAT(18A1,  A2,F4.0,F4.0,I2,I2,A3,I1,F5.0,39A1)                 MAP  699
  604 FORMAT (I2)                                                       MAP  700
  605 FORMAT(F10.0)                                                     MAP  701
770   607 FORMAT(1H1)                                                   MAP  702
  609 FORMAT(1X,A2,11F7.0/3X,2A10/A1,2X,F6.2,14F5.2)
  699 FORMAT(/T15,*NUMBER OF GUN TYPES READ IS *,I5)                    MAP  704
  700 FORMAT(1H1,///,T15,*.....     MAP OF SOURCE POINTS     .....*)    MAP  705
  701 FORMAT(//,T15,*NUMBER OF DATA BASE CARD IMAGES READ IS *,I5)      MAP  706
775   702 FORMAT(/,T15,*NUMBER OF TARGETS READ IS *,I5)                 MAP  707
  703 FORMAT(/,T15,*NUMBER OF SOURCES READ IS *,I5)                     MAP  708
  704 FORMAT(/,T15,*TOTAL DAY FIRINGS IS   *,F10.2,                     MAP  709
     1/,T15,*TOTAL NIGHT FIRINGS IS *,F10.2)                            MAP  710
  705 FORMAT(/,T15,*MAXIMUM HEIGHT IS *,F10.2,//,T15,*MAXIMUM DEPTH IS *,MAP  711
780  1F10.2,/)                                                          MAP  712
  708 FORMAT(/,T15,*MAXIMUM X IS *,F10.1,* IN PAIR  (*,F10.1,* , *,F10.1MAP  713
     1,* )*)                                                            MAP  714
  709 FORMAT(/,T15,*MAXIMUM Y IS *,F10.1,* IN PAIR  (*,F10.1,* , *,F10.1MAP  715
     1,* )*)                                                            MAP  716
785   710 FORMAT(/,T15,*MINIMUM X IS *,F10.1,* IN PAIR  (*,F10.1,* , *,F10.1MAP  717
     1,* )*)                                                            MAP  718
  711 FORMAT(/,T15,*MINIMUM Y IS *,F10.1,* IN PAIR  (*,F10.1,* , *,F10.1MAP  719
     1,* )*)                                                            MAP  720
  712 FORMAT(//T15,* FOR GRID SIZE*,F8.1,*, GRID DIMENSIONS =*,F7.1,    MAP  721
790  1* X *,F7.1)                                                       MAP  722
  713 FORMAT(/T15,*MINIMUM CHARGE NUMBER*,I5/T15,*MAXIMUM CHARGE NUMBER*MAP  723
     1,I5//                                                             MAP  724
     2T15,*MINIMUM CHARGE WEIGHT*,F9.1,* LBS*/T15,*MAXIMUM CHARGE WEIGHTMAP  725
     3*,F9.1,* LBS*//                                                   MAP  726
795  4 T15,*TOTAL DAY CHARGE WEIGHT PER DAY*,2X,F10.1,* LBS*/           MAP  727
     5 T15,*TOTAL NIGHT CHARGE WEIGHT PER DAY*,F10.1,* LBS*)
  714 FORMAT(//,T15,*.....     TARGET CARDS     .....*,//T10,*FLAG*,2X, MAP  728
     1*  IO *,2X,*   X   *,2X,*   Y   *,4X,*HT CORR*//)                 MAP  729
```

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      715  FORMAT(T12,A1,2X,A1,A3,A1,1X,3(2X,F7.0),48A1)                    MAP  730
800   716  FORMAT(1H1/                                                      MAP  731
     1          T15,*.....     FIRING PT. SOURCE AND DEFINITION CARDS      MAP  732
     1  .....*//)                                                          MAP  733
     7161 FORMAT(                                                         MAP  734
     1   T3,*FLAG*,2X,*  ID *,2X,*   X    *,2X,*   Y    *,2X,*HT CORR*,  MAP  735
805  1 3X,*G TYPE*,                                                       MAP  736
     12X,*DAY NO*,2X,*NIGHT NO*,2X,*MIN*,2X,*MAX*,2X,*T ID*,2X,*FLAG*,    MAP  737
     12X,*HGT*,                                                          MAP  738
     2,//)                                                               MAP  739
      718 FORMAT                                                          MAP  740
810   1     (T5,A1,17A1,                                                  MAP  741
     1             22X,A2,4X,F5.0,3X,F5.0,4X,I2,3X,I2,3X,A3,3X,I2,F7.1,  MAP  742
     2              39A1)                                                MAP  743
      719  FORMAT(///,T3 ,*]]]]]      ERROR -- EOF ENCOUNTERED WHILE READING TMAP  744
     1ARGET CARDS*)                                                       MAP  745
815   720  FORMAT(///,T3 ,*]]]]]      ERROR -- SOURCE DEFINITION CARD ENDS IMPMAP  746
     1ROPERLY (WITH A EOF)     .....*,//)                                 MAP  747
      721  FORMAT(/,T15,*TOTAL PER DAY DAY FIRINGS IS   *,F10.2,          MAP  748
     1/,T15,*TOTAL PER DAY NIGHT FIRINGS IS *,F10.2)                      MAP  749
      722 FORMAT(T3,*.....      ERROR -- UNDEFINED TARGET ID*,A5,          MAP  750
820   1* FOR FIRING PT.*,A3)                                              MAP  751
      723 FORMAT(//T15,*.....      DATA BASE TIME PERIOD:*,F5.0,* DAY(S)*)  MAP  752
      724 FORMAT(//T15,*.....      GUN TYPE CARDS      .....*//T10,*FLAG*,2X, MAP  753
     1*G TYPE*,2X,*T CHARGE*,40X,*PROPELLANT WEIGHTS*//)                  MAP  754
      725 FORMAT(T12,A1,4X,A3,3X,F9.2,2X,10F9.2)                          MAP  755
825   726 FORMAT(  T3,*]]]]]      ERROR -- GUN TYPES EXCEED TABLE LIMIT IN MAMAP  756
     1P;ONLY FIRST*,I3,* TYPES USED FOR SUBSEQUENT CROSS-CHECKING*)       MAP  757
      727 FORMAT(  T3,*]]]]]      ERROR -- UNDEFINED GUN     ID*,A5,       MAP  758
     1* FOR FIRING PT.*,A3)                                              MAP  759
      728 FORMAT(  T3,*]]]]]      ERROR   -- BLANK TARGET ID, HIT FLAG NOT SEMAP  760
830   1T: FIRING PT.*,A3)                                                 MAP  761
      729 FORMAT(//T3,*]]]]]      ERROR -- EOF ENCOUNTERED WHILE READING GUN MAP  762
     1 TYPE DEFINITION CARDS*//)                                          MAP  763
      730 FORMAT(/T3,*.....*,I4,* ERROR/WARNING CONDITIONS DETECTED FOR THISMAP  764
     1 CARD TYPE*)                                                        MAP  765
835   731 FORMAT(T3,*.....      ERROR -- NO POSITIVE CHARGE FOR GUN TYPE*)  MAP  766
      732 FORMAT(T3,*.....      ERROR -- *,I3,* NEG. CHARGES ENCOUNTERED*)  MAP  767
      733 FORMAT(T3,*.....      WARNING -- *,I3,* CHARGES LARGER THAN*,F4.0, MAP  768
     1* LBS*)                                                             MAP  769
      734 FORMAT(T3,*.....      ERROR -- DUPLICATE ID;FIRST OCCURRENCE USED FMAP  770
840   1OR TABLE*)                                                         MAP  771
      735 FORMAT(T3,*.....      WARNING -- EXTRANEOUS DATA STARTING IN CARD CMAP  772
     1OL.*,                                                               MAP  773
     1I3,*) CHECK ALL FIELDS*)                                            MAP  774
      736 FORMAT(T3,*.....      ERROR -- HEIGHT CORRECTION DATA OUT OF RANGE*MAP  775
845   1)                                                                  MAP  776
      737 FORMAT(T3,*.....      WARNING -- DUP. POINT: IDENTICAL COORDINATES*MAP  777
     1)                                                                   MAP  778
      738 FORMAT(/T3,*.....      ERROR -- TARGETS EXCEED TABLE LIMIT IN MAP; MAP  779
     1ONLY FIRST*,I3,  USED FOR SUBSEQUENT CROSS-CHECKING*/)              MAP  780
850   739 FORMAT(T3,*.....      ERROR -- FIRINGS DATA NEGATIVE OR BOTH ZERO OMAP  781
     1N DEF. CARD FOR FIRING PT.*,A3)                                     MAP  782
      740 FORMAT(T3,*.....      ERROR -- INVALID CHARGE NO.:NONPOSITIVE OR NMAP  783
     1 GUN TABLE ENTRY; DEF CARD FOR FIRING PT. *,A3)                     MAP  784
      741 FORMAT(T3,*.....      ERROR -- HIT GREATER THAN MAX CHARGE NO.; DEFMAP  785
855   1 CARD FOR FIRING PT.*,A3)                                          MAP  786
```

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                742 FORMAT(T5,*.....    WARNING -- LARGE WEIGHT VALUE IN DEF. CARD FORMAP  787
                   1FIRING PT. *,A3)                                                MAP  788
                743 FORMAT(/T3,*.....    ERROR -- FIRING PTS. EXCEED TABLE LIMIT IN MAMAP  789
                   1P; ONLY FIRST*,I3,* USED FOR SUBSEQUENT CROSS CHECKING*/)       MAP  790
      860       744 FORMAT(//T3,*..... END OF INPUT PHASE:*,I5,* ERROR/WARNING CONDITIMAP  791
                   1ONS DETECTED*)                                                  MAP  792
                745 FORMAT(/1X,*CROSS-REFERENCE: TARGETS BY FIRING POINTS ; DAILY FIRIMAP  793
                   1NGS*////                                                        MAP  794
                   1      1X,*TARGET ID*/10X,7(*FPT ID          *))                MAP  795
      865       746 FORMAT(/1X,*.....     WARNING -- DUE TO PREVIOUS TABLE OVERFLOW, TMAP  796
                   1HE FOLLOWING CROSS-REFERENCE TABLE IS INCOMPLETE*/)             MAP  797
                748  FORMAT(/1X,*CROSS-REFERENCE: TARGETS BY GUN TYPES;  DAILY *
                   1,*PROJECTILE CHARGE WEIGHT (LBS)*////
                   1              1X,*TARGET ID*/10X,7(*GUN ID          *))        MAP  800
      870       750   FORMAT(/1X,*CROSS-REFERENCE: GUN TYPES BY TARGETS;  DAILY *
                   1,*PROJECTILE CHARGE WEIGHT (LBS)*////
                   1              1X,*GUN ID*/10X,7(*TAR ID          * ))          MAP  803
                752 FORMAT                                                          MAP  804
                   1(/1X,*CROSS-REFERENCE: GUN TYPES BY FIRING POINTS; DAILY *
      875          2,*PROPELLENT CHARGE WEIGHT (LBS)*////
                   1                    1X,*GUN ID*/10X,7(*FPT ID          *))  MAP  807
                753 FORMAT(T3,*.....     ERROR -- DUPLICATE ID,COORDINATES; DEF CARDS MAP  808
                   1CHECKED FOR ERRORS,BUT OTHERWISE IGNORED*)                      MAP  809
                754 FORMAT(T3,*.....     ERROR -- DUPLICATE ID,DIFFERENT COORDINATES; MAP  810
      880          1TREATED AS SEPARATE ENTRY,*)                                    MAP  811
                755 FORMAT(T24,*GENERATED ID = *,A3)                                MAP  812
                756 FORMAT(/T3,*.....     ERROR --*,I3,* NONPOSITIVE CHARGE NOS. ENCOUMAP  813
                   1NTERED FOR FIRING PT. *,A3)                                     MAP  814
                757 FORMAT(T3,*.....     ERROR -- NONPOSITIVE TARGET CHARGE IN TABLE FMAP  815
      885          1OR GUN *,A3,* ;DEF CARD FOR FIRING PT.*,A3)                     MAP  816
                899 FORMAT(///T3,*)))))     ERROR -- MISSING DATA BASE FILE; EXECUTIONMAP  817
                   1 ABORTED*)                                                      MAP  818
                900  FORMAT(//,T15,*.....     TIME FOR MAPPING SUBPROGRAM IS *,F8.3,  MAP  819
                   1* SECONDS*)                                                     MAP  820
      890           END                                                           MAP  821
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
1 MAP 1 752

VARIABLES	SN	TYPE	RELOCATION								
4335 ADEPT		REAL	ARRAY	REFS	5	12	727	745			
4171 ADGUN		REAL	ARRAY	REFS	8	12	734	739	745		
4253 ADTRG		REAL	ARRAY	REFS	F	12	727	734	739		
2011 BIGCHG		REAL		REFS	137	150	DEFINED	30			
5011 CHARGE		REAL	ARRAY	REFS	5	121	123	130	137	143	161
					498	517	571	DEFINED	111	121	
4072 CHGVAL		REAL		REFS	520	585	691	694	DEFINED	55	520
					585	691					
4073 CHGVAN		REAL		REFS	521	586	692	694	DEFINED	56	521
					586	692					
0 CHECK		LOGICAL		REFS	17	1F					

VARIABLES	SN	TYPE	RELOCATABLE							
4147	CMG	REAL		REFS	499	2*500	518	2*519	520	521	616
				DEFINED	498	513	517	528			
4070	CMLRG	REAL		REFS	519	694	DEFINED	53	519		
4071	CMSML	REAL		REFS	500	694	DEFINED	54	500		
21612	CONTUR	REAL	ARRAY	REFS	15	192	DEFINED	111			
4136	DARR	REAL		REFS	438	447	479	480	483	521	586
					632	DEFINED	430	436			
4075	DARRN	REAL		REFS	483	687	689	690	DEFINED	57	483
					689						
4135	DAY	REAL		REFS	437	447	479	480	482	520	585
					632	DEFINED	430	437			
4074	DAYN	REAL		REFS	482	687	688	690	DEFINED	57	482
					688						
4157	DAYS	REAL		REFS	685	688	689	691	692	727	734
					739	745	DEFINED	679	681		
4051	DUP	LOGICAL		REFS	22	481	520	521	585	586	599
				DEFINED	368	398					
4160	DX	REAL		REFS	709	DEFINED	700				
4164	DX1	REAL		REFS	711	DEFINED	709				
4161	DY	REAL		REFS	710	DEFINED	701				
4165	DY1	REAL		REFS	711	DEFINED	710				
6305	FCORDS	REAL	ARRAY	REFS	8	2*391	415	416	DEFINED	372	373
					384	385					
4163	GRDSZ	REAL		REFS	709	710	711	DEFINED	707		
0	GTxFPT	REAL	ARRAY GRID	REFS	7	8	610	745	DEFINED	96	618
4102	HABV	REAL		REFS	589	2*695	DEFINED	60	589		
4103	HBEL	REAL		REFS	588	2*695	DEFINED	60	588		
4056	HDRRTN	INTEGER		REFS	26	643	DEFINED	321	429		
4143	HGT	REAL		REFS	443	447	587	2*588	2*589	632	
				DEFINED	430	443					
4104	I	INTEGER		REFS	69	94	96	101	5*111	2*119	2*121
					2*123	130	137	2*143	153	154	155	2*161
					170	171	183	249	255	261	262	263
					287	288	306	369	376	382	383	384
					385	408	617	618	661	662		
				DEFINED	68	93	95	100	110	166	171	
					176	209	271	288	293	320	399	618
					623	661	705					
2002	IBLNK	INTEGER		REFS	228	343	453	543	DEFINED	27		
4122	ID	INTEGER		REFS	157	218	223	250	257	261	300	
					331	338	371	378	382	409	473	490
					511	532	538	550	562	581	595	618
				DEFINED	155	210	219	323	331	408		
4335	IDFPT	INTEGER	ARRAY	REFS	8	12	378	DEFINED	371	382		
4171	IDGUN	INTEGER	ARRAY	REFS	6	12	119	123	143	155	157	
					161	192	467	DEFINED	111	119		
4141	IDT	INTEGER		REFS	442	447	543	556	562	632		
				DEFINED	430	442						
4253	IDTRG	INTEGER	ARRAY	REFS	6	12	257	556	DEFINED	250	261	
4107	IFLAG	INTEGER		REFS	85	123	143	161	169	223	286	
					300	336	447	612	632	DEFINED	81	111
					210	323	430					
4133	IFP	INTEGER		REFS	601	2*603	609	2*610	DEFINED	370	383	
					597	629						
4145	IG	INTEGER		REFS	467	496	498	516	517	568	571	
					605	2*607	2*610	DEFINED	466	476		
4113	IGF	INTEGER		REFS	89	741	DEFINED	81				

VARIABLES	SN	TYPE	RELOCATION								
4112	IGT	INTEGER		REFS	88	735	DEFINED	81			
4166	IJ	INTEGER		REFS	727	734	745	DEFINED	720		
4047	IMAGE	LOGICAL		REFS	21	142	160	233	240	266	279
					348	356	388	419	458	470	486	503
					524	535	546	559	577	591		
				DEFINED	124	144	162	225	302	340	450
					634						
23170	IN	INTEGER	ARRAY	REFS	16	69	DEFINED	28			
4106	IN1	INTEGER		REFS	113	212	325	432	DEFINED	77	
				I/O REFS	75	111	210	323	430		
4114	IO1	INTEGER		REFS	83	DEFINED	81				
4150	IT	INTEGER		REFS	556	600	2*603	2*607	DEFINED	544	555
					565						
4110	ITF	INTEGER		REFS	87	723	DEFINED	81			
4111	ITG	INTEGER		REFS	88	730	DEFINED	81			
4134	ITYPE	INTEGER		REFS	436	447	467	473	581	632	
				DEFINED	430	436					
4105	IU	INTEGER		REFS	72	77	DEFINED	69	I/O REFS	70	71
4115	J	INTEGER		REFS	94	96	101	2*111	2*121	123	130
					137	143	161	192	210	223	228	236
					257	275	276	300	323	338	343	351
					378	2*391	415	416	2*430	2*447	453	462
					2*632	DEFINED	92	99	2*111	120	123	129
					143	161	192	210	223	227	256	274
					300	323	338	342	377	414	2*430	2*447
					452	2*632						
4167	JI	INTEGER		REFS	739	DEFINED	722				
4123	K	INTEGER		REFS	157	4*192	DEFINED	156	191		
0	KARD	INTEGER	IC	REFS	6	680	704	I/O REFS	81	679	703
				707							
4116	KERR	INTEGER		REFS	133	139	165	197	198	237	244
					270	284	308	309	353	361	394	404
					423	464	474	491	506	527	539	551
					563	582	596	664	665	DEFINED	109	133
					139	165	199	237	244	270	284	310
					353	361	394	404	423	464	474	491
					506	527	539	551	563	582	596	
4142	KFLAG	INTEGER		REFS	441	447	545	570	632			
				DEFINED	430	441						
1	KPRINT	INTEGER	IC	REFS	0	I/O REFS	44	75	107	123	143
					146	148	150	161	164	175	187	192
					197	205	206	223	236	243	269	283
					292	300	308	317	318	338	351	360
					393	403	409	422	447	462	473	490
					511	532	538	550	562	581	595	622
					632	640	641	664	670	671	673	675
					676	677	685	687	690	694	695	696
					697	698	699	711	724	725	726	731
					732	733	736	737	738	742	743	744
					751	756	760	763				
4144	KPRNTO	INTEGER		REFS	635	DEFINED	459	471	487	504	525
					536	547	560	578	592			
4131	KPRNTT	INTEGER		REFS	303	DEFINED	234	241	267	280	349
					357	389	420					
4064	LINES	INTEGER		REFS	336	352	362	395	405	410	424
					445	449	463	475	492	512	533	540
					552	564	583	597	615	DEFINED	49	352

VARIABLES	SN	TYPE	RELOCATION							
				382	395	405	419	424	449	363	475
				496	512	533	542	552	564	583	597
				615	642						
4052	LP1	LOGICAL		REFS	23	232	236	347	351	457	462
				DEFINED	83						
4120	LPS	INTEGER		REFS	138	141	2*150	DEFINED	127	138	
4140	MAX	INTEGER		REFS	440	447	2*514	2*515	517	529	534
				632	DEFINED	438	447				
4125	MAXPTS	INTEGER		REFS	658	DEFINED	203	315			
4137	MIN	INTEGER		REFS	439	447	2*494	2*495	498	507	534
				632	DEFINED	438	439				
4162	N	INTEGER		REFS	705	DEFINED	733				
6057	NAME1	INTEGER	ARRAY	REFS	8	192	DEFINED	111			
21245	NAME2	INTEGER	ARRAY	REFS	8	192	DEFINED	111			
4060	NCARDS	INTEGER		REFS	115	214	327	434	673		
				DEFINED	45	115	214	327	434		
21531	NDCOLS	INTEGER	ARRAY	REFS	14	462	DEFINED	33			
4117	NEG	INTEGER		REFS	132	141	2*148	508	530	2*614	
				DEFINED	126	132	322	508	530		
4065	NERR	INTEGER		REFS	198	309	665	670	DEFINED	50	198
				304	665						
2003	NFILES	INTEGER		REFS	68	DEFINED	28				
4063	NG	INTEGER		REFS	117	675	DEFINED	48	117		
4066	NLRG	INTEGER		REFS	514	694	DEFINED	51	514		
4062	NS	INTEGER		REFS	329	677	678	DEFINED	47	329	
4067	NSML	INTEGER		REFS	494	694	DEFINED	52	494		
4156	NS=CS	INTEGER		REFS	727	745	DEFINED	662			
4061	NT	INTEGER		REFS	216	676	DEFINED	96	216		
4132	NTAB	INTEGER		REFS	555	727	734	739	DEFINED	306	
21447	NTCOLS	INTEGER	ARRAY	REFS	14	236	351	DEFINED	33		
4121	NTD	INTEGER		REFS	156	166	256	271	274	377	399
				414	DEFINED	154	255	376			
4124	NTYPES	INTEGER		REFS	191	466	734	739	745		
				DEFINED	183						
21327	NUL	INTEGER	ARRAY	REFS	14	3*223	228	3*300	3*338	343	2*447
				453	2*632	DEFINED	3*210	3*323	2*430		
2010	NUMCHG	INTEGER		REFS	111	120	123	129	143	161	495
				515	DEFINED	30					
2006	NUMFPT	INTEGER		REFS	92	617	622	623	662	727	745
				DEFINED	30						
2005	NUMGT	INTEGER		REFS	95	99	173	175	176	183	734
				739	745	DEFINED	30				
2007	NUMLIN	INTEGER		REFS	336	345	DEFINED	30			
2004	NUMTRG	INTEGER		REFS	93	100	287	292	293	306	727
				734	739	DEFINED	30				
4046	OVNFL	LOGICAL		REFS	21	174	260	271	291	381	396
				406	621	661	DEFINED	108	177	207	298
				319	624						
4130	PMCORR	REAL		REFS	221	223	2*239	300	334	338	2*355
				DEFINED	210	221	323	334			
4050	POS	LOGICAL		REFS	21	141	146	DEFINED	128	136	
4045	PRNT	LOGICAL		REFS	20	123	124	184	223	225	336
				336	340	445	447	450	DEFINED	85	
1	REED	LOGICAL	DEMOD	REFS	17	18	DEFINED	42			
4044	REOF	LOGICAL		REFS	19	DEFINED	43	642			
4146	SMOIS	REAL		REFS	484	599	603	607	610		
				DEFINED	480	485					

VARIABLES	SN	TYPE	RELOCATION							
4151	TCHG	REAL		REFS	572	585	586	607	DEFINED	569	571
				573							
6141	TCOMDS	REAL	ARRAY	REFS	8	275	276	DEFINED	251	252	262
				263							
0	TXFPT	REAL	ARRAY FT	REFS	5	8	603	727	DEFINED	94	603
7435	TXGT	REAL	ARRAY	REFS	8	607	734	739	DEFINED	101	607
4057	T100	REAL		REFS	39	750					
4170	T99	REAL		REFS	749	750	751	DEFINED	750		
4055	XGF	INTEGER		REFS	25	91	180	609	627	743	
				DEFINED	63	89	180	627			
4126	XLOC	REAL		REFS	219	223	251	262	275	300	332
				336	372	384	391	415	646	647	650
				652	653	656	DEFINED	210	219	323	332
4076	XLRG	REAL		REFS	646	2*696	700	DEFINED	58	647	
4153	XLRG1	REAL		REFS	697	DEFINED	650				
14341	XREF	REAL	ARRAY	REFS	8	727	734	739	745		
4100	XSML	REAL		REFS	652	2*698	700	DEFINED	59	653	
4155	XSML1	REAL		REFS	699	DEFINED	656				
4053	XTF	INTEGER		REFS	25	91	297	601	626	725	
				DEFINED	61	87	297	626			
4054	XTG	INTEGER		REFS	25	98	179	296	606	732	737
				DEFINED	62	88	179	296			
4127	YLOC	REAL		REFS	220	223	252	263	276	300	333
				336	373	385	391	416	648	649	651
				654	655	657	DEFINED	210	220	323	333
4077	YLRG	REAL		REFS	649	2*697	701	DEFINED	58	651	
4152	YLRG1	REAL		REFS	696	DEFINED	648				
4101	YSML	REAL		REFS	655	2*699	701	DEFINED	59	657	
4150	YSML1	REAL		REFS	698	DEFINED	654				

FILE NAMES	MODE			
TAPE6	BUT	WRITES	614	
VARIABLES USED AS FILE NAMES, SEE ABOVE				

EXTERNALS	TYPE	ARGS	REFERENCES					
EOF	REAL	1	72	113	212	325	432	680	704
PUTBB		10	727	734	739	745			
SECOND		1	39	749					

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES			
ABS	REAL	1	INTRIN	587	2*695	700	701
MIN0	INTEGER	0	INTRIN	183	306	662	
SHIFT	NO TYPE	2	INTRIN	408			

STATEMENT LABELS			DEF LINE	REFERENCES		
0	5		73	68		
47	6		77	72		
0	10		94	93		
0	11		96	95		
0	14		97	92		
111	15		98	91		
0	16		101	99	100	
123	21		112	98		
137	50		111	172	174	191
0	55		121	120		
0	58	INACTIVE	132	130		
227	59		136	130		

STATEMENT LABELS		PER LINE REFERENCES				
232	60	128	129	130	134	137
251	65	140	142			
262	70	151	141			
0	75	154	156			
272	76	160	157			
302	77	164	160			
307	80	167	153	159		
315	85	174	176			
332	90	183	169			
0	91	195	191			
372	95	197	184			
1458	100	644	646			
1461	105	652	649			
1466	115	655	652			
1473	120	658	655			
405	200	210	289	291	298	
0	210	229	227			
436	211	232	228			
443	212	236	233	234	303	
451	213	237	232			
453	220	239	230			
461	222	243	240	241	303	
465	230	246	239			
466	231	247	203	658		
475	239	255	249			
0	240	258	256			
512	241	266	257			
516	242	269	266	267	303	
524	245	273	260	264		
533	246	277	274	275		
535	247	279	276			
541	248	283	279	280	303	
545	250	286	253	278		
553	260	291	287			
574	290	300	286			
1676	299	754	212	678		
612	300	321	619	621	630	
636	301	337	321	643		
0	310	344	342			
650	311	347	343			
655	312	351	303	348	349	
665	313	353	347			
667	320	355	345			
675	322	360	303	356	357	
702	330	365	355			
703	331	366	315	658		
713	339	376	369			
0	340	379	377			
731	341	388	378			
735	342	391	303	388	389	
723	343	382	411			
754	344	403	391			
767	345	413	381	386	400	406
776	346	417	414	415		
1000	347	419	416			
1004	348	422	303	419	420	
1011	350	425	374	418		

STATEMENT LABELS			OFF LINE	REFERENCES						
1701	394		758	432						
1912	400		430	612						
1043	401		446	429	643					
0	405		454	452						
1057	406		457	453						
1064	407		462	458	459	635				
1074	408		464	457						
1076	409		466	455						
0	410		468	466						
1107	411		473	470	471	635				
1115	415		477	467						
1125	419		484	481						
1127	420		485	479						
1133	421		490	486	487	635				
1140	430		494	484						
1156	434		503	495	499					
1161	435		506	503	504	635				
1166	436		511	507						
1172	440		513	496	501	509				
1221	444		524	515	518					
1224	445		527	524	525	635				
1235	446		534	516	522	531				
1242	447		538	535	536	635				
1231	448		532	529						
1247	450		543	534						
1256	451		550	546	547	635				
1263	460		555	543						
0	465		557	555						
1273	467		562	559	560					
1301	468		568	556						
1314	469		581	577	578	635				
1321	470		585	545	553	566	568	570	572	
1342	475		591	587						
1345	477		595	591	592					
1352	480		599	590						
1363	485		605	601						
1373	487		609	600	606					
1403	490		612	599	605	609				
1416	491		621	617						
1704	499		763	113						
1475	500		661	325						
1531	501		683	680						
0	505		712	705						
1611	510		713	704						
1626	560		730	723						
1641	565		735	730						
1654	570		741	735						
1667	590		747	741						
2735	600	FMT	765	81						
2737	601	FMT	766	210	323					
2743	603	FMT	767	430						
2751	604	FMT	768	703						
2753	605	FMT	769	679	707					
2755	607	FMT	770	695	640	671	724	741	736	742
2757	609	FMT	771	71	111					
2764	699	FMT	772	675						
2772	700	FMT	773	44						

STATEMENT	LABELS		DEF LINE	REFERENCES						
3001	701	FMT	774	673						
3010	702	FMT	775	676						
3015	703	FMT	776	677						
3022	704	FMT	777	687						
3033	705	FMT	779	695						
3043	708	FMT	781	696						
3053	709	FMT	783	697						
3063	710	FMT	785	698						
3073	711	FMT	787	699						
3103	712	FMT	789	711						
3113	713	FMT	791	694						
3147	714	FMT	797	206						
3163	715	FMT	799	223	300	338				
3170	716	FMT	800	317						
3221	718	FMT	809	447	632					
3231	719	FMT	813	756						
3242	720	FMT	815	760						
3255	721	FMT	817	690						
3270	722	FMT	819	562						
3301	723	FMT	821	685						
3310	724	FMT	822	107						
3325	725	FMT	824	123	143	161				
3331	726	FMT	825	175						
3347	727	FMT	827	473						
3360	728	FMT	829	550						
3371	729	FMT	831	763						
3403	730	FMT	833	197	308	664				
3414	731	FMT	835	146						
3423	732	FMT	836	148						
3432	733	FMT	837	150						
3442	734	FMT	839	164	269					
3453	735	FMT	841	236	351	462				
3466	736	FMT	844	243	360					
3476	737	FMT	846	283	422					
3506	738	FMT	848	292						
3523	739	FMT	850	490						
3536	740	FMT	852	511	532					
3552	741	FMT	854	538						
3564	742	FMT	856	595						
3575	743	FMT	858	622						
3612	744	FMT	860	670						
3623	745	FMT	862	726						
3640	746	FMT	865	725	732	737	743			
3655	748	FMT	867	733						
3674	750	FMT	870	738						
3713	752	FMT	873	744						
3732	753	FMT	877	393						
3746	754	FMT	879	403						
3760	755	FMT	881	409						
3764	756	FMT	882	614						
3776	757	FMT	884	581						
4012	899	FMT	886	75						
4023	900	FMT	888	751						
3201	7161	FMT	803	318	641					
2127	7241	FMT	188	187						
2153	7251	FMT	194	192						
567	29991		300	235	242	268	281	350	358	390	421

```
      SUBROUTINE MAP        74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43       PAGE    24

STATEMENT LABELS                DEF LINE   REFERENCES
 1433  49991                      632        460        472        488        505        526        537        548        561        579
                                             593
 1440  99991                      639        336        445
 1447  99992                      645        246        365

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   31  5         I           68 73        13B                EXT REFS    EXITS
  101  14        J           92 97        10B                NOT INNER
  103  10        I           93 94         2B      INSTACK
  106  11        I.          95 96         2B      INSTACK
  117  16        J           99 101        4B                NOT INNER
  120  16        I          100 101        2B      INSTACK
  154            J          111 111       10B                EXT REFS
  201  55        J          120 121        3B      INSTACK
  224  60        J          129 140        7B      INSTACK
  267  75        K          156 158        2B      INSTACK     EXITS
  344  91        K          191 195       26B                EXT REFS  NOT INNER
  356            J          192 192       10B                EXT REFS
  433  210       J          227 229        2B      INSTACK     EXITS
  502  240       J          256 258        2B      INSTACK     EXITS
  530  246       J          274 277        4B      INSTACK     EXITS
  645  310       J          342 344        2B      INSTACK     EXITS
  720  340       J          377 379        2B      INSTACK     EXITS
  773  346       J          414 417        4B      INSTACK     EXITS
 1054  405       J          452 454        2B      INSTACK     EXITS
 1102  410       IG         466 468        3B      INSTACK     EXITS
 1266  465       IT         555 557        2B      INSTACK     EXITS
 1577  505       I          705 712       12B                EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FT        15000              0 TXFPT  (15000)
       IO            2              0 KARD   (1)                  1 KPRINT (1)
       GRID      15000              0 GTXFPT (15000)
       DEBUG         2              0 CHECK  (1)                  1 REED   (1)

EQUIV CLASSES   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       ADGUN        50              0 IDGUN  (50)
       ADTRG        50              0 IDTRG  (50)
       ADFPT       300              0 IDFPT  (300)

STATISTICS
  PROGRAM LENGTH                 23173B    9851
  CM LABELED COMMON LENGTH       72464B   30004
          66600B CM USED
```

```
      SUBROUTINE READTB                                                 READTB 2
C READS INFORMATION FROM TABLES (FOUND IN TAPE 20) AND MODIFIES IT ACCORDING TO
C THE INVERSION FACTORS (USED BY THE CALLING SUBROUTINE. THE TABLES ARE
C UNDER THE CONDITIONS OF STABLE PERCENT TEMPERATURE INVERSION FACTORS.
      COMMON/I/PARB,PARB1,P                                             READTB 3
      COMMON/PARTI/ P1=1.0,P1=1.2,P1=3
      COMMON/CONST/PI,RPD,TABS                                          READTB 5
      COMMON/PARM/IMAP,PRINT
      LOGICAL IMAP,PRINT,TAB                                            READTB 6
C     COMMON BLOCK TABLE CONTAINS THE TABLES OF PROGRAM TABGEN
C     FOUND IN TAPE 20.
C     OBV=TABLE OF OBS VALUES
C     PERV=TABLE OF PERCENTAGES
C     ENV=TABLE OF ENSEMBLE VALUES
C     CSCF=TABLE OF CHANGE SIZE CORRECTION FACTORS
C     FUN1 AND FUN2 ARE USED IN FI COMPUTATION
C     FTAB IS USED IN F2 COMPUTATION
      COMMON /TABLE/ OBV(301,4,2) , PERV(301,4,2) , ENV(1501)
     1 CSCF(601) ,FUN1(301,4,2),FUN2(301,4,2),FTAB(151,2)
      DATA IN1/20/                                                      READTB 8
      REWIND IN1                                                        READTB 9
C THIS READS THE STANDARD PERCENT TEMPERATURE INVERSION FACTORS FROM TAPE20.
      READ (IN1) PC1,PC2,PC3
C ERROR...OB,PERCENT CURVE TABLES MISSING--PROGRAM ABORTED*
      IF(EOF(IN1).GT.0.0) GO TO 999                                     READTB11
C     L=1 IS DAY
C     L=2 IS NIGHT
C     J=1 FOCUS MAX
C     J=2 FOCUS MEAN
C     J=3 BASE MAX
C     J=4 BASE MEAN
C     J=5 NEG MAX
C     J=6 NEG MEAN
C     J=7 EX NEG MAX
C     J=8 EX NEG MEAN
C     J=9 EX NEG MIN
      DO 20 L=1,2
      DO 20 J=1,9
C READ OB VALUES FORM TAPE 20 INTO ARRAY OBV.
      READ (IN1) (OBV(I,J,L),I=1,301)
20    CONTINUE
C     L=1 IS DAY
C     L=2 IS NIGHT
C     J=1 FOCUS
C     J=2 BASE
C     J=3 NEG
C     J=4 EX NEG
C
      DO 30 L=1,2
      DO 30 J=1,4
C READ PERCENT VALUES FROM TAPE 20 INTO ARRAY PERV.
      READ (IN1) (PERV(I,J,L),I=1,301)
30    CONTINUE
C CSCF=CHANGE SIZE CORRECTION FACTOR.
      READ (IN1) CSCF
C COMPUTE CORRECTION FACTORS FOR THE INVERSION FACTORS. DISTANCE BETWEEN
C SOURCE AND POINT < 2 MILES.  DISTANCE> 10 MILES  2<DISTANCE<10
```

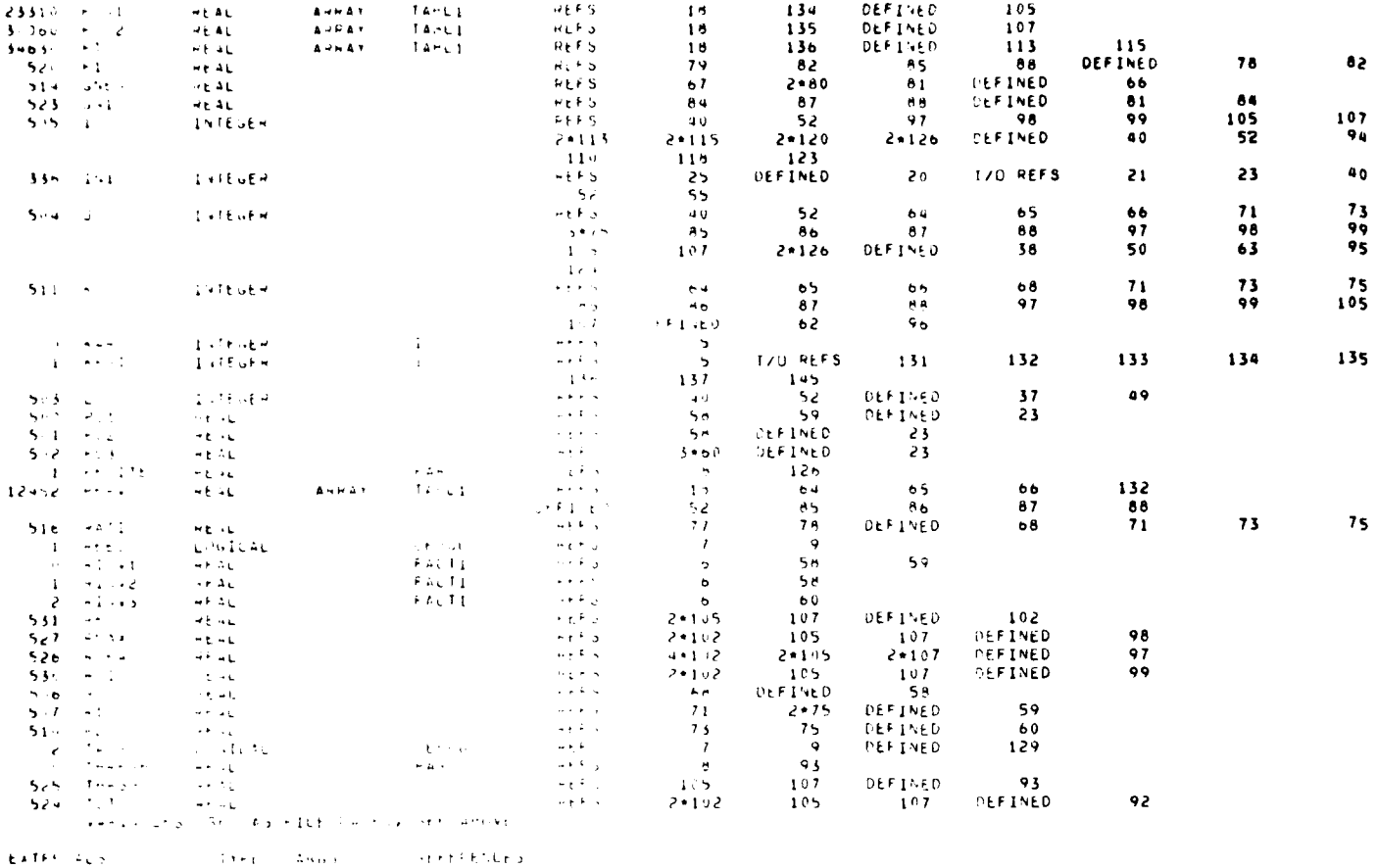
```
                R0=(RINV1+RINV2)/(PC1+PC2)                                      READTB14
                R1=RINV1/PC1                                                    READTB15
 60             R2= ((RINV3-PC3)/2. + PC3) /PC3
      C         CORRECT THE PERCENTAGE
                DO 100 K=1,2                                                    READTB17
                DO 100 J=1,301
                BASE=  PERV(J,2,K)
 65             FOCUS=  PERV(J,1,K)
                GNEG=  PERV(J,3,K)
                EXNEG=100.-(BASE+FOCUS+GNEG)                                    READTB22
                IF(K.EQ.1) RATIO=R0                                             READTB23
      C  2 MILE OR LESS         (152)                                           READTB24
 70   C         100*ALOG10((2 MILE)*(5280 FEET/MILE) *(.3048 METER/FEET)) =199
                IF(K.EQ.2.AND.J.LT.152)RATIO=R1
      C         10 OR GREATER        (22)
                IF (K.EQ.2.AND.J.GT.222) RATIO  =R2
      C BETWEEN 2 AND 10                                                        READTB28
 75             IF (K.EQ.2.AND. (J.LE.222.AND. J.GE.152))
               1  RATIO = (R2-R1) * (J-152) / 70.0  + R1
                B1=BASE*RATIO                                                   READTB30
                F1=FOCUS*RATIO                                                  READTB31
                DELB= BASE-B1 +FOCUS-F1                                         READTB32
 80             DELN=GNEG/(GNEG+EXNEG)*DELB                                     READTB33
                GN1=GNEG+DELN                                                   READTB34
                IF (F1.LT.0) F1=0.
                IF (B1.LT.0.) B1=0.
                IF (GN1.LT.0.) GN1=0.
 85             PERV(J,1,K)=  F1/100.
                PERV(J,2,K) = B1/100.
                PERV(J,3,K)= GN1/100.
                PERV(J,4,K)= (100.-F1-B1-GN1)/100.
            100 CONTINUE                                                        READTB47
 90   C         FUNE
      C F1 COMPUTATION
                TLT =10.0 / ALOG (10.0)
                THRSH=10.**(THRESH/10.)
                DO 50 I=1,301
 95             DO 50 J=1,4
                DO 50 K=1,2
                RMEAN  = DBV(I,J+2,K)
                RMAX=  DBV(I,J+2-1,K)
                RMIN=  DBV(I,J+2+1,K)
100   C         GET THE K FACTOR
      C GET THE K FACTOR
                RK= (TLT*( 10.**((RMAX-RMEAN)/10.0)-1.0) - (RMAX-RMEAN))  /
               1  ((RMEAN-RMIN) - (TLT * (1.0- 10.0**((RMIN-RMEAN)/10.0) )))
      C         CASE ONE
105             FUN1(I,J,K)=TLT*THRSH*RK/(RK*(RMEAN-RMIN)+(RMAX-RMEAN))
      C         CASE TWO
                FUN2(I,J,K)=TLT*THRSH/(RK*(RMEAN-RMIN)+(RMAX-RMEAN))
            50  CONTINUE
      C         FIN
110             DO 60 I= 1,151
      C         CASE 1
      C F2 COMPUTATION
                FUN2(I,1)= 1.0-10. **((1-I)/100.0)
      C         CASE 2
```

```
      FTAU(I,2) = 10.0**((I-1)/100.)-1.0
   60 CONTINUE
C     DB TO ENERGY
      DO 70 I=1,1501
C CHANGE DB TO ENERGY.  STORE IN ARRAY ENV.
      ENV(I) = 10.0 **((I+249) / 100.0)
   70 CONTINUE
C       CORRECT FOR NIGHT TIME VALUES
      DO 80 I=1,301
      DO 80 J=1,9
C NIGHTTIME CORRECTION FACTOR.
      DBV(I,J,2) = DBV(I,J,2) + PENITE
   80 CONTINUE
C LOGICAL FLAG IS TRUE AFTER THE EXECUTION OF THE SUBROUTINE
      TABHD=.TRUE.                                                    READTB48
      IF (.NOT.CHECK) RETURN
      WRITE(KPRINT,997)      DBV
      WRITE(KPRINT,996) PERV
      WRITE(KPRINT,995) CSCF
      WRITE(KPRINT,994) FON1
      WRITE(KPRINT,994) FON2
      WRITE(KPRINT,993) FTAU
      WRITE(KPRINT,992) ENV
  997 FORMAT(1H1,18(/,1H0,20(/,1H ,15F8.2),/,1H ,F8.2))
  996 FORMAT (1H1,8(/,1H0,20(/,1H ,15F8.4),/,1H ,F8.4))
  995 FORMAT(1H1,(15F8.2))
  994 FORMAT(1H1,8(/,1H0,30(/,1H ,10E12.5),/,1H ,E12.5))
  993 FORMAT(1H1,2(/,1H0,15(/,1H ,10E12.5),/,1H ,E12.5))
  992 FORMAT(1H1,151(/,1H ,10E12.5))
      RETURN                                                          READTB49
  999 WRITE(KPRINT,998)                                               READTB50
  998 FORMAT(//10X,*..... ERROR .....DB,PERCENT CURVE TABLES(TAPE20) MISREADTB51
     1SING -- PROGRAM ABORTED*)                                       READTB52
      STOP                                                            READTB53
      END                                                             READTB54
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
1 READTB 1 130 144

VARIABLES	SN	TYPE		RELOCATION									
512	BASE	REAL			REFS	67	77	79	DEFINED	64			
517	B1	REAL			REFS	79	83	86	88	DEFINED	77	83	
0	CHECK	LOGICAL		DEBUG	REFS	7	9	130					
22157	CSCF	REAL	ARRAY	TABLI	REFS	18	133	DEFINED	55				
0	DBV	REAL	ARRAY	TABLI	REFS	18	97	98	99	126	131		
					DEFINED	40	126						
521	DELB	REAL			REFS	80	DEFINED	79					
522	DELN	REAL			REFS	81	DEFINED	80					
17222	ENV	REAL	ARRAY	TABLI	REFS	18	137	DEFINED	120				
515	ENEG	REAL			REFS	80	DEFINED	67					
513	FOCUS	REAL			REFS	67	78	79	DEFINED	65			



```
VARIABLES      SN  TYPE          RELOCATION
23310  [illegible]     REAL      ARRAY    TABL1      REFS      18      134    DEFINED     105
3[illegible]  [illegible]  REAL      ARRAY    TABL1      REFS      18      135    DEFINED     107
3[illegible]  [illegible]  REAL      ARRAY    TABL1      REFS      18      136    DEFINED     113      115
  52[illegible]  [illegible]  REAL                        REFS      79       82       85       88   DEFINED      78       82
  514  [illegible]  REAL                        REFS      67     2*80       81   DEFINED      66
  523  [illegible]  REAL                        REFS      84       87       88   DEFINED      81       84
  5[illegible]  [illegible]  INTEGER                     REFS      40       52       97       98       99      105      107
                                                 2*113    2*115    2*120    2*126   DEFINED      40       52       94
                                                  110      118      123
  33[illegible]  [illegible]  INTEGER                     REFS      25   DEFINED       20   I/O REFS      21       23       40
                                                   52       55
  5[illegible]  [illegible]  INTEGER                     REFS      40       52       64       65       66       71       73
                                                  3*75      85       86       87       88       97       98       99
                                                  1[illegible]     107    2*126   DEFINED      38       50       63       95
                                                  12[illegible]
  511  [illegible]  INTEGER                     REFS      64       65       66       68       71       73       75
                                                   [illegible]      86       87       88       97       98       99      105
                                                  1[illegible]   DEFINED       62       96
  [illegible]  [illegible]  INTEGER          I         REFS       5
  [illegible]  [illegible]  INTEGER          I         REFS       5   I/O REFS      131      132      133      134      135
                                                  13[illegible]     137      145
  5[illegible]  [illegible]  INTEGER                     REFS      40       52   DEFINED       37       49
  5[illegible]  [illegible]  REAL                        REFS      58       59   DEFINED       23
  5[illegible]  [illegible]  REAL                        REFS      58   DEFINED       23
  5[illegible]  [illegible]  REAL                        REFS    3*60   DEFINED       23
  [illegible]  [illegible]  REAL          [illegible]      REFS       5      126
12452  [illegible]  REAL      ARRAY    TABL1      REFS      15       64       65       66      132
                                                 DEFINED      52       85       86       87       88
  516  [illegible]  REAL                        REFS      77       78   DEFINED       68       71       73       75
  [illegible]  [illegible]  LOGICAL          [illegible]      REFS       7        9
  [illegible]  [illegible]  REAL          FACT1      REFS       5       58       59
  [illegible]  [illegible]  REAL          FACT1      REFS       6       58
  [illegible]  [illegible]  REAL          FACT1      REFS       6       60
  531  [illegible]  REAL                        REFS    2*105      107   DEFINED      102
  527  [illegible]  REAL                        REFS    2*102      105      107   DEFINED       98
  526  [illegible]  REAL                        REFS    4*102    2*105    2*107   DEFINED       97
  53[illegible]  [illegible]  REAL                        REFS    2*102      105      107   DEFINED       99
  5[illegible]  [illegible]  REAL                        REFS      68   DEFINED       58
  5[illegible]  [illegible]  REAL                        REFS      71     2*75   DEFINED       59
  51[illegible]  [illegible]  REAL                        REFS      73       75   DEFINED       60
  [illegible]  [illegible]  LOGICAL          [illegible]      REFS       7        9   DEFINED      129
  [illegible]  [illegible]  REAL          [illegible]      REFS       8       93
  525  [illegible]  REAL                        REFS     105      107   DEFINED       93
  524  [illegible]  REAL                        REFS    2*102      105      107   DEFINED       92
       [illegible]

EXTERNALS          TYPE    ARGS        REFERENCES
       [illegible]  REAL      1 LIBRARY      92
       [illegible]  REAL      1              25

STATE [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
       [illegible]                  [illegible]
```

```
      SUBROUTINE READTB      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE     5

STATEMENT LABELS                DEF LINE    REFERENCES
    0  100                         89         62         63
  445  992      FMT               143        137
  440  993      FMT               142        136
  433  994      FMT               141        134        135
  430  995      FMT               140        133
  423  996      FMT               139        132
  416  997      FMT               138        131
  454  998      FMT               146        145
  323  999                        145         25

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   16  20        L           37 41        16B                EXT REFS  NOT INNER
   21  20        J           38 41        10B                EXT REFS
   41  30        L           49 53        16B                EXT REFS  NOT INNER
   44  30        J           50 53        10B                EXT REFS
   76  100       K           62 89        62B                NOT INNER
  103  100       J           63 89        51B         OPT
  170  50        I           94 108       55B                EXT REFS  NOT INNER
  174  50        J           95 108       46B                EXT REFS  NOT INNER
  200  50        K           96 108       35B                EXT REFS
  246  60        I          110 116       16B                EXT REFS
  265  70        I          118 121        7B                EXT REFS
  276  80        I          123 127        4B                NOT INNER
  277  80        J          124 127        2B      INSTACK

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       IO            2              0 KARD    (1)                1 KPRINT (1)
       FACTI         3              0 RINV1   (1)                1 RINV2  (1)                2 RINV3  (1)
       DEBUG         3              0 CHECK   (1)                1 REED   (1)                2 TABRD  (1)
       PARM          2              0 THRESH  (1)                1 PENITE (1)
       TABL1     15046              0 DBV     (5418)          5418 PERV   (2408)          7826 ENV    (1501)
                                 9327 CSCF    (601)           9928 FON1   (2408)         12336 FON2   (2408)
                                14744 FTWO    (302)

STATISTICS
  PROGRAM LENGTH                  5328      346
  CM LABELED COMMON LENGTH      353208    15056
          600008 CM USED
```

```
      SUBROUTINE READIN                                                 READIN 2
C     THIS ROUTINE IS CALLED TO READ DATA FROM FORMA
      COMMON/IO/KARD,KPRINT                                             READIN 3
      COMMON /SRCS/ NSRCS
      COMMON/FT/GRDSZ,CNR,XLOC,YLOC,DAYNO,DARKND                        READIN 5
      DIMENSION XLOC(2000),YLOC(2000),DARKND(2000),DAYNO(2000)          READIN 6
      COMMON/GRID/NRCNR,EAS,RCNR,DIST,SDBHH,          ANGCOS,ANGSIN
      DIMENSION RCNR(10),DIST(10),SDBHH(2000),
     1ANGCOS(2000),ANGSIN(2000)                                         READIN 9
      COMMON/DEBUG/CHECK,REED                                           READIN10
      LOGICAL CHECK,REED                                                READIN11
      DATA IN1/8/                                                       READIN12
C     READ NUMBER OF NOISE SOURCES AND NUMBER OF DAYS
      READ(IN1) NSRCS,DAYS
C     READ XLOC AND YLOC FOR TARGETS AND FIRING POINTS
      READ(IN1) XLOC                                                    READIN16
      READ(IN1) YLOC                                                    READIN17
C     READ CHARGE SIZES
      READ(IN1) SDBHH                                                   READIN18
C     READ SINE AND COSINE FOR ANGLE BETWEEN GUN AND TARGET
      READ(IN1) ANGSIN                                                  READIN19
      READ(IN1) ANGCOS                                                  READIN20
C     NUMBER OF DAY FIRINGS AND NIGHT FIRINGS
      READ(IN1) DAYNO                                                   READIN21
      READ(IN1) DARKND                                                  READIN23
C     REWIND FILE
      REWIND IN1                                                        READIN25
C     SET FLAG
      REED=.TRUE.                                                       READIN26
      RETURN                                                            READIN68
      END                                                               READIN69
```

```
      SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS      DEF LINE      REFERENCES
    1  READIN          1          30

VARIABLES      SN  TYPE            RELOCATION
 3746  ANGCOS      REAL        ARRAY     GRID          REFS          7          8     DEFINED        22
 7666  ANGSIN      REAL        ARRAY     GRID          REFS          7          8     DEFINED        21
    0  CHECK       LOGICAL               DEBUG         REFS         10         11
    1  CNR         REAL                  FT            REFS          5
13562  DARKNO      REAL        ARRAY     FT            REFS          5          6     DEFINED        25
 7642  DAYNO       REAL        ARRAY     FT            REFS          5          6     DEFINED        24
   71  DAYS      * REAL                                DEFINED        14
   14  DIST        REAL        ARRAY     GRID          REFS          7          8
    1  EAS         REAL                  GRID          REFS          7
    0  GRDSZ       REAL                  FT            REFS          5
   26  IN1         INTEGER                             DEFINED        12     I/O REFS       14         16         17         19         21
                                                            22        24         25         27
    0  KARD        INTEGER               IO            REFS          3
    1  KPRINT      INTEGER               IO            REFS          3
    0  NRCNR       INTEGER               GRID          REFS          7

      SUBROUTINE READIN      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE      2

VARIABLES      SN  TYPE            RELOCATION
    0  NSRCS       INTEGER               SRCS          REFS          4     DEFINED        14
    2  RCNR        REAL        ARRAY     GRID          REFS          7          8
    1  REED        LOGICAL               DEBUG         REFS         10         11     DEFINED        29
   26  SDBWH       REAL        ARRAY     GRID          REFS          7          8     DEFINED        19
    2  XLOC        REAL        ARRAY     FT            REFS          5          6     DEFINED        16
 3722  YLOC        REAL        ARRAY     FT            REFS          5          6     DEFINED        17
      VARIABLES USED AS FILE NAMES, SEE ABOVE

COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
      IO             2                0 KARD    (1)                  1 KPRINT (1)
      SRCS           1                0 NSRCS   (1)
      FT          8002                0 GRDSZ   (1)                  1 CNR     (1)                  2 XLOC    (2000)
                                   2002 YLOC    (2000)            4002 DAYNO   (2000)            6002 DARKNO (2000)
      GRID        6022                0 NRCNR   (1)                  1 EAS     (1)                  2 RCNR    (10)
                                     12 DIST    (10)                22 SDBWH   (2000)            2022 ANGCOS (2000)
                                   4022 ANGSIN  (2000)
      DEBUG          2                0 CHECK   (1)                  1 REED    (1)

STATISTICS
  PROGRAM LENGTH                   72B       58
  CM LABELED COMMON LENGTH      33315B    14029
        600008 CM USED
```

```
      SUBROUTINE POINT
C     SEE ZDEF FOR THE DESCRIPTION OF THESE VARIABLES
      COMMON/IO/KARD,KPRINT                                          PGRID  3
      COMMON/BOUND/XMIN,YMIN,XMAX,YMAX,NBS                           PGRID  4
      LOGICAL BES                                                    PGRID  5
      COMMON /SWLS/ NSWLS
      COMMON/FT/GRDSZ,CNR,XLOC,YLOC,DAYNO,DARKNO                     PGRID  7
      DIMENSION XLOC(2000),YLOC(2000),DARKNO(2000),DAYNO(2000)       PGRID  8
      COMMON/FACTI/ RINV1,RINV2,RINV3
      COMMON/DEBUG/CHECK,REED,TABRD                                  PGRID 10
      COMMON/CALC/DAYCNR,DRKCNR                                      PGRID 11
      COMMON/METRIC/METERS,IMETER,IBOTH                              PGRID 12
      LOGICAL METERS                                                 PGRID 13
      LOGICAL DAYCNR,DRKCNR                                          PGRID 14
      LOGICAL OUT
C     FLAGS FOR READING TAPE5 INFO(REED), TAPE20 INFO(TABRD)
      LOGICAL CHECK,REED,TABRD                                       PGRID 15
      CALL SECOND(T100)                                              PGRID 22
      WRITE(KPRINT,610)                                              PGRID 23
C IF THE DATA IS NOT ALREADY READ IN FOR USE IN POINT, THEN CALL SUBROUTINE
C READIN TO READ THE DATA FROM TAPE 8.
      IF (.NOT. REED) CALL READIN                                    PGRID 24
C IF GRID BOUNDARIES ARE NOT PROPERLY INITIALIZED, COMPLAIN.
C GRID BOUNDARIES NOT PROPERLY INITIALIZED -- ABORT                  PGRID 25
      IF(BDS) GO TO 10
      WRITE(KPRINT,5)
5     FORMAT(*  ... NO BOUNDS CALL BEFORE POINT CALL...*)
      STOP
C READ INPUT DIRECTIVE,SET DEFAULTS,IF NECESSARY                     PGRID 28
C THIS READS IN THE CARD CONTAINING THE INVERSION FACTORS, AND DAY/NIGHT/BOTH
10    READ(KARD,700) X1,X2,X4,X3
C ERROR MESSAGE:  ERROR--MISSING INPUT DIRECTIVE; JOB ABORTED
      IF(EOF(KARD).NE.0.)GO TO 300                                   PGRID 30
C INVERSION FACTORS                                                  PGRID 31
C THIS SECTION READS, VERIFIES OR FINDS OUT ABOUT THE INVERSION FACTORS USED
C FROM SUBROUTINE READIB OR THE DIRECTIVE CARD.
      IF(.NOT.TABRD)GO TO 50                                         PGRID 32
      IF(X1.EQ.RINV1.AND.X2.EQ.RINV2.AND.X4.EQ.RINV3)   GOTO 75
      TABRD=.FALSE.                                                  PGRID 34
   50 RINV1=X1                                                       PGRID 35
      RINV2=X2                                                       PGRID 36
      RINV3= X4
      CALL READTB                                                    PGRID 37
   75 CONTINUE                                                       PGRID 38
C DAY +/OR NIGHT CONSIDERED                                          PGRID 42
      DAYCNR=(X3.EQ.10HBOTH        .OR. X3.EQ.10HDAY          )      PGRID 43
      DRKCNR=(X3.EQ.10HBOTH        .OR. X3.EQ.10HNIGHT        )      PGRID 44
      IF(DAYCNR.OR.DRKCNR)GO TO 90                                   PGRID 45
      DAYCNR=.TRUE.                                                  PGRID 46
      DRKCNR=.TRUE.                                                  PGRID 47
   90 CONTINUE                                                       PGRID 48
      IF (DRKCNR) IBOTH=10HNIGHT ONLY                                PGRID 49
      IF (DAYCNR) IBOTH=10H  DAY ONLY                                PGRID 50
      IF (DAYCNR .A. DRKCNR) IBOTH=10HBOTH D + N                     PGRID 51
C PRINT PARAMETERS                                                   PGRID 60
      WRITE(KPRINT,620) RINV1,RINV2,RINV3
      WRITE(KPRINT,622) IBOTH                                        PGRID 64
```

```
C     LOOP THROUGH DATA CARDS UNTILL A STAR IS READ
      WRITE(KPRINT,599)
      J=0
150   CONTINUE
      WRITE(KPRINT,600)
      DO 200 I=1,3
      J=J+1
      READ(KARD,601) IFLAG,NAME,X,Y
C     TEST IF THERE WAS A CARD
      IF (EOF(KARD).NE.0.) GOTO 3000
C TEST IF POINT IS IN BOUNDS
      OUT=.FALSE.
      IF (X.LT.XMIN.OR.X.GT.XMAX) OUT=.TRUE.
      IF (Y.LT.YMIN.OR.Y.GT.YMAX) OUT=.TRUE.
C THIS CALLS CALCNR TO COMPUTE THE CLOW FOR GRID COORDINATES X AND Y AND STORES
C THE VALUES AS VNEF, OR CNR.
      CALL CALCNR(X,Y)
      IF (CNR.GT.99.) CNR=99.
      IF (OUT) WRITE(KPRINT,602) J,NAME,X,Y,CNR
      IF (.NOT.OUT) WRITE(KPRINT,603) J,NAME,X,Y,CNR
      WRITE(10,800) CNR
      IF (IFLAG.EQ.1H*)  GOTO 400
200   CONTINUE
      WRITE(KPRINT,640)
      GOTO 150

400   CONTINUE
C THIS CALCULATES THE TIME SPENT IN POINT
      CALL SECOND(T99)                                                  PGRID132
      T99=T99-T100                                                      PGRID133
      WRITE(KPRINT,900) T99                                             PGRID134
      RETURN                                                            PGRID135
C     EARLY END OF FILE
3000  WRITE(KPRINT,699)
      STOP
C EOF EXIT                                                              PGRID136
  300 WRITE(KPRINT,698)                                                 PGRID137
      STOP                                                              PGRID138
599   FORMAT(///3H    )
600   FORMAT(11X,4HNAME,9X,1HX,9X,1HY,8X,5HLEVEL  )
601   FORMAT(1A1,1A9,2F10.0)
602   FORMAT(I5,4X,1A9,2F10.0,F10.2,5X,13HOUT OF BOUNDS  )
603   FORMAT(I5,4X,1A9,2F10.0,F10.2)
 610  FORMAT(1H1,///,T15,*.....        POINT        .....*)
620   FORMAT(//T16,*  INVERSION =*, 3F8.2 //)
 622  FORMAT(T12,*CALCULATIONS FOR NEF WILL USE *,A10,* OF DAY AND NIGHT PGRID156
     1 CALCULATIONS*,//)                                                PGRID157
640   FORMAT(1H1)
  698 FORMAT(///   56H *****     ERROR -- MISSING INPUT DIRECTIVE; JOB APGRID160
     1BORTED  )                                                         PGRID161
699   FORMAT(///   56H *****     ERROR -- EARLY END OF FILE ; JOB AB.
     1RTED       )
700   FORMAT(4F10.0,A10)
  800 FORMAT(F10.2)
900   FORMAT(//,T15,*.....   TIME FOR THE POINT SUBPROGRAM IS *,F8.3
     1* SECONDS*)                                                       PGRID165
```

```
  115                 END                                                                  PGRID166


      SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS      DEF LINE      REFERENCES
    1  POINT             1        90

VARIABLES     SN  TYPE              RELOCATION
    4  BDS        LOGICAL              MOONE      REFS      4        5        25
    0  CHECK      LOGICAL              DEBUG      REFS     10       17
    1  CNR        REAL                 FT         REFS      7       76        77        78        79
                                                   DEFINED  76
13562  DARKNG     REAL         ARRAY   FT         REFS      7        8
    0  DAYCNR     LOGICAL              CALC       REFS     11       14        48        53        54
                                                   DEFINED  46       49
 7642  DAYNO      REAL         ARRAY   FT         REFS      7        8
    1  DRKCNR     LOGICAL              CALC       REFS     11       14        48        52        54
                                                   DEFINED  47       50
    0  GRDSZ      REAL                 FT         REFS      7
  433  I        * INTEGER              DEFINED    64
    2  IBOTH      INTEGER              METRIC     REFS     12       57        DEFINED   52        53        54
  434  IFLAG      INTEGER              PEFS       80       DEFINED  66
    1  IMETER     INTEGER              METRIC     REFS     12
  432  J          INTEGER              REFS       65       77        78        DEFINED   61        65
    0  KAMD       INTEGER              IO         REFS      3       33        68        I/O REFS  31        66
    1  KPRINT     INTEGER              IO         REFS      3  I/O REFS      19        26        56        57        60
                                                   63       77        78        82        89        92        95
    0  METERS     LOGICAL              METRIC     REFS     12       13
  435  NAME       INTEGER              REFS       77       78        DEFINED   66
    0  NSMCS      INTEGER              SMCS       REFS      6
  424  OUT        LOGICAL              REFS       15       77        78        DEFINED   70        71        72
    1  REED       LOGICAL              DEBUG      REFS     10       17        22
    0  RINV1      REAL                 FACTI      REFS      9       38        56        DEFINED   40
    1  RINV2      REAL                 FACTI      REFS      9       38        56        DEFINED   41
    2  RINV3      REAL                 FACTI      REFS      9       38        56        DEFINED   42
    2  TARGD      LOGICAL              DEBUG      REFS     10       17        37        DEFINED   39
  425  TIJD       REAL                 REFS       18       88
  440  TSS        REAL                 REFS       87       88        89        DEFINED   88
  436  X          REAL                 REFS      2*71      75        77        78        DEFINED   66
    2  XLOC       REAL         ARRAY   FT         REFS      7        8
    2  XMAX       REAL                 MOONE      REFS      4       71
    0  XMIN       REAL                 MOONE      REFS      4       71
  426  X1         REAL                 REFS      38       40        DEFINED   31
  427  X2         REAL                 REFS      38       41        DEFINED   31
  431  X3         REAL                 REFS      2*46     2*47      DEFINED   31
  430  X4         REAL                 REFS      38       42        DEFINED   31
  437  Y          REAL                 REFS      2*72      75        77        78        DEFINED   66
 3722  YLOC       REAL         ARRAY   FT         REFS      7        8
    3  YMAX       REAL                 MOONE      REFS      4       72
    1  YMIN       REAL                 MOONE      REFS      4       72
```

```
      SUBROUTINE POINT      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE     4

FILE NAMES          MODE
      TAPE10      FMT                        WRITES        79
      VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS              TYPE    ARGS        REFERENCES
      CALCNR                    2              75
      EOF          REAL         1              33          68
      READIN                    0              22
      READTB                    0              43
      SECOND                    1              18          87

STATEMENT LABELS                  DEF LINE    REFERENCES
  175  5          FMT                27          26
   15  10                            31          25
   33  50                            40          37
   41  75                            44          38
   52  90                            51          48
   73  150                           62          83
    0  200                           81          64
  153  300                           95          33
  141  400                           85          80
  304  599        FMT                97          60
  306  600        FMT                98          63
  312  601        FMT                99          66
  315  602        FMT               100          77
  323  603        FMT               101          78
  327  610        FMT               102          19
  335  620        FMT               103          56
  342  622        FMT               104          57
  353  640        FMT               106          82
  355  698        FMT               107          95
  365  699        FMT               109          92
  375  700        FMT               111          31
  400  800        FMT               112          79
  402  900        FMT               113          89
  150  3000                          92          68

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   76  200       I           64 81        418                EXT REFS     EXITS

COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
      IO             2                0 KARD    (1)                1 KPRINT (1)
      BOUND          5                0 XMIN    (1)                1 YMIN   (1)                2 XMAX   (1)
                                      3 YMAX    (1)                4 BDS    (1)
      SRCS           1                0 NSRCS   (1)
      FT          8002                0 GRDSZ   (1)                1 CNR    (1)                2 XLOC   (2000)
                                   2002 YLOC    (2000)          4002 DAYNO  (2000)          6002 DARKNO (2000)
      FACTI          3                0 RINV1   (1)                1 RINV2  (1)                2 RINV3  (1)
      DEBUG          3                0 CHECK   (1)                1 REED   (1)                2 TABRD  (1)
      CALC           2                0 DAYCNR  (1)                1 DRKCNR (1)
      METRIC         3                0 METERS  (1)                1 IMETER (1)                2 IBOTH  (1)

STATISTICS
  PROGRAM LENGTH                  441B      289
  CM LABELED COMMON LENGTH      17525B     8021
        60000B CM USED
```

```
      SUBROUTINE PGRID                                                  PGRID  2
C SETS UP A GRID OF LCON VALUES FOR A SPECIFIED AREA.
C     SEE ZNEF FOR THE DESCRIPTION OF THESE VARIABLES
      COMMON/IO/KARD,KPRINT                                             PGRID  3
      COMMON/BOUND/XMIN,YMIN,XMAX,YMAX,BDS                              PGRID  4
      LOGICAL BDS                                                       PGRID  5
      COMMON /SRCS/ NSRCS
      COMMON/FT/GRDSZ,CNR,XLOC,YLOC,DAYNO,DARKNO                        PGRID  7
      DIMENSION XLOC(2000),YLOC(2000),DARKNO(2000),DAYNO(2000)          PGRID  8
      COMMON/FACTI/ RINV1,RINV2,RINV3                                   PGRID  9
      COMMON/DEBUG/CHECK,REED,TABRD                                     PGRID 10
      COMMON/CALC/DAYCNR,DRKCNR                                         PGRID 11
      COMMON/METRIC/METERS,IMETER,IBOTH                                 PGRID 12
      LOGICAL METERS                                                    PGRID 13
      LOGICAL DAYCNR,DRKCNR                                             PGRID 14
C     FLAGS FOR READING TAPE8 INFO(REED), TAPE20 INFO(TABRD)
      LOGICAL CHECK,REED,TABRD                                          PGRID 15
C     FLAG TO DENOTE WHETHER OR NOT THE ORIGINAL BOUNDS WERE CHANGED
      LOGICAL DELBDS                                                    PGRID 16
C     ARRAYS FOR LABELS(IL,JL) XARRY CONTAINS LCON VALUES
      DIMENSION IL(100),JL(50),XARRY(50)                                PGRID 17
      EQUIVALENCE (JL(1),XARRY(1))                                      PGRID 18
C     DEFGSZ=DEFAULT GRID SIZE
C     KOLS=MAX. NUMBER OF COLUMNS
C     GMULT=MULTIPLE VALUE
C     TOL = TOLERENCE
      DATA DEFGSZ/2000./,KOLS/15/,GMULT/250./,TOL/.01/                  PGRID 19
C     NSKIP AIDS IN SETTING UP TABLE FOR OUTPUT
      DATA BLANK/1H /,ZERO/1H0/,NSKIP/5/                                PGRID 20
C     IOUT=TAPE1
      DATA IOUT/1/                                                      PGRID 21
      CALL SECOND(T100)                                                 PGRID 22
      WRITE(KPRINT,610)                                                 PGRID 23
C IF THE DATA IS NOT ALREADY READ IN FOR USE IN PGRID, THEN CALL SUBROUTINE
C READIN TO READ THE DATA FROM TAPE 8.
      IF (.NOT. REED) CALL READIN                                       PGRID 24
C IF GRID BOUNDARIES ARE NOT PROPERLY INITIALIZED, COMPLAIN.
C GRID BOUNDARIES NOT PROPERLY INITIALIZED -- ABORT                     PGRID 25
      IF(BDS) GO TO 10
      WRITE(KPRINT,5)
5     FORMAT(*  ...NO BOUNDS CALL BEFORE PUDDLE GRID CALL...*)
      STOP
C READ INPUT DIRECTIVE,SET DEFAULTS,IF NECESSARY                        PGRID 28
C THIS READS PGRID-2 CARD CONTAINING THE INVERSION FACTORS, GRID SIZE, AND DAY
C AND/OR NIGHT.
10    READ(KARD,700) X1,X2,X4,GRDSZ,X3,GRDNAME
C ERROR MESSAGE:  ERROR--MISSING INPUT DIRECTIVE; JOB ABORTED
      IF(EOF(KARD).NE.0)GO TO 300                                       PGRID 30
C INVERSION FACTORS                                                     PGRID 31
C THIS SECTION READS, VERIFIES OR FINDS OUT ABOUT THE INVERSION FACTORS USED
C FROM SUBROUTINE READIN OR THE DIRECTIVE CARD.
      IF(.NOT.TABRD)GO TO 50                                            PGRID 32
      IF(X1.EQ.RINV1.AND.X2.EQ.RINV2.AND.X4.EQ.RINV3)   GOTO 75
      TABRD=.FALSE.                                                     PGRID 34
50    RINV1=X1                                                          PGRID 35
      RINV2=X2                                                          PGRID 36
      RINV3= X4
```

```
      CALL READTB                                                       PGRID 37
   75 CONTINUE                                                          PGRID 38
C GRID SIZE                                                             PGRID 39
C IF THERE IS NO GRID SIZE ON THE DIRECTIVE CARD, THEN IT ASSUMES A DEFAULT
C VALUE (HERE DEFGSZ=2000)
      IF(GRDSZ.LE.0.) GRDSZ=DEFGSZ                                      PGRID 40
C THIS IS A WARNING STATING THAT THE INPUT GRID SIZE IS NOT A MULTIPLE OF SOME
C NUMBER,GMULT.  (HERE, GMULT=2509)
      IF(AMOD(GRDSZ,GMULT).GT.TOL)WRITE(KPRINT,697)GRDSZ,GMULT          PGRID 41
C DAY +/OR NIGHT CONSIDERED                                             PGRID 42
      DAYCNR=(X3.EQ.10HBOTH        .OR. X3.EQ.10HDAY          )         PGRID 43
      DRKCNR=(X3.EQ.10HBOTH        .OR. X3.EQ.10HNIGHT        )         PGRID 44
      IF(DAYCNR.OR.DRKCNR)GO TO 90                                      PGRID 45
      DAYCNR=.TRUE.                                                     PGRID 46
      DRKCNR=.TRUE.                                                     PGRID 47
   90 CONTINUE                                                          PGRID 48
      IF (DRKCNR) IBOTH=10HNIGHT ONLY                                   PGRID 49
      IF (DAYCNR) IBOTH=10H  DAY ONLY                                   PGRID 50
      IF (DAYCNR .A. DRKCNR) IBOTH=10HBOTH D + N                        PGRID 51
C THE NEXT FEW LINES CHECK TO MAKE SURE EACH BOUND SUBMITTED BY THE USER IS
C CORRECT BY CALLING SUBROUTINE BDSET.
      PGXMIN=XMIN
      PGYMIN=YMIN
      PGXMAX=XMAX
       PGYMAX=YMAX
      DELBDS=.FALSE.                                                    PGRID 55
C THESE CALLS SEND BOTH THE MINIMUM AND MAXIMUM BOUNDARY VALUES TO
C BDSET SO AS TO FIND THE AREA THEY EMCOMPASS.
      CALL BDSET(PGXMIN,PGXMAX,GRDSZ,NJ,DELBDS)
      CALL BDSET(PGYMIN,PGYMAX,GRDSZ,NI,DELBDS)
C PRINT PARAMETERS                                                      PGRID 60
C IF THE FLAG IS TRUE THEN THE BOUNDS ARE MODIFIED,  IF NOT, PGRID WILL USE
C THE PRESENT BOUNDS.
      IF(DELBDS) WRITE(KPRINT,612) XMIN,YMIN,XMAX,YMAX                  PGRID 61
      WRITE(KPRINT,611)PGXMIN,PGYMIN,PGXMAX,PGYMAX                      PGRID 62
      WRITE(KPRINT,620) RINV1,RINV2,RINV3
      WRITE(KPRINT,622) IBOTH                                           PGRID 64
      WRITE(KPRINT,621) GRDSZ,IMETER                                    PGRID 65
C NASAPLOT PROGRAM INPUT -- WRITE HDR INFO                              PGRID 80
      REWIND IOUT                                                       PGRID 81
      WRITE(IOUT,701)GRDNAME,GRDSZ,PGXMIN,PGYMIN,PGXMAX,PGYMAX,IMETER   PGRID 82
      WRITE(IOUT,605)                                                   PGRID 83
      WRITE(IOUT,603)NI,NJ                                              PGRID 84
C ADD ONE TO DIFFERENCES TO GET ACTUAL ROW,COL. COUNTS FOR LOOPING;     PGRID 85
C   NASAPLOT ROWS,COLS = ACTUAL -1                                      PGRID 86
      NI=NI+1                                                           PGRID 87
      NJ=NJ+1                                                           PGRID 88
C STORE ROW LABELS                                                      PGRID 89
      IGRDSZ=GRDSZ                                                      PGRID 90
C THIS LOOP INITIALIZES THE IL ARRAY TO THE ROW LABLES USED IN SETTING UP THE
C GRID.
      IL(1)=PGYMAX                                                      PGRID 91
      DO 130 I=2,NI                                                     PGRID 92
C     CHECK FOR OVERFLOW
      IF(I .GT. 100) GO TO 3000
  130 IL(I)= IL(I-1) - IGRDSZ
C IXP = STARTING X VALUE FOR CURRENT PAGE                               PGRID 94
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```
      IXP=0
C     LOOP HERE FOR NEXT PAGE
  140 IX=IXP                                                          PGRID 96
      IY=NI-1
      LINECT=0                                                        PGRID 98
      CC=ZERO                                                         PGRID 99
C SET UP PAGING                                                       PGRID100
      NJP=NJ                                                          PGRID101
      IF(NJ.LE.NOLS)GO TO 150                                         PGRID102
      NJP=NOLS                                                        PGRID103
  150 CONTINUE                                                        PGRID104
C PRINT COL. LABELS FOR THIS PAGE                                     PGRID105
C THIS LOOP INITIALIZES THE JL ARRAY TO THE COLUMN LABLES USED IN SETTING UP
C THE GRID.  NEXT, IT PRINTS ALL OF THE COLUMN LABELS.
      JL(1)=PGXMIN+ IX*GRDSZ
      DO 160 J=2,NJP                                                  PGRID107
      IF(J .EQ. 50) GO TO 3000
  160 JL(J)=JL(J-1) + IGRDSZ
      WRITE(KPRINT,600) (JL(J),J=1,NJP)                               PGRID109
C THIS DO-LOOP CALCULATES THE VALUES ON THE GRID FOR X AND Y TO BE SENT TO
C SUBROUTINE CALCNR TO COMPUTE THE LCOR VALUES.
      DO 180 I=1,NI                                                   PGRID110
C     THIS SETS UP THE ROW LABEL (Y COORDINATE) USED BY NASAPLOT
      II=NI-I+1                                                       PGRID111
      DO 170 J=1,NJP                                                  PGRID112
C THIS SETS UP THE COLUMN LABEL (OR X COORDINATE USED).
      X=IX*GRDSZ+PGXMIN
      Y=IY*GRDSZ+PGYMIN
C THIS CALLS CALCNR TO COMPUTE THE LCOR FOR GRID COORDINATES X AND Y AND STORES
C THE VALUES AS VNEF, OR CNR.
      CALL CALCNR(X,Y)
C     VNEF,II,JJ--INPUT TO NASAPLOT
      VNEF=XARRY(J)=CNR
      IF(VNEF.GT.80.)VNEF=80.                                         PGRID116
      JJ = IX+1
C     OUTPUT TO NASSAPLOT   ROW,COL,VALUE
C     WRITE PGRID INFO TO  TAPE1
      WRITE(IOUT,604) II,JJ,VNEF
  170 IX=IX+1
      IF(MOD(LINECT,4*IP).EQ.0)CC=ZERO                                PGRID119
C THIS PRINTS OUT THE LCOR VALUES FOR THE POODLE GRID OUTPUT.
      WRITE(KPRINT,601)CC,IL(I),(XARRY(J),J=1,NJP)                    PGRID120
      LINECT=LINECT+1                                                 PGRID121
      CC=BLANK                                                        PGRID122
      IY=IY-1
  180 IX=IXP                                                          PGRID124
  190 CONTINUE                                                        PGRID125
      NJ=NJ-NJP                                                       PGRID126
C ANOTHER PAGE?
C THIS CHECKS TO SEE IF THERE IS A NEED FOR ANOTHER PAGE OF OUTPUT SINCE THERE
C IS A LIMIT PER PAGE OF OUTPUT.
      IF(NJ.LE.0)GO TO 200                                            PGRID128
      IXP=IXP+NJP                                                     PGRID129
C     START A NEW PAGE
      GO TO 140                                                       PGRID130
  200 CONTINUE                                                        PGRID131
C THIS CALCULATES THE TIME SPENT IN PGRID.
```

```
                CALL SECOND(T99)                                                PGRID132
                T99=T99-T100                                                    PGRID133
                WRITE(KPRINT,900) T99                                           PGRID134
                RETURN                                                          PGRID135
           3000 WRITE (KPRINT,702)
                STOP
          C EOF EXIT                                                            PGRID136
            300 WRITE(KPRINT,698)                                               PGRID137
                STOP                                                            PGRID138
            600 FORMAT(1H1///8X,15(I7,1X) )                                     PGRID139
            601 FORMAT(A1,I7,15(F6.1,2X))                                       PGRID140
            603 FORMAT(4HGRID,2X,2I8)                                           PGRID141
            604 FORMAT(4HGRDI,2X,2I8,F8.3)                                      PGRID142
            605 FORMAT(4HPHS2)                                                  PGRID143
            610  FORMAT(1H1,///,T15,*.....      PUDDLE GRID      .....*)        PGRID144
            611 FORMAT(                                          ///T12,*START PGRID145
               1AT DATA BASE COORDINATES (*,F9.1,*,*,F9.1,* )*                  PGRID146
               2                                                //T12,*STOP  PGRID147
               1AT DATA BASE COORDINATES (*,F9.1,*,*,F9.1,* )* )                PGRID148
            612 FORMAT(///   40H *****      WARNING -- SPECIFIED BOUNDS ( ,F9.1,*,*PGRID149
               1,F9.1,* ):(*,F9.1,*,*,F9.1,* ) DO NOT CORRESPOND TO INTEGRAL GRID PGRID150
               2BOUNDS.*/21X,*MODIFIED BOUNDS WILL BE USED TO PRODUCE THE GRID ANDPGRID151
               3 TO DEFINE ANY PLOT UTILIZING THIS GRID*)                       PGRID152
           620   FORMAT(//T16,*  INVERSION =*, 3F8.2 //)
            621 FORMAT(/12X,*GRID SIZE =*,F8.1,                  * ; DISTANCES IN PGRID154
               1*,A10//)                                                        PGRID155
            622  FORMAT(T12,*CALCULATIONS FOR NEF WILL USE *,A10,* OF DAY AND NIGHTPGRID156
               1 CALCULATIONS*,//)                                              PGRID157
            697 FORMAT(///   31H *****      WARNING -- GRID SIZE ,F8.1,* NOT MULTIPPGRID158
               1LE OF*,F8.1)                                                    PGRID159
            698 FORMAT(///   56H *****      ERROR -- MISSING INPUT DIRECTIVE; JOB APGRID160
               1BORTED  )                                                       PGRID161
           700   FORMAT(4F10.0,2A10)
            701 FORMAT(A10,5F10.0,A10)                                          PGRID163
            702 FORMAT(/// 48H *ARRAY INDEX LARGER THAN THE DIMENSIONS; ABORT*)
            900  FORMAT(//,T15,*.....      TIME FOR PUDDLING SUBPROGRAM IS *,F8.3,  PGRID164
               1* SECONDS*)                                                     PGRID165
                END                                                             PGRID166
```

SYMBOLIC REFERENCE MAP (R=3)

```
ENTRY POINTS      DEF LINE      REFERENCES
    1  PGRID           1          175

VARIABLES      SN  TYPE            RELOCATION
    4  BDS        LOGICAL              BOUND        REFS        5         6        39
  347  BLANK      REAL                              REFS      158   DEFINED        29
  743  CC         REAL                              REFS      156   DEFINED       120       154       158
    0  CHECK      LOGICAL              DEBUG        REFS       11        17
    1  CNR        REAL                 FT           REFS        8       147
13562  DARKNO     REAL        ARRAY    FT           REFS        8         9
    0  DAYCNR     LOGICAL              CALL         REFS       12        15        70        75        76
                                                  DEFINED       68        71
```

VARIABLES	SN	TYPE		RELOCATION								
7642	DAYNO	REAL	ARRAY	FT	REFS	8	9					
343	DEFGSZ	REAL			REFS	63	DEFINED	27				
720	DELBUS	LOGICAL			REFS	14	86	87	91	DEFINED	83	
1	DMRCNR	LOGICAL		CALC	REFS	12	15	70	74	76		
					DEFINED	69	72					
345	GMULT	REAL			REFS	2*66	DEFINED	27				
726	GNUNAME	REAL			REFS	98	DEFINED	46				
0	GRDSZ	REAL		FT	REFS	8	63	2*66	86	87	95	98
						106	129	141	142	DEFINED	46	63
736	I	INTEGER			REFS	112	2*113	138	156	DEFINED	110	136
2	IBUTM	INTEGER		METRIC	REFS	13	94	DEFINED	74	75	76	
735	IGRDSZ	INTEGER			REFS	113	132	DEFINED	106			
746	II	INTEGER			REFS	152	DEFINED	138				
1036	IL	INTEGER	ARRAY		REFS	21	113	156	DEFINED	109	113	
1	IMETER	INTEGER		METRIC	REFS	13	95	98				
352	IOUT	INTEGER			DEFINED	31	I/O REFS	97	98	99	100	152
740	IX	INTEGER			REFS	129	141	149	153	DEFINED	117	153
						160						
737	IXP	INTEGER			REFS	117	160	167	DEFINED	115	167	
741	IY	INTEGER			REFS	142	159	DEFINED	118	159		
745	J	INTEGER			REFS	131	2*132	133	147	156		
					DEFINED	130	133	139	156			
752	JJ	INTEGER			REFS	152	DEFINED	149				
754	JL	INTEGER	ARRAY		REFS	21	22	132	133	DEFINED	129	132
0	KARD	INTEGER		IO	REFS	4	48	I/O REFS	46			
344	KULS	INTEGER			REFS	123	124	DEFINED	27			
1	KPRINT	INTEGER		IO	REFS	4	I/O REFS	33	40	66	91	92
						93	94	95	133	156	174	176	179
742	LINECT	INTEGER			REFS	154	157	DEFINED	119	157		
0	METERS	LOGICAL		METRIC	REFS	13	14					
734	NI	INTEGER			REFS	87	100	103	110	118	136	138
					DEFINED	105						
733	NJ	INTEGER			REFS	86	100	104	122	123	162	166
					DEFINED	104	162					
744	NJP	INTEGER			REFS	130	133	139	156	162	167	
					DEFINED	122	124					
351	NSKIP	INTEGER			REFS	154	DEFINED	29				
0	NSRCS	INTEGER		SRCS	REFS	7						
731	PGXMAX	REAL			REFS	86	92	98	DEFINED	81		
727	PGXMIN	REAL			REFS	80	92	98	129	141		
					DEFINED	79						
732	PGYMAX	REAL			REFS	87	92	98	109	DEFINED	82	
730	PGYMIN	REAL			REFS	87	92	98	142	DEFINED	80	
1	REED	LOGICAL		DEBUG	REFS	11	17	36				
0	RINV1	REAL		FACTI	REFS	10	53	93	DEFINED	55		
1	RINV2	REAL		FACTI	REFS	10	53	93	DEFINED	56		
2	RINV3	REAL		FACTI	REFS	10	53	93	DEFINED	57		
2	TABRD	LOGICAL		DEBUG	REFS	11	17	52	DEFINED	54		
346	TOL	REAL			REFS	66	DEFINED	27				
721	T100	REAL			REFS	32	173					
753	T99	REAL			REFS	172	173	174	DEFINED	173		
751	VREF	REAL			REFS	148	152	DEFINED	147	148		
747	X	REAL			REFS	145	DEFINED	141				
754	XARRY	REAL	ARRAY		REFS	21	22	156	DEFINED	147		
2	XLOC	REAL	ARRAY	FT	REFS	8	9					
2	XMAX	REAL		ROUND	REFS	5	81	91				
0	XMIN	REAL		ROUND	REFS	5	79	91				

VARIABLES	SN	TYPE	RELOCATION						
722	X1	REAL			REFS	55	55	DEFINED	46
723	X2	REAL			REFS	55	56	DEFINED	46
725	X3	REAL			REFS	2*08	2*09	DEFINED	46
724	X4	REAL			REFS	55	57	DEFINED	46
750	Y	REAL			REFS	145	DEFINED	142	
3722	YLOC	REAL	ARRAY	X1	REFS	8	9		
3	YMAX	REAL		BOUND	REFS	5	82	91	
1	YMIN	REAL		BOUND	REFS	5	80	91	
350	ZERO	REAL			REFS	120	154	DEFINED	29

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES	
BUSET		5	80	87
CALCNR		2	145	
EOF	REAL	1	48	
READIN		0	36	
READTB		0	58	
SECOND		1	32	172

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES
AMOD	REAL	2	INTRIN		66
MOD	INTEGER	2	INTRIN		154

STATEMENT LABELS			DEF LINE	REFERENCES	
361	5	FMT	41	40	
15	10		46	39	
33	50		55	52	
41	75		59	53	
65	90		73	70	
0	130		113	110	
157	140		117	109	
170	150		125	123	
0	160		132	130	
0	170		135	139	
0	180		161	136	
273	200		170	166	
305	300		179	48	
521	600	FMT	181	133	
524	601	FMT	182	156	
527	603	FMT	183	100	
532	604	FMT	184	152	
535	605	FMT	185	94	
537	610	FMT	188	35	
545	611	FMT	187	92	
563	612	FMT	191	91	
614	620	FMT	195	93	
621	621	FMT	196	95	
630	622	FMT	198	94	
641	697	FMT	200	66	
651	698	FMT	202	179	
661	700	FMT	204	46	
664	701	FMT	205	98	
667	702	FMT	206	176	
676	900	FMT	207	174	
302	3000		176	112	131

```
      SUBROUTINE PGRID        74/175  OPT=2 ROUND=+++.                    FTN 4.8  508        80/10/30. 12.45.43        PAGE     7

LOOPS  LABEL     INDEX      FR MAT.     LENGTH     PROPERTIES
  143  130       I          110 113        5B      INSTACK     EXITS
  176  160       J          130 132        4B      INSTACK     EXITS
  215  180       I          136 161       52B                 EXT REFS   NOT INNER
  222  170       J          139 153       24B                 EXT REFS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       IO            2                0 KARD    (1)                  1 KPRINT (1)
       BOUND         5                0 XMIN    (1)                  1 YMIN   (1)                  2 XMAX   (1)
                                      3 YMAX    (1)                  4 BLS    (1)
       SRCS          1                0 NSRCS   (1)
       FT         8002                0 GRDSZ   (1)                  1 CNR    (1)                  2 XLOC   (2000)
                                   2002 YLOC    (2000)            4002 DAYNO  (2000)            6002 DARKNO (2000)
       FACTI         3                0 RINV1   (1)                  1 RINV2  (1)                  2 RINV3  (1)
       DEBUG         3                0 CHECK   (1)                  1 REED   (1)                  2 TABRD  (1)
       CALC          2                0 DAYCNR  (1)                  1 DRKCNR (1)
       METRIC        3                0 METERS  (1)                  1 IMETER (1)                  2 IBOTH  (1)

EQUIV CLASSES    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       JL           50                0 XARRY   (50)

STATISTICS
  PROGRAM LENGTH                 12028      642
  CM LABELED COMMON LENGTH      175256     8021
        600008 CM USED
```

```
      SUBROUTINE PLOT                                                   PLOT   2
C     PLOT SAGE ARG                                                     PLOT   3
C         PLOTTER SELECTION                                             PLOT   4
C         = 1 CALCOMP                                                   PLOT   5
C         = 2 CALCOMP/SCATTERCHECK                                      PLOT   6
C         = 3 BASEMAN                                                   PLOT   7
C     TAPE ARGS                                                         PLOT   8
C         IN1 PLOT TAPE                                                 PLOT   9
C         IN2 EMBED TAPE                                                PLOT  10
C         IN3 SCATTER TAPE                                              PLOT  11
C         IN4 SCATTER ARE                                               PLOT  12
      COMMON /PLOT/ XMIN,XMAX,YMIN,YMAX                                 PLOT  13
      COMMON /PLOT/ IOPT,ICT,SCATABLE,SYTABLE,LABSE                     PLOT  14
      COMMON /PLOT/ XMIN,XMAX,YMIN,YMAX,XMEAS,YMEAS,NOS                 PLOT  15
      LOGICAL BLOCKED                                                   PLOT  16
      COMMON /MACHINE/ BITSWS                                           PLOT  17
      LOGICAL METERS                                                    PLOT  18
      MEAS MEAS                                                         PLOT  19
      DIMENSION NAME(10)                                                PLOT  20
      DIMENSION METERS                                                  PLOT  21
      DIMENSION LABEL(10)                                               PLOT  22
      DIMENSION IBEAT(3)                                                PLOT  23
      INTEGER PLOTTER,OPTION                                            PLOT  24
      INTEGER TEST,CONSTAB                                              PLOT  25
      DIMENSION MEASUREMENTS(20)                                        PLOT  26
      INTEGER START,STOP,CONTROL,SCATTABLE,LINE                         PLOT  27
      INTEGER PLOT,PLOTTER,SCATTER,MEAS                                 PLOT  28
      DIMENSION MEASUREMENTS(2)                                         PLOT  29
      DIMENSION IUNIT(4)                                                PLOT  30
      EQUIVALENCE (IUNIT(1),IN1),(IUNIT(2),IN2),(IUNIT(3),IN3),(IUNIT(4),PLOT  31
     1,IN4)                                                             PLOT  32
      EQUIVALENCE (IFILE(1),IN1),(IFILE(2),MEAS),(IFILE(3),SCC),(IFILE(4),PLOT  33
     1,SCAT)                                                            PLOT  34
      DATA MEASUREMENTS(1)/MEASUREMENTS    /,LIMITS    /                PLOT  35
      DATA MEAS /1HMEAS/      /LIMITS/      /LOCATION   /SCATTER  /     PLOT  36
                                                                        PLOT  37
C                                                                       PLOT  38
C     VARIABLE ILOT MUST BE INITIALIZED TO INPUT UNIT NUMBER            PLOT  39
C                                                                       PLOT  40
      DATA ZERO,ONE,TWO,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,NINE/0,1,2,3,4,5,PLOT  41
C     TAPE5,IN,PLOT,IOPT,ICT,SCATABLE,SYTABLE,LABSE,                    PLOT  42
      WRITE(NMSG,115)                                                   PLOT  43
  115 FORMAT(1H1,5X,8(8H********,      PLOT      ********))             PLOT  44
C     IF(NOS.NE.0) GO TO 120                                            PLOT  45
      PLOTTER=1                                                         PLOT  46
      IF(NOS.EQ.0)                                                      PLOT  47
C     PRINT *,'PLOT',NOS,' NOS WERE INPUT INSTEAD OF ZERO'              PLOT  48
        ALL=.FALSE.                                                     PLOT  49
        LABEL=.TRUE.                                                    PLOT  50
        ALL=.FALSE.                                                     PLOT  51
      WRITE(NMSG,*)'PLOT',NOS,' NOS WERE INPUT INSTEAD OF ZERO'         PLOT  52
  120 IF(NOS.EQ.1) GO TO 130                                            PLOT  53
      IF(NOS.EQ.2) GO TO 140                                            PLOT  54
      IF(NOS.EQ.3) GO TO 150                                            PLOT  55
      IF(NOS.EQ.4) GO TO 160                                            PLOT  56
      IF(NOS.EQ.5) GO TO 170                                            PLOT  57
      IF(NOS.EQ.6) GO TO 180                                            PLOT  58
      IF(NOS.EQ.7) GO TO 190                                            PLOT  59
      IF(NOS.EQ.8) GO TO 200                                            PLOT  60
      IF(NOS.EQ.9) GO TO 210                                            PLOT  61
      IF(NOS.EQ.10) GO TO 220                                           PLOT  62
      IF(NOS.EQ.11) GO TO 230                                           PLOT  63
      IF(NOS.EQ.12) GO TO 240                                           PLOT  64
      IF(NOS.EQ.13) GO TO 250                                           PLOT  65
      IF(NOS.EQ.14) GO TO 260                                           PLOT  66
      IF(NOS.EQ.15) GO TO 270                                           PLOT  67
      IF(NOS.EQ.16) GO TO 280                                           PLOT  68
      IF(NOS.EQ.17) GO TO 290                                           PLOT  69
      IF(NOS.EQ.18) GO TO 300                                           PLOT  70
      IF(NOS.EQ.19) GO TO 310                                           PLOT  71
      IF(NOS.EQ.20) GO TO 320                                           PLOT  72
      IF(NOS.EQ.21) GO TO 330                                           PLOT  73
      IF(NOS.EQ.22) GO TO 340                                           PLOT  74
      IF(NOS.EQ.23) GO TO 350                                           PLOT  75
      IF(NOS.EQ.24) GO TO 360                                           PLOT  76
      IF(NOS.EQ.25) GO TO 370                                           PLOT  77
      IF(NOS.EQ.26) GO TO 380                                           PLOT  78
      IF(NOS.EQ.27) GO TO 390                                           PLOT  79
      IF(NOS.EQ.28) GO TO 400                                           PLOT  80
      IF(NOS.EQ.29) GO TO 410                                           PLOT  81
      IF(NOS.EQ.30) GO TO 420                                           PLOT  82
      IF(NOS.EQ.31) GO TO 430                                           PLOT  83
      IF(NOS.EQ.32) GO TO 440                                           PLOT  84
      IF(NOS.EQ.33) GO TO 450                                           PLOT  85
      IF(NOS.EQ.34) GO TO 460                                           PLOT  86
      IF(NOS.EQ.35) GO TO 470                                           PLOT  87
      IF(NOS.EQ.36) GO TO 480                                           PLOT  88
      IF(NOS.EQ.37) GO TO 490                                           PLOT  89
      IF(NOS.EQ.38) GO TO 500                                           PLOT  90
      IF(NOS.EQ.39) GO TO 510                                           PLOT  91
      IF(NOS.EQ.40) GO TO 520                                           PLOT  92
      IF(NOS.EQ.41) GO TO 530                                           PLOT  93
      IF(NOS.EQ.42) GO TO 540                                           PLOT  94
      IF(NOS.EQ.43) GO TO 550                                           PLOT  95
      IF(NOS.EQ.44) GO TO 560                                           PLOT  96
      IF(NOS.EQ.45) GO TO 570                                           PLOT  97
      IF(NOS.EQ.46) GO TO 580                                           PLOT  98
      IF(NOS.EQ.47) GO TO 590                                           PLOT  99
      IF(NOS.EQ.48) GO TO 600                                           PLOT 100
      IF(NOS.EQ.49) GO TO 610                                           PLOT 101
      IF(NOS.EQ.50) GO TO 620                                           PLOT 102
      IF(NOS.EQ.51) GO TO 630                                           PLOT 103
      IF(NOS.EQ.52) GO TO 640                                           PLOT 104
      IF(NOS.EQ.53) GO TO 650                                           PLOT 105
```

```
      [illegible]                                                       PLOT  54
      [illegible]
      WRITE [illegible]
      [illegible]
      [illegible]
                                                                        PLOT  56
          [illegible] IF [illegible] FILES                              PLOT  57
                    [illegible]                                         PLOT  58
                                                                        PLOT  59
      [illegible]                                                       PLOT  60
          [illegible]                                                   PLOT  61
      [illegible]
      [illegible]                                                       PLOT  62
      [illegible]                                                       PLOT  63
      [illegible]                                                       PLOT  64
      READ [illegible]                                                  PLOT  65
    2 FORMAT [illegible]                                                PLOT  66
      [illegible]                                                       PLOT  67
      [illegible]                                                       PLOT  68
    3 CONTINUE                                                          PLOT  69
      [illegible]                                                       PLOT  70
      [illegible]                                                       PLOT  71
    6 [illegible]                                                       PLOT  72
      WRITE(*PRINT,7)                                                   PLOT  73
    7 FORMAT(1H0,2 X,*THE [illegible] REQUESTED BUT NOT AVAILAR         PLOT  74
     1[illegible]                                                       PLOT  75
    8 WRITE(*PRINT,9) [illegible]                                       PLOT  76
    9 FORMAT(25X,A10)                                                   PLOT  77
      [illegible]                                                       PLOT  78
      [illegible]                                                       PLOT  79
      WRITE [illegible] NAME [illegible] REQUESTED FILE [illegible] TAPE 55
 1111 WRITE([illegible])                                                PLOT  80
      WRITE([illegible])                                                PLOT  81
   10 FORMAT(A4)                                                        PLOT  82
      READ PLOT-3 [illegible] PLOT SPECIFICATIONS
      READ [illegible],PERCSM,START,STOP,LSTART,                        PLOT  84
     1[illegible]
   11 FORMAT [illegible]
      [illegible]                                                       PLOT  87
      PLOT-3 [illegible]
   16 [illegible] $ PERCSM=[illegible] $ START=[illegible]              PLOT  88
      [illegible] $ INC= $ LINE=[illegible]                             PLOT  89
      [illegible]                                                       PLOT  90
                                                                        PLOT  91
                                                                        PLOT  92
          [illegible]                                                   PLOT  93
                                                                        PLOT  94
                                                                        PLOT  95
      [illegible]                                                       PLOT  96
  111 [illegible]
      [illegible]                                                       PLOT  98
      [illegible]                                                       PLOT  99
      [illegible]                                                       PLOT 100
      [illegible]                                                       PLOT 101
      [illegible]                                                       PLOT 102
      [illegible]                                                       PLOT 103
      [illegible]                                                       PLOT 104
```

```
      MAG = DEFAULT 1.                                                  PLOT 105
      IF (MAG.GT.9.0.OR.MAG.LT.0.01) MAG=1.0                            PLOT 106
      IF(MAG.EQ.1.0) STARS(4)=2H**                                      PLOT 107
C     PERCSM = DEFAULT .333                                             PLOT 108
      IF(PERCSM.GT.9.0.OR.PERCSM.LT.0.01) PERCSM=.333                   PLOT 109
      IF(PERCSM.EQ.333) STARS(5)=2H**                                   PLOT 110
C     START = DEFAULT 5
      IF(START.GT.999.OR.START.LT.1) START=55
      IF(START.EQ.55) STARS(6)=2H**
C     STOP = DEFAULT 75
      IF(STOP.GT.999.OR.STOP.LT.1) STOP=75
      IF(STOP.EQ.75) STARS(7)=2H**
C     LSTART = DEFAULT 55
      IF((LSTART.GT.999).OR.(LSTART.LT.1)) LSTART=55
      IF(LSTART.EQ.55) STARS(8)=2H**
C     LSTOP = DEFAULT 75
      IF((LSTOP.GT.999).OR.(LSTOP.LT.1)) LSTOP=75
      IF(LSTOP.EQ.75) STARS(9)=2H**
C     LABEL = DEFAULT 1                                                 PLOT 123
      IF((LABEL.NE.-1).AND.(LABEL.EQ.0).AND.(LABEL.NE.1)) LABEL=1       PLOT 124
      IF(LABEL.EQ.1)      STARS(10)=2H**                                PLOT 125
C     INC = DEFAULT 5                                                   PLOT 126
      IF((INC.GT.99).OR.(INC.LE.0)) INC=5                               PLOT 127
      IF(INC.EQ.5) STARS(11)=2H**                                       PLOT 128
C     LINC= DEFAULT5                                                    PLOT 129
      IF((LINC.GT.99).OR.(LINC.LE.0)) LINC=5                            PLOT 130
      IF(LINC.EQ.5) STARS(12)=2H**                                      PLOT 131
C     INPUT VALIDITY CHECK                                              PLOT 132
      WRITE(KPRINT,151)                                                 PLOT 133
  151 FORMAT(1H0,20X,30HFOLLOWING FILES WERE REQUESTED/)                PLOT 134
      DO 153 I=1,4                                                      PLOT 135
      IF(IFILE(I).EQ.1) WRITE(KPRINT,152) HEAD(I)                       PLOT 136
  152 FORMAT(25X,A10)                                                   PLOT 137
  153 CONTINUE                                                          PLOT 138
C     CHECK PLOT BOUNDS AND LABEL BOUNDS
      IF(START.GE.STOP) GO TO 300                                       PLOT 139
      IF(LSTART.GE.LSTOP) GO TO 320                                     PLOT 140
      I5=0                                                              PLOT 141
  200 J1=MOD(START,INC)                                                 PLOT 142
      J2=MOD(STOP,INC)                                                  PLOT 143
      IF(J1.EQ.J2) GO TO 210                                            PLOT 144
      I5=1                                                              PLOT 145
      STOP=STOP+1                                                       PLOT 146
      GO TO 200                                                         PLOT 147
  210 IF(I5.EQ.1) WRITE(KPRINT,220) STOP                                PLOT 148
  220 FORMAT(15X,"WARNING..START + (INC * X ) .NE. STOP",/15X,"STOP INCRPLOT 149
     1EASED TO ",I3)                                                    PLOT 150
  230 J1=MOD(LSTART,INC)                                                PLOT 151
      J2=MOD(LSTOP,INC)                                                 PLOT 152
      IF(J1.EQ.J2) GO TO 240                                            PLOT 153
      I5=2                                                              PLOT 154
      LSTOP=LSTOP+1                                                     PLOT 155
      GO TO 230                                                         PLOT 156
  240 IF(I5.EQ.2) WRITE(KPRINT,250) LSTOP                               PLOT 157
  250 FORMAT(15X,"WARNING..LSTART+(INC*X) .NE. LSTOP",/15X,"LSTOP INCREAPLOT 158
     1SED TO ",I3)                                                      PLOT 159
      GO TO 105                                                         PLOT 160
```

```
      300  WRITE(KPRINT,310)                                                 PLOT 161
      310  FORMAT("START ,GE.STOP...JOB ENDED")                             PLOT 162
           READ*D IOUT                                                       PLOT 163
175        GO TO 900                                                         PLOT 164
      320  WRITE(KPRINT,330)                                                 PLOT 165
      330  FORMAT("LSTART ,GE. LSTOP...JOB ENDED")                          PLOT 166
           REWIND IOUT                                                       PLOT 167
           GO TO 900                                                         PLOT 168
180   C                                                                      PLOT 169
      C                                                                      PLOT 170
      C    DEFAULT AND ERRORS CHECKED - CREATE CARDS                         PLOT 171
      C                                                                      PLOT 172
      C                                                                      PLOT 173
185   C                                                                      PLOT 174
      C       THE FOLLOWING COMPARES BOUNDARY VALUES FROM COMMON             PLOT 175
      C       WITH THOSE READ FROM PGRID TAPE. IF DIFFERENT PGRID            PLOT 176
      C       VALUES USED.                                                   PLOT 177
      C                                                                      PLOT 178
190    105 IF(PUDG.NE.1) GO TO 108                                           PLOT 179
      C    PGRID INFORMATION IS FOUND ON TAPE 1(IN1)
           REWIND IN1                                                        PLOT 180
           READ(IN1,166)GRDNAME,GRDSZ,XMIN,YMIN,XMAX,YMAX                   PLOT 181
      166  FORMAT(A10,5E10.0)                                                PLOT 182
195        IF((XMIN.EQ.XMIN1).AND.(YMIN.EQ.YMIN1).AND.(XMAX.EQ.XMAX1)        PLOT 183
          1.AND.(YMAX.EQ.YMAX1)) GO TO 109                                   PLOT 184
           WRITE(KPRINT,107) XMIN,XMIN1,YMIN,YMIN1,XMAX,XMAX1,YMAX,YMAX1     PLOT 185
      107  FORMAT(1H0, 7X,*WARNING...PUDGLE GRID BOUNDS DO NOT MATCH SPECIFIEPLOT 186
          1D BOUNDS...*//25X,*PGRID VALUES USED*,10X,*SPECIFIED BOUNDS*/     PLOT 187
200        11SX,*XMIN*,6X,F10.2,17X,F10.2/                                   PLOT 188
           11SX,*YMIN*,6X,F10.2,17X,F10.2/                                   PLOT 189
           11SX,*XMAX*,6X,F10.2,17X,F10.2/                                   PLOT 190
           11SX,*YMAX*,6X,F10.2,17X,F10.2)                                   PLOT 191
           GO TO 109                                                         PLOT 192
205    108 XMIN=XMIN1                                                        PLOT 193
           YMIN=YMIN1                                                        PLOT 194
           XMAX=XMAX1                                                        PLOT 195
           YMAX=YMAX1                                                        PLOT 196
      109  XSCALE=SCALE/PERCX/12.0
210        YSCALE=SCALE/PERCY/12.0
           IF (METERS) XSCALE=XSCALE*0.02540 *12.0
           IF (METERS) YSCALE=YSCALE*0.02540 *12.0
           XOR=5.0*MAG                                                       PLOT 199
           YOR=0.5                                                           PLOT 200
215   C    WRITE OUT TAPE 55 INFORMATION ABOUT BOUNDS, MAGNIFICATION,
      C    AND SCALING.
           WRITE(IOUT,119)GRMAPS,XSCALE,YSCALE,XMIN,XMAX,YMIN,YMAX,XOR,YOR   PLOT 201
      110  FORMAT(A4,2X,2E8.3,4E8.3,2E8.3)                                   PLOT 202
           WRITE(IOUT,115) GRSCLE,MAG                                        PLOT 203
220    115 FORMAT(A4,2X,F4.3)                                                PLOT 204
           IF(SYTABLE.GE. 0) GO TO 116                                       PLOT 205
           SYTABLE=(YMAX+YMIN)/XSCALE*PERCX*MAG+YOR+5.                       PLOT 206
           SYTABLE=11.
           IF(SYTABLE.LE.11.) GO TO 117
225        IF((YMAX+YMIN)/XSCALE*PERCX*MAG+YOR+5) .GT. 11.) SYTABLE=34.5
      C
      117  WRITE(IOUT,120) GRDIMT,SXTABLE,SYTABLE                           PLOT 211
      120  FORMAT(A4,2X,2E8.3)                                               PLOT 212
```

```
      C
      C
      C     IF 2ND PLOT
      C
      C
      116   IF(PLTCT.EQ.1) GO TO 395
            WRITE(IOUT ,301) 4HPAGE
       301  FORMAT(A4)
      C
      C
      C     IF PUDDLEGRID
      C
      C
       395  IF(PUDG.NE.1) GO TO 495
       400  READ(IN1,99)
            IF(EOF(IN1))430,410
      410   WRITE(IOUT,99)
            IF (IDUMP.NE.0)  WRITE(KPRINT,99)
            GO TO 400
       430  WRITE(IOUT ,440) 4HPHS3
       440  FORMAT(A4)
            ZMIN=START
            ZLMIN=LSTART
            D2=INC
            D2L=LINC
            NLEVS=(STOP-START)/D2+1.0001
            KLEV=0
            L1=LABEL
            L2=1
            ID=-1
            DISL=2.0
            HGTL=.167
            DIST=0
            TLNG=0
            TLER=(PERCSM*2)/(XSCALE+YSCALE)*GRDSZ
            I=2
            SKIP=0
      C     WRITE OUT PGRID INFO INTO PHS3 OF TAPE 55
            WRITE(IOUT ,441)4HPLOT,ZMIN,ZLMIN,D2,D2L,NLEVS,KLEV,L1,L2,ID,DISL,
           1HGTL,DIST,TLNG,TLER,I,SKIP
       441  FORMAT(A4,2X,2F7.0,2F6.0,I5,I4,3I2,5F4.2,I1,F4.2)
      C
      C
      C     IF LOCATION
      C
      C
       495  IF(LOC.NE.1) GO TO 530
      C     TAPE 3 CONTAINS INFORMATION FROM LOCATOR
            REWIND IN3
            READ(IN3,99)
            WRITE(IOUT,99)
       500  READ(IN3,501) XPOS,YPOS,HITE,ANG,(ITEXT(I),I=1,3),L
       501  FORMAT(6X,2F8.0,8X,2F8.3,2X,2A10,A4,I2)
            IF(EOF(IN3).NE.0) GO TO 530
      C
      C        THE FOLLOWING CENTERS THE X-ORDER ON THE POINT. OTHERWISE
      C        THE POINT WOULD BE AT THE LOWER LEFT CORNER OF THE MARK.
```

```
      C
            ANG1=ANG*3.1416/180.0
            XOFF=.5*(6./7.*HITE)*XSCALE
            YOFF=.5*(HITE)*YSCALE
            YPRIME=(SQRT(XOFF**2+YOFF**2))*
           1       (SIN(ANG1+(ATAN(YOFF/XOFF))))
            XPRIME=(SQRT(XOFF**2+YOFF**2))*
           1       (COS(ANG1+(ATAN(YOFF/XOFF))))
            XPOS=XPOS-XPRIME
            YPOS=YPOS-YPRIME
      C
      C        THE FOLLOWING CHECKS FOR ENOUGH ROOM TO PRINT THE
      C        LABELING INFORMATION WITHIN THE BOUNDARY.
      C
            LENTH=L*6./7.*HITE*XSCALE
      C        IF ENOUGH ROOM GIVEN ANGLE
            IF(((XPOS+LENTH*COS(ANG1)).GT.XMAX).OR.
           1((YPOS+LENTH*SIN(ANG1)).GT.YMAX).OR.
           1((YPOS+LENTH*SIN(ANG1)).LT.YMIN).OR.
           1((XPOS+LENTH*COS(ANG1)).LT.XMIN)) GO TO 21
            GO TO 51
      C        IF ENOUGH ROOM 90 DEGREES
       21   IF((YPOS+LENTH).GT.YMAX) GO TO 22
            ANG=90.0
            GO TO 51
      C        IF ENOUGH ROOM 270 DEGREES
       22   IF((YPOS-LENTH).LT.YMIN) GO TO 23
            ANG=270.0
            GO TO 51
      C        IF ENOUGH ROOM 180 DEGREES
       23   IF((XPOS-LENTH).LT.XMIN) GO TO 49
            ANG=180.0
            GO TO 51
       49   GO TO 51
      C     WRITE OUT LOC INFO TO TAPE 55
        51  WRITE(IOUT,502)XPOS,YPOS,HITE,ANG,(ITEXT(I),I=1,3)
       502  FORMAT(4HTEXT,2X,2F8.0,8X,2F8.3,2H 1,2A10,A4)
            GO TO 500
      C
      C
      C     IF SCATTER
      C
      C
       530  IF(SCAT.NE.1) GO TO 560
      C     TAPE 4 CONTAINS INFORMATION FROM SCATTER
            REWIND IN4
       535  READ(IN4,99)
            IF(EOF(IN4)) 560,545
      C     WRITE OUT SCATTER INFO TO TAPE 55
       545  WRITE(IOUT,99)
            GO TO 535
      C
      C
      C     IF BASE
      C
      C
       560  IF(BAS.NE.1) GO TO 580
```

```
C     TAPE 2 CONTAINS INFORMATION FROM BASE
      REWIND IN2                                                        PLOT 323
  565 READ(IN2,99)                                                      PLOT 324
      IF(EOF(IN2))580,572                                               PLOT 326
  572 WRITE(IOUT,99)                                                    PLOT 327
   99 FORMAT(80H                                                        PLOT 328
     1                                                                  PLOT 329
      GO TO 565                                                         PLOT 330
  580 WRITE(KPRINT,575)                                                 PLOT 331
  575 FORMAT(1H0,25X,20HVALUES USED BY PLOT /)                          PLOT 332
      WRITE(KPRINT,590) STARS(1),SCALE,STARS(2),PERCX,STARS(3),PERCY    PLOT 333
     1,STARS(4),MAG,STARS(5),PERCSM,STARS(6),START,STARS(7),STOP,       PLOT 334
     1STARS(8),LSTART,STARS(9),LSTOP,STARS(10),LABEL,STARS(11),INC,     PLOT 335
     1STARS(12),LINC,GRDSZ                                              PLOT 336
  590 FORMAT(18X,A2,10HSCALE     =,F7.1//                               PLOT 337
     118X,A2,10HPERCENT X=,F4.2,10X,A2,10HPERCENT Y=,F4.2//             PLOT 338
     118X,A2,10HMAG       =,F4.2,10X,A2,10HPERC SMTH=,F4.2//            PLOT 339
     118X,A2,10HSTART     =,I3,11X,A2,10HSTOP      =,I3//               PLOT 340
     118X,A2,10HL START   =,I3,11X,A2,10HL STOP    =,I3//               PLOT 341
     118X,A2,10HLABEL     =,I2,12X,A2,10HINCREMENT=,I2//                PLOT 342
     118X,A2,10HL INCREMT=,I2,14X,10HGRID SIZE=,F6.0)                   PLOT 343
      WRITE(KPRINT,13)                                                  PLOT 344
   13 FORMAT(1H0,18X,29HSTARS INDICATE DEFAULT VALUES)                  PLOT 345
C                                                                       PLOT 346
C                                                                       PLOT 347
C     PRINT ANY USER TEXT                                               PLOT 348
C                                                                       PLOT 349
C                                                                       PLOT 350
      WRITE(IOUT  ,690) 4HPHS4                                          PLOT 351
      WRITE(IOUT,690)4HBRDR                                             PLOT 352
  690 FORMAT(A4)                                                        PLOT 353
      IF(IFLAG.EQ.1) GO TO 800                                          PLOT 354
      WRITE(KPRINT,156)                                                 PLOT 355
  156 FORMAT(1H0,18X,36HFOLLOWING CARDS WERE USER TEXT INPUT)           PLOT 356
C     READ PLT-4 CARD WITH USER TEXT INPUT
  700 READ(KARD,705)X,Y,HT,ANGLE,IC,(TEXT(I),I=1,38),STAR               PLOT 357
      ANGLE1=ANGLE*3.1416/180.0                                         PLOT 358
      DO 701 I=1,200                                                    PLOT 359
  701 HGT(I)=0.0                                                        PLOT 360
  705 FORMAT(4F10.0,I1,39A1)                                            PLOT 361
      IF(EOF(KARD).NE.0.)GO TO 800                                      PLOT 362
      IF((STAR.EQ.1H*).AND.(X.EQ.0)) GO TO 800                          PLOT 363
      IFLAG=2                                                           PLOT 364
      WRITE(KPRINT,157)X,Y,HT,ANGLE,IC,(TEXT(I),I=1,38),STAR            PLOT 365
  157 FORMAT(1H0,18X,1H",4F10.3,I1,39A1,1H")                            PLOT 366
      DO 720 J=1,38                                                     PLOT 367
C     IF $ CONTINUE TEXT ON NEXT CARD(PLT-5)
      IF(TEXT(J).EQ.1H$) GO TO 730                                      PLOT 368
  720 CONTINUE                                                          PLOT 369
      J=38                                                              PLOT 370
  730 HGT(1)=HT                                                         PLOT 371
      IF (STAR.EQ.1H*) GO TO 801                                        PLOT 372
  735 K=J+68                                                            PLOT 373
C     READ PLT-5 CARD
      READ(KARD,740) HT1,(TEXT(I),I=J,K),STAR                           PLOT 374
      WRITE(KPRINT,158)HT1,(TEXT(I),I=J,K),STAR                         PLOT 375
  158 FORMAT(1H ,18X,F10.3,70A1)                                        PLOT 376
```

```
                740  FORMAT(F10.0,72A1)                                              PLOT 377
                     IF((HT1.EQ.HT).OR.(HT1.EQ.0)) GO TO 745                         PLOT 378
                     HGT(J)=HT1                                                      PLOT 379
                745  DO 750 J2=J,K                                                   PLOT 380
                     HT=HT1                                                          PLOT 381
                     IF(TEXT(J2).EQ.1H$) GO TO 760                                   PLOT 382
                750  CONTINUE                                                        PLOT 383
                     J2=K                                                            PLOT 384
                760  J=J2                                                            PLOT 385
               C     MAYBE MORE TEXT INPUT
                     IF(STAR.NE.1H*) GO TO 735                                       PLOT 386
                801  K1=1                                                            PLOT 387
                     DO 850 K=2,J                                                    PLOT 388
                     I1=0 $ I2=0 $ I3=0                                              PLOT 389
                     IF(K.EQ.J) GO TO 815                                            PLOT 390
                     IF(HGT(K).EQ.0) GO TO 850                                       PLOT 391
                815  K2=K-K1                                                         PLOT 392
               C    K2=NUMBER OF CHARACTERS - THIS HEIGHT                           PLOT 393
               C     K1= POSITION OF HEIGHT AND STARTING CHARACTER                  PLOT 394
                     IF(K2.GT.24) GO TO 820                                          PLOT 395
                     I1=K1+K2-1                                                      PLOT 396
                     GO TO 845                                                       PLOT 397
                820  IF(K2.GT.90) GO TO 830                                          PLOT 398
                     I1=K1+23                                                        PLOT 399
                     I2=K2+K1-1                                                      PLOT 400
                     GO TO 845                                                       PLOT 401
                830  I1=23+K1                                                        PLOT 402
                     I2=K1+89                                                        PLOT 403
                     I3=K2                                                           PLOT 404
               C CHOOSE FORMAT ACCORDING TO WHETHER OR NOT IC=0 OR IC=1
                     IF(IC.NE.0) GO TO 779                                           PLOT 405
                845  WRITE(IOUT  ,780)4HTEXT,X,Y,Z,HGT(K1),ANGLE,IC,(TEXT(I),I=K1,I1)  PLOT 406
                780  FORMAT(A4,2X,5F8.3,I2,24A1)
                     GO TO 782
                 779 WRITE(IOUT,781)4HTEXT,X,Y,Z,HGT(K1),ANGLE,IC,(TEXT(I),I=K1,I1)
                 781 FORMAT(A4,2X,2F8.0,3F8.3,I2,24A1)
                 782 IF(I2.EQ.0) GO TO 840
                     I1=I1+1                                                         PLOT 408
               C     WRITE USER TEXT TO TAPE 55
                     WRITE(IOUT,790) 4HCTEX,(TEXT(I),I=I1,I2)                        PLOT 409
                     IF(I3.EQ.0) GO TO 840                                           PLOT 410
                     I2=I2+1                                                         PLOT 411
                     WRITE(IOUT  ,790)4HCTEX,(TEXT(I),I=I2,I3)                       PLOT 412
                790  FORMAT(A4,2X,66A1)                                             PLOT 413
                840  X=X+K2*(6./7.) *HGT(K1)*COS(ANGLE1)                            PLOT 414
                     Y=Y+K2*(6./7.)*HGT(K1)*SIN(ANGLE1)                              PLOT 415
                     K1=K                                                            PLOT 416
                850  CONTINUE                                                        PLOT 417
                     GO TO 700                                                       PLOT 418
               C                                                                     PLOT 419
               C                                                                     PLOT 420
               C     PRINT IDENTIFYING TEXT (TIME OF DAY)                            PLOT 421
               C                                                                     PLOT 422
               C                                                                     PLOT 423
                900  PLOTY=((YMAX-YMIN)*GROSZ)/YSCALE*PERCY*MAG+YOR                  PLOT 424
                     PLOTX=(XMAX-XMIN)/XSCALE*PERCX*MAG+XOR                          PLOT 425
                     IF(IFLAG.EQ.1) WRITE(XPRINT,902)                                PLOT 426
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                      IF((IFLAG.NE.2).AND.(IFLAG.NE.1)) WRITE(KPRINT,802)                PLOT 427
                  802 FORMAT(1H0,18X,24HNO USER TEXT CARDS INPUT)                        PLOT 428
                      WRITE(KPRINT,159)PLOTX,PLOTY                                       PLOT 429
      460             FORMAT(1H0,18X,12HTHIS PLOT IS,I4,10H INCHES BY,I4,7H INCHES)      PLOT 430
                      L10=2                                                              PLOT 431
                C     SCALE IF MEASUREMENTS ARE IN METERS
                      IF(METERS) L10=1                                                   PLOT 432
                      FAKTOR=(XSCALE+YSCALE)/2/MAG                                       PLOT 433
      465             WRITE(KPRINT,149)FAKTOR,MEASURE(L10)                               PLOT 434
                  149 FORMAT(1H0,18X,20HONE INCH IS EQUAL TO,F7.0,1X,A10)                PLOT 435
                      DO 630 J1=1,50                                                     PLOT 436
                      IF(PLOTX.LE.J1*8.5) GO TO 633                                      PLOT 437
                  630 CONTINUE                                                           PLOT 438
      470         633 DO 634 J=1,10                                                      PLOT 439
                      IYSZ=SYTABLE+0.4
                      IF(PLOTY.LE.J*IYSZ) GO TO 635                                      PLOT 440
                  634 CONTINUE                                                           PLOT 441
                  635 Z1=0 $ X1=1.0*MAG $ ANGLE=90.0                $ HT=.3*MAG          PLOT 442
      475             X2=2.0*MAG                                                         PLOT 443
                      CALL DATE(B)                                                       PLOT 444
                      CALL GETJN(K)                                                      PLOT 445
                      DO 645  I=1,J                                                      PLOT 446
                      Y1=((I-1)*IYSZ+1)                                                  PLOT 447
      480       C     WRITE OUT HEIGHT, ANGLE MEASUREMENTS TO TAPE 55
                      WRITE(IOUT,640)X1,Y1,Z1,HT,ANGLE,IC1,K,B                           PLOT 448
                  640 FORMAT(4HTEXT,2X,5F8.3,I2,2A10,2X,2HPL)                            PLOT 449
                C     WRITE OUT NUMBER OF PLOTS REQUESTED TO TAPE 55
                      WRITE(IOUT,641)PLTCT,I,J                                           PLOT 450
      485         641 FORMAT(4HCTEX,2X,2HOT,I2,3X,I1,1X,2HOF,1X,I1)                      PLOT 451
                      WRITE(IOUT,642)X2,Y1,Z1,HT,ANGLE,IC1,SCALE                         PLOT 452
                  642 FORMAT(4HTEXT,2X,5F8.3,I2,8HSCALE 1:,F7.0,2X,7H1 INCH=)            PLOT 453
                      WRITE(IOUT,643)FAKTOR,MEASURE(L10)                                 PLOT 454
                  643 FORMAT(4HCTEX,2X,F6.0,1X,A10)                                      PLOT 455
      490         645 CONTINUE                                                           PLOT 456
                      WRITE(IOUT,301)4HEND                                               PLOT 457
                      WRITE(KPRINT,160) J1,J                                             PLOT 458
                  160 FORMAT(1H0,18X,14HIT CONSISTS OF,I3,* PAGES IN THE X DIRECTIO*,    PLOT 459
                     1*N AND*,I3,* SECTIONS IN THE Y DIRECTION*)
      495       C     COMPUTE TIME IN PLOT
                      CPTIME1=SECOND(CP)                                                 PLOT 461
                      CPTIME=CPTIME1-CPTIME                                              PLOT 462
                      WRITE(KPRINT,101)CPTIME                                            PLOT 463
                  101 FORMAT(1H0,21X,21H..... TIME IN PLOT IS,F8.3,6H .....)             PLOT 464
      500         900 RETURN                                                             PLOT 465
                      END                                                                PLOT 466
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
1 PLOT	1	500

VARIABLES	SN	TYPE	RELOCATION								
2644	ANG	REAL		REFS	287	321	DEFINED	280	309	313	317
2677	ANGLE	REAL		REFS	379	386	431	434	481	486	
				DEFINED	378	474					
2701	ANGLE1	REAL		REFS	444	445	DEFINED	379			
2666	ANG1	REAL		REFS	290	292	4*302	DEFINED	287		
2611	B	REAL		REFS	48	51	476	481			
2726	BAS	INTEGER		REFS	27	32	342	DEFINED	57		
4	BDS	LOGICAL	BOUND	REFS	14	15	59				
2612	C	REAL		REFS	49	51					
2607	CP	REAL		REFS	41	496					
2606	CPTIME	REAL		REFS	497	498	DEFINED	41	497		
2720	CPTIME1	REAL		REFS	497	DEFINED	496				
2653	DISL	REAL		REFS	267	DEFINED	259				
2655	DIST	REAL		REFS	267	DEFINED	261				
2644	D2	REAL		REFS	254	267	DEFINED	252			
2645	D2L	REAL		REFS	267	DEFINED	253				
2712	FAKTOR	REAL		REFS	465	488	DEFINED	464			
2631	GRDNAME *	REAL		DEFINED	193						
2614	GRDSZ	REAL		REFS	263	353	454	DEFINED	53	193	
2745	HEAD	REAL	ARRAY	REFS	20	84	146	DEFINED	35		
3264	HGT	REAL	ARRAY	REFS	25	415	431	434	444	445	
				DEFINED	381	393	402				
2654	HGTL	REAL		REFS	267	DEFINED	260				
2663	HITE	REAL		REFS	288	289	300	321	DEFINED	280	
2676	HT	REAL		REFS	386	393	401	481	486		
				DEFINED	378	404	474				
2703	HT1	REAL		REFS	398	2*401	402	404	DEFINED	397	
2615	I	INTEGER		REFS	55	70	71	84	2*146	267	280
				321	378	381	386	397	398	431	434
				439	442	479	484	DEFINED	54	68	145
				264	280	321	378	380	386	397	398
				431	434	439	442	478			
2700	IC	INTEGER		REFS	386	430	431	434	DEFINED	378	
1323	IC1	INTEGER		REFS	481	486	DEFINED	39			
2652	ID	INTEGER		REFS	267	DEFINED	258				
2625	IDUMP	INTEGER		REFS	246	DEFINED	93				
2725	IFILE	INTEGER	ARRAY	REFS	21	4*32	70	146			
2610	IFLAG	INTEGER		REFS	374	456	2*457	DEFINED	46	100	385
2624	INC	INTEGER		REFS	2*137	138	153	154	162	163	252
				353	DEFINED	93	99	137			
2721	IN1	INTEGER		REFS	30	244	DEFINED	39	I/O REFS	192	193
				243							
2722	IN2	INTEGER		REFS	30	346	DEFINED	39	I/O REFS	344	345
2723	IN3	INTEGER		REFS	30	282	DEFINED	39	I/O REFS	277	278
				280							
2724	IN4	INTEGER		REFS	30	333	DEFINED	39	I/O REFS	331	332
1322	IOUT	INTEGER		DEFINED	39	I/O REFS	89	90	174	178	217
				219	227	235	245	248	267	279	321
				335	347	371	372	431	434	439	442
				481	484	486	488	491			
2617	ITEST	INTEGER		REFS	75	DEFINED	71	I/O REFS	72	73	76
2751	ITEXT	INTEGER	ARRAY	REFS	22	321	DEFINED	280			
2721	IUNIT	INTEGER	ARRAY	REFS	29	4*30	71				
2713	IYSZ	INTEGER		REFS	472	479	DEFINED	471			
2705	I1	INTEGER		REFS	431	434	437	439	DEFINED	413	420
				423	426	437					

VARIABLES	SN	TYPE	RELOCATION							
2706	I2	INTEGER		REFS	436	439	441	442	DEFINED	413	424
				427	441						
2707	I3	INTEGER		REFS	440	442	DEFINED	413	428		
2626	IS	INTEGER		REFS	159	168	DEFINED	152	156	165	
2702	J	INTEGER		REFS	390	395	397	398	402	403	412
				414	472	478	484	492	DEFINED	388	392
				408	470						
2616	JFLAG	INTEGER		REFS	78	80	DEFINED	67	86		
2627	J1	INTEGER		REFS	155	164	468	492	DEFINED	153	162
				467							
2630	J2	INTEGER		REFS	155	164	405	408	DEFINED	154	163
				403	407						
2613	K	INTEGER		REFS	50	51	397	398	403	407	414
				415	416	446	477	481	DEFINED	395	412
0	KARD	INTEGER	IO	REFS	12	96	383	I/O REFS	57	93	378
				397							
2647	KLEV	INTEGER		REFS	267	DEFINED	255				
1	KPRINT	INTEGER	IO	REFS	12	I/O REFS	42	51	60	81	84
				143	146	159	168	172	176	197	246
				351	353	364	375	386	398	456	457
				459	465	492	498				
2704	K1	INTEGER		REFS	416	420	423	424	426	427	2*431
				2*434	444	445	DEFINED	411	446		
2710	K2	INTEGER		REFS	419	420	422	424	428	444	445
				DEFINED	416						
2665	L	INTEGER		REFS	300	DEFINED	280				
2604	LABEL	INTEGER		REFS	26	3*134	135	256	353		
				DEFINED	93	99	134				
3	LARGE	LOGICAL	PLOTCM	REFS	13	15	224				
2673	LENTH	INTEGER		REFS	4*302	308	312	316	DEFINED	300	
2605	LINC	INTEGER		REFS	26	2*140	141	253	353		
				DEFINED	93	99	140				
2727	LOC	INTEGER		REFS	27	32	275	DEFINED	57		
2602	LSTART	INTEGER		REFS	26	2*128	129	151	162	251	353
				DEFINED	93	99	128				
2603	LSTOP	INTEGER		REFS	26	2*131	132	151	163	166	168
				353	DEFINED	93	99	131	166		
2650	1	INTEGER		REFS	267	DEFINED	256				
2711	L10	INTEGER		REFS	465	488	DEFINED	461	463		
2651	L2	INTEGER		REFS	267	DEFINED	257				
2574	MAG	REAL		REFS	18	2*116	117	213	219	222	225
				353	454	455	464	2*474	475		
				DEFINED	93	98	116				
3574	MEASURE	INTEGER	ARRAY	REFS	28	465	488	DEFINED	34		
0	METERS	LOGICAL	METRIC	REFS	16	17	211	212	463		
2644	NLEVS	INTEGER		REFS	267	DEFINED	254				
2623	PERCSM	REAL		REFS	2*119	120	263	353	DEFINED	93	98
				114							
2621	PENCX	REAL		REFS	2*110	111	209	222	353	455	
				DEFINED	93	98	110				
2622	PENCY	REAL		REFS	2*113	114	210	225	353	454	
				DEFINED	93	98	113				
2575	PLOTX	INTEGER		REFS	23	459	468	DEFINED	455		
2576	PLOTY	INTEGER		REFS	23	459	472	DEFINED	454		
0	PLTCT	INTEGER	PLOTCM	REFS	13	27	45	51	234	484	
				DEFINED	45						
2725	PUDG	INTEGER		REFS	27	32	59	190	242		

VARIABLES	SN	TYPE		RELOCATION							
					DEFINED	57					
2620	SCALE	REAL			REFS	107	108	209	210	353	486	
					DEFINED	93	98	107				
2730	SCAT	INTEGER			REFS	27	32	329	DEFINED	57		
2660	SKIP	REAL			REFS	267	DEFINED	265				
2577	STAR	INTEGER			REFS	24	384	386	394	398	410	
					DEFINED	378	397					
2731	STARS	REAL	ARRAY		REFS	19	12*353	DEFINED	55	108	111	114
					117	120	123	126	129	132	135	138
					141							
2600	START	INTEGER			REFS	26	2*122	123	150	153	250	254
					353	DEFINED	93	98	122			
2601	STOP	INTEGER			REFS	26	2*125	126	150	154	157	159
					254	353	DEFINED	93	99	125	157	
1	SXTABLE	REAL		PLOTCM	REFS	13	221	227	DEFINED	222		
2	SYTABLE	REAL		PLOTCM	REFS	13	227	471	DEFINED	223	225	
2754	TEXT	INTEGER	ARRAY		REFS	24	386	390	398	405	431	434
					439	442	DEFINED	378	397			
2657	TLER	REAL			REFS	267	DEFINED	263				
2656	TLNG	REAL			REFS	267	DEFINED	262				
2674	X	REAL			REFS	384	386	431	434	444		
					DEFINED	378	444					
2634	XMAX	REAL			REFS	195	197	217	222	302	455	
					DEFINED	193	207					
2	XMAX1	REAL		BOUND	REFS	14	195	197	207			
2632	XMIN	REAL			REFS	195	197	217	222	302	316	455
					DEFINED	193	205					
0	XMIN1	REAL		BOUND	REFS	14	195	197	205			
2667	XOFF	REAL			REFS	2*290	2*292	DEFINED	288			
2640	XOR	REAL			REFS	217	222	455	DEFINED	213		
2661	XPOS	REAL			REFS	294	2*302	316	321	DEFINED	280	294
2672	XPRIME	REAL			REFS	294	DEFINED	292				
2636	XSCALE	REAL			REFS	211	217	222	263	288	300	455
					464	DEFINED	209	211				
2715	X1	REAL			REFS	481	DEFINED	474				
2716	X2	REAL			REFS	486	DEFINED	475				
2675	Y	REAL			REFS	386	431	434	445	DEFINED	378	445
2635	YMAX	REAL			REFS	195	197	217	225	302	308	454
					DEFINED	193	208					
3	YMAX1	REAL		BOUND	REFS	14	195	197	208			
2633	YMIN	REAL			REFS	195	197	217	225	302	312	454
					DEFINED	193	206					
1	YMIN1	REAL		BOUND	REFS	14	195	197	206			
2670	YOFF	REAL			REFS	2*290	2*292	DEFINED	289			
2641	YOR	REAL			REFS	217	225	454	DEFINED	214		
2662	YPOS	REAL			REFS	295	2*302	308	312	321		
					DEFINED	290	295					
2671	YPRIME	REAL			REFS	295	DEFINED	290				
2637	YSCALE	REAL			REFS	212	217	225	263	289	454	464
					DEFINED	210	212					
2717	Y1	REAL			REFS	481	486	DEFINED	479			
1321	Z	REAL			REFS	431	434	DEFINED	39			
2643	ZLMIN	REAL			REFS	267	DEFINED	251				
2642	ZMIN	REAL			REFS	267	DEFINED	250				
2714	Z1	REAL			REFS	481	486	DEFINED	474			

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES							
ATAN	REAL	1	LIBRARY	290	292					
COS	REAL	1	LIBRARY	292	2*302	444				
DATE		1		48	476					
EOF	REAL	1		75	96	244	282	333	346	383
GETJN		1		50	477					
SECOND	REAL	1		41	496					
SIN	REAL	1	LIBRARY	290	2*302	445				
SQRT	REAL	1	LIBRARY	290	292					
TIME		1		49						

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES			
MOD	INTEGER	2	INTRIN	153	154	162	163

STATEMENT LABELS			DEF LINE	REFERENCES							
1402	2	FMT	74	73							
53	3		77	68	70	87					
62	6		80	75							
1410	7	FMT	82	81							
66	8		84	80							
1426	9	FMT	85	84							
1440	10	FMT	91	89	90						
0	11		55	54							
2170	13	FMT	365	364							
1366	15	FMT	61	60							
34	17		67	59							
1361	20	FMT	58	57							
627	21		308	302							
635	22		312	308							
643	23		316	312							
651	49		319	316							
651	51		321	306	310	314	318	319			
2047	99	FMT	348	243	245	246	278	279	332	335	345	347
1463	100	FMT	95	93							
350	105		190	171							
0	106	INACTIVE	98	96							
1612	107	FMT	198	197							
377	108		205	190							
404	109		209	195	204						
1657	110	FMT	218	217							
115	111		107	96							
1670	115	FMT	220	219							
452	116		234	221							
450	117		227	224							
1701	120	FMT	228	227							
2005	149	FMT	466	465							
1327	150	FMT	43	42							
1471	151	FMT	144	143							
1503	152	FMT	147	146							
0	153		148	145							
2212	156	FMT	376	375							
2250	157	FMT	387	386							
2271	158	FMT	399	398							
2371	159	FMT	460	459							
2506	160	FMT	493	492							
2525	161	FMT	499	498							
1574	166	FMT	194	193							

STATEMENT LABELS

				DEF LINE	REFERENCES		
1344	101	FMT		52	51		
313	200			153	158		
320	210			159	155		
1511	220	FMT		160	159		
330	230			162	167		
335	240			168	164		
1526	250	FMT		169	168		
342	300			172	150		
1710	301	FMT		236	235	491	
1542	310	FMT		173	172		
347	320			176	151		
1553	330	FMT		177	176		
456	395			242	234		
460	400			243	247		
0	410		INACTIVE	245	244		
472	430			248	248		
1730	440	FMT		249	248		
1756	441	FMT		269	267		
525	495			275	242		
535	500			280	323		
2006	501	FMT		281	280		
2022	502	FMT		322	321		
654	530			329	275	282	
660	535			332	336		
0	545		INACTIVE	335	333		
667	560			342	329	333	
673	565			345	350		
0	572		INACTIVE	347	346		
2064	575	FMT		352	351		
702	580			351	342	346	
2125	590	FMT		357	353		
0	630			469	467		
1207	633			470	468		
0	634			473	470		
1220	635			474	472		
2426	640	FMT		482	481		
2440	641	FMT		485	484		
2457	642	FMT		487	486		
2472	643	FMT		489	488		
0	645			490	478		
2205	690	FMT		373	371	372	
726	700			378	448		
0	701			381	380		
2233	705	FMT		382	378		
0	720			391	388		
756	730			393	390		
762	735			395	410		
2274	740	FMT		400	397		
1002	745			403	401		
0	750			406	403		
1013	760			414	405		
1063	779			434	430		
2312	780	FMT		432	431		
2330	781	FMT		435	434		
1074	782			438	433		
2346	790	FMT		443	439	442	
1135	800			454	374	383	384

STATEMENT LABELS			DEF LINE	REFERENCES		
1017	801		411	390		
2357	802	FMT	458	456	457	
1026	815		416	414		
1034	820		422	419		
1043	830		426	422		
1114	840		435	436	440	
1051	845		431	421	425	
1132	850		447	412	415	
1266	900		500	175	174	
74	1111		89	79		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES			
23	11	I	54 55	2B	INSTACK			
40	3	I	6B 77	16B		EXT REFS	ENTRIES	EXITS
272	153	I	145 148	11B		EXT REFS		
733	701	I	380 385	2B	INSTACK			
752	720	J	386 391	3B	INSTACK	EXITS		
1007	750	J2	403 406	3B	INSTACK	EXITS		
1021	850	K	412 447	114B		EXT REFS		
1204	630	J1	467 469	3B	INSTACK	EXITS		
1215	634	J	470 473	3B	INSTACK	EXITS		
1237	645	I	478 490	16B		EXT REFS		

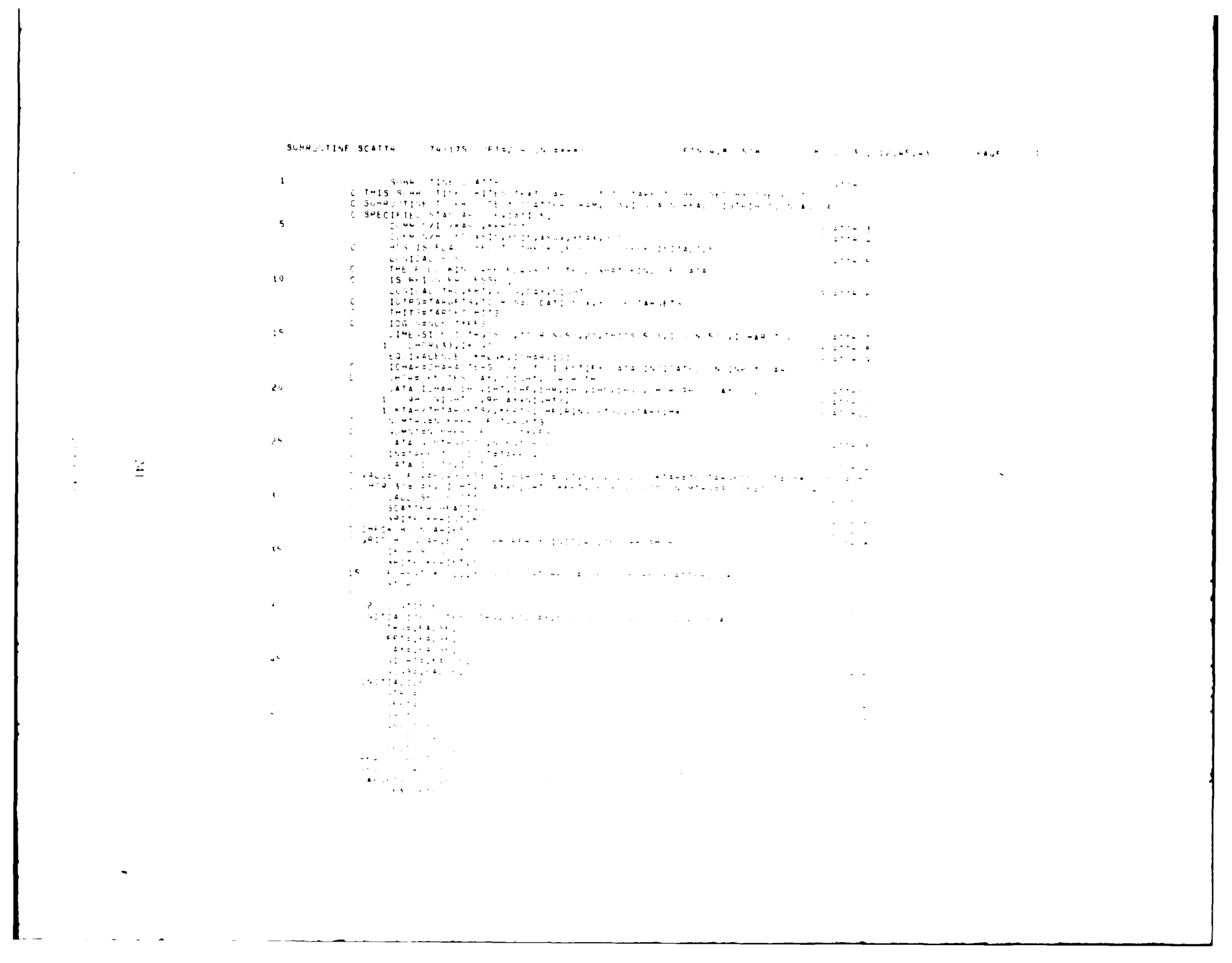
COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
IO	2	0 NAPO (1)		1 KPRINT (1)			
PLOTCM	4	0 PLTCT (1)		1 SXTABLE(1)		2 SYTABLE(1)	
		3 LARGE (1)					
BOUND	5	0 XMIN1 (1)		1 YMIN1 (1)		2 XMAX1 (1)	
		3 YMAX1 (1)		4 BDS (1)			
METRIC	1	0 METERS (1)					

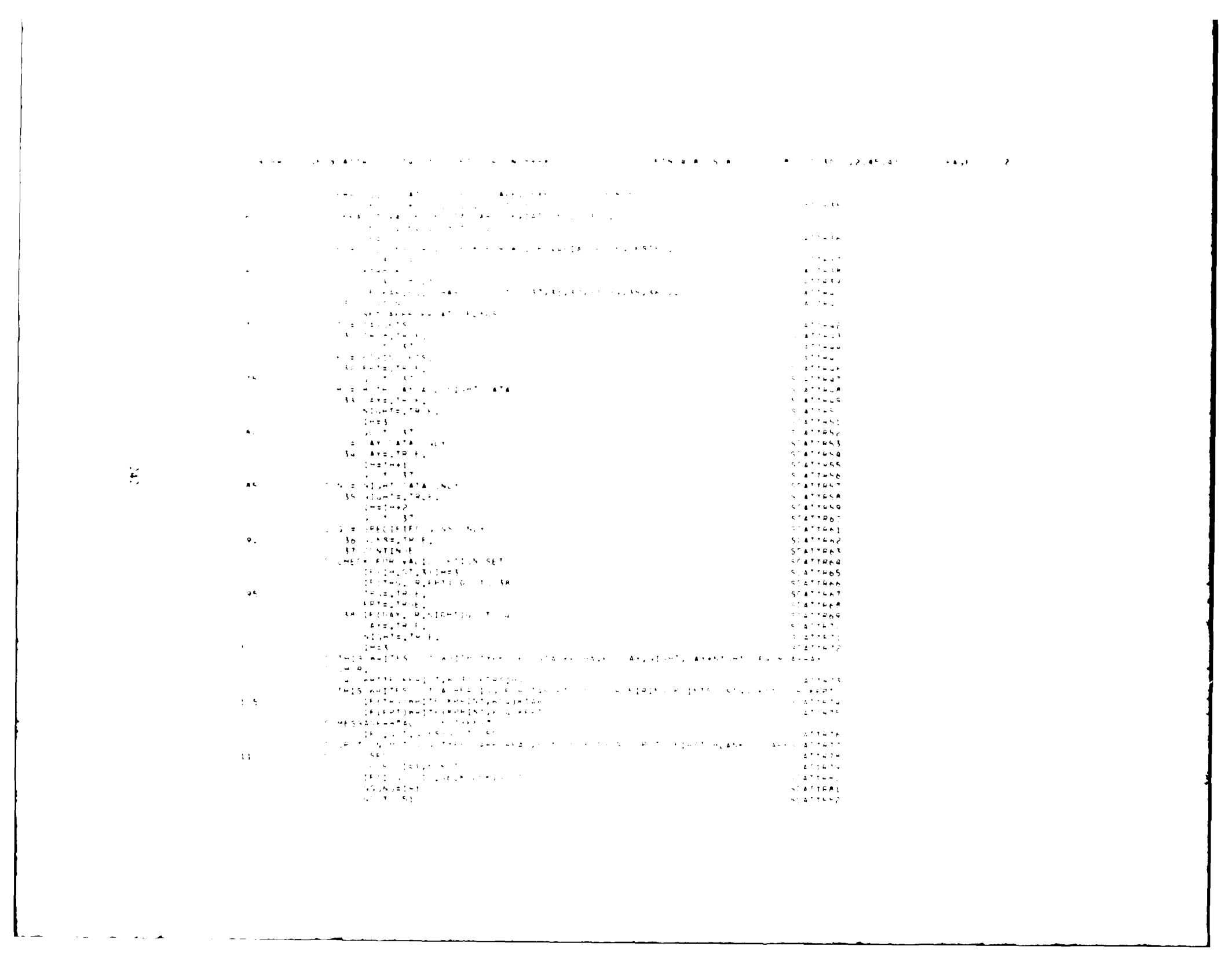
EQUIV CLASSES	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
IUNIT	4	0 IN1 (1)		1 IN2 (1)		2 IN3 (1)	
		3 IN4 (1)					
IFILE	4	0 PUDG (1)		1 BAS (1)		2 LOC (1)	
		3 SCAT (1)					

STATISTICS

PROGRAM LENGTH	36348	1948
CM LABELED COMMON LENGTH	14B	12

600008 CM USED





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                C READ DEF CARD                                                  SCATT131
                  1   READ(IR,*,END=320)IDUM1,IDUM,DAYNO,DARKNO,IDT,KFLAG       SCATT132
                      IF(.NOT.KFLAG)GO TO 320                                    SCATT133
175             C CHECK IF TARGET REQUESTED GOES TYPESETIF NOT,READ NEXT DEF CARD SCATT134
                      DO 310 I=1,NTRG                                            SCATT135
                      IF(IDT.EQ.ITRG(I))GO TO 320                                SCATT136
                  310 CONTINUE                                                   SCATT137
                      GO TO 350                                                  SCATT138
180             C IF TARGETS REQUESTED ,CHECK HIT FLAG;IF.NE.0,NO HIT            SCATT139
                  320 IF(.NOT.TRG.OR.KFLAG.NE.0)GO TO 350                        SCATT140
                      DO 325 I=1,NTRG                                            SCATT141
                      IF(IDT.EQ.ITRG(I))GO TO 330                                SCATT142
                  325 CONTINUE                                                   SCATT143
185             C ERROR -- UNDEFINED TARGET                                      SCATT144
                      WRITE(KPRINT,902)IDT                                       SCATT145
                      STOP                                                       SCATT146
                C CUMULATE TARGET HITS                                           SCATT147
                  330 IF(DAY) THITS(I)=THITS(I)+DAYNO                            SCATT148
190                   IF(NIGHT) THITS(I)=THITS(I)+DARKNO                         SCATT149
                  350 IF(.NOT.FRT)GO TO 390                                      SCATT150
                C CUMULATE FIRING PT SHOTS                                       SCATT151
                      IF(DAY)FSHOTS=FSHOTS+DAYNO                                 SCATT152
                      IF(NIGHT)FSHOTS=FSHOTS+DARKNO                              SCATT153
195             C LAST DEF CARD?                                                 SCATT154
                  390 IF(IDUM1.NE.STAR)GO TO 305                                 SCATT155
                      IF(.NOT.FRT)GO TO 300                                      SCATT156
                C     TEST IF DATA POINT IS IN BOUNDS  IF NOT DON'T DO
                      IF (X.LT.XMIN.OR.X.GT.XMAX)  GOTO 300
200                   IF (Y.LT.YMIN.OR.Y.GT.YMAX)  GOTO 300
                C PROCESS ALL POINTS FOR 1 FIRING PT                             SCATT157
                      XEFACT=FSHOTS/DAYS+.5                                      SCATT158
                C     TOTAL NUMBER OF FIRINGS FOR 1 FIRING POINT
                      XSHOTS=FSHOTS+XN                                           SCATT159
205             C     CALCULATE STANDARD DEVIATION
                      SS=(SD/10.)*(S.M((FLOAT(I)))
                      IF(N.GT.0)CALL SCATPL(F,X,Y,SS)                            SCATT160
                      GO TO 300                                                  SCATT161
                C PROCESS TARGET HITS,IF REQ ENTER                               SCATT162
210               400 IF(.NOT.TRG)GO TO 500                                      SCATT163
                      DO 450 I=1,NTRG                                            SCATT164
                      IF(THITS(I).E.0.)GO TO 450                                 SCATT165
                C     TEST IF DATA POINT IS IN BOUNDS
                      IF (X(I).LT.XMIN.OR.X(I).GT.XMAX  GOTO 450
215                   IF (Y(I).LT.YMIN.OR.Y(I).GT.YMAX) GOTO 450
                C     TARGET HIT PROBABILITY FOR 1 FIRING PT
                      XEFACT=THITS(I)/DAYS+.5                                    SCATT166
                      XHITS=XHIT*XEFACT                                          SCATT167
                C COMPUTE THE CEP OF A POINT DISTRIBUTION WITH EQUAL TO TWO
220             C NUMBER OF FIRINGS
                      SS=SD(I)*(P-.5*ALOG(1.-P))                                 SCATT168
                      IF(N.GT.0)CALL SCATPL(F,X(I),Y(I),SS)                      SCATT169
                  450 CONTINUE                                                   SCATT170
                C END LOOP                                                       SCATT171
225             C WRITE TARGET HITS                                              SCATT172
                      WRITE(KPRINT,903)                                          SCATT173
                      WRITE(KPRINT,904)(I,THITS(I),I=1,NTRG)                     SCATT174
                C STATISTICS                                                     SCATT175
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                WRITE(KPRINT,611) IT,XTRG,XHITS,NEPI,XSHOTS,FACT                SCATT175
      C COMPUTE TIME SPENT IN SCATTER,                                          SCATT176
            CALL SECOND(T99)                                                    SCATT177
            T99=T99-T100                                                        SCATT178
            WRITE(KPRINT,904)T99                                                SCATT179
            RETURN                                                              SCATT180
      C EOF -- INPUT DIRECTIVES                                                 SCATT181
        550 WRITE(KPRINT,905) KARD                                              SCATT182
            STOP                                                                SCATT183
      C EOF - DATA BASE                                                         SCATT184
        590 WRITE(KPRINT,906)IX                                                 SCATT185
            STOP                                                                SCATT186
        600 FORMAT(1H1///T15,*.....     SCATTER     .....*)                     SCATT187
        601 FORMAT(4A1,20A2,2F10.0)                                             SCATT188
        602 FORMAT(F10.0)                                                       SCATT189
        603 FORMAT(////* THE SCATTER DIAGRAM WILL REPRESENT ..*,A9,*.. DATA FR SCATT190
       1R:*//)                                                                  SCATT191
        604 FORMAT(/10X,*...*,A10)                                              SCATT192
        605 FORMAT(/10X,*...60* TYPES:*,33(1X,A2))                              SCATT193
        606 FORMAT(/10X,*...ALL 60* TYPES*)                                     SCATT194
        607 FORMAT(//5X,*...STANDARD DEVIATION =*,F10.3)                        SCATT195
        608 FORMAT(//5X,*...*,F4.0,* DAYS DATA IN DATA BASE*)                   SCATT196
        609 FORMAT(A1,1X,A3,1X,2F8.3)                                           SCATT197
        610 FORMAT(A1,17X,A2,2F4.0,4X,A3,I1)                                    SCATT198
        611 FORMAT(////* OUTPUT FILE TAPE*,I1,* CONTAINS MASAPLOT PHS4 INPUT D SCATT199
       1ATA REPRESENTING:*                                                      SCATT200
       1                  ///5X,I5,* TARGETS   :*,I6,* SCATTER PTS.*           SCATT201
       1                   ///5X,I5,* FIRING PTS:*,I6,* SCATTER PTS.*          SCATT202
       1                  ///5X,**MULTIPLIER USED =*,F10.1)                    SCATT203
        612 FORMAT(///5X,*...MULTIPLIER =*,F10.1)                               SCATT204
        613 FORMAT(//* MOVED BY (*,F4.1,*,*,F9.1,*) - (*,F9.1,*,*,F9.1,*)*)     SCATT205
        700 FORMAT(6HERR=6)                                                     SCATT206
        701 FORMAT(6HREC=0)                                                     SCATT207
        901 FORMAT(///1H ***** ERROR -- TARGET TABLE OVERFLOW: EXEC TERM        SCATT208
       1ABORTED )                                                               SCATT209
        902 FORMAT(///1H ***** ERROR -- ERR N I. DATA BASE: UNDEFINED TA-SCATT210
       1SET ID  ,A4,*; EXECUTION ABORTED *)                                     SCATT211
        904 FORMAT(///T15,*.....  TIME IN SCATTER IS*,F4.3,* SECONDS*)          SCATT213
        905 FORMAT(///1H ***** ERROR -- FORMAT OF DIR ON TAPE ,I1,*; EXECSCATT214
       1TION ABORTED*)                                                          SCATT215
        906 FORMAT(///1HO ***** ERROR -- END OF FILE SELECTED BUT NO DATA TYSCATT216
       1PES SPECIFIED: EXECUTION ABORTED                                        SCATT217
            END                                                                 SCATT218
```

SYMBOLIC REFERENCE MAP (R=8)

ENTRY POINTS DEF LINE REFERENCES
1 SCATT2 1 245

VARIABLES SN TYPE RELOCATION REFERENCES
4 A01 COM1 REAL ERROR 197 DEFINED 198 199
1134 COM1 REAL ERROR 194 DEFINED 198 199
194 197 173

VARIABLES SN TYPE RELOCATION

1145	DARKNS	REAL		REFS	190	194	DEFINED	173				
1117	DAY	LOGICAL		REFS	11	97	189	193	DEFINED	44	77	
					82	98						
1144	DAYNS	REAL		REFS	189	193	DEFINED	173				
1135	DAYS	REAL		REFS	136	137	202	217	DEFINED	132	136	
1554	DHOR	REAL	ARRAY	REFS	15	103	DEFINED	20				
1127	FACT	REAL		REFS	128	130	202	217	229			
				DEFINED	57	128						
1115	FPT	LOGICAL		REFS	11	94	106	191	197			
				DEFINED	43	74	96					
1142	FSHOTS	REAL		REFS	193	194	202	DEFINED	171	193	194	
1116	GUNS	LOGICAL		REFS	11	108	174	DEFINED	46	90		
1126	I	INTEGER		REFS	53	57	65	112	113	122	3*155	
					177	183	2*189	2*190	212	2*214	2*215	217
					2*222	DEFINED	52	57	64	111	122	154
					176	182	211					
1153	ICHAR	INTEGER	ARRAY	REFS	15	17	67	DEFINED	20			
1137	ID	* INTEGER		DEFINED	168							
1143	IDG	INTEGER		REFS	177	DEFINED	173					
1472	IDGUN	INTEGER	ARRAY	REFS	15	112	122	177	DEFINED	57		
1146	IDT	INTEGER		REFS	183	186	DEFINED	173				
1162	IDTRG	INTEGER	ARRAY	REFS	15	183	DEFINED	155				
1131	IH	INTEGER		REFS	83	87	93	103	DEFINED	62	79	
					83	87	93	100				
1557	IK	INTEGER	ARRAY	REFS	15	65	DEFINED	57				
461	IN	INTEGER		REFS	148	156	165	169	239			
				DEFINED	27	I/O REFS	144	146	155	164	168	
					173							
462	IOUT	INTEGER		REFS	229	DEFINED	27	I/O REFS	139	141	142	
					226	227						
1133	J	INTEGER		REFS	2*67	DEFINED	66					
1132	KAR	INTEGER		REFS	67	DEFINED	65					
0	KARD	INTEGER	IO	REFS	5	59	134	236	I/O REFS	57	132	
1153	KBLNK	INTEGER		REFS	17	112						
1147	KFLAG	INTEGER		REFS	181	DEFINED	173					
455	KFPT	INTEGER		REFS	106	DEFINED	20					
1	KPRINT	INTEGER	IO	REFS	5	I/O REFS	32	36	103	105	106	
					119	122	124	126	130	131	137	161
					196	229	233	236	239			
454	KTAR	INTEGER		REFS	105	DEFINED	20					
1150	L	INTEGER		REFS	204	206	2*207	218	221	2*222		
				DEFINED	202	217						
1123	NFPT	INTEGER		REFS	170	229	DEFINED	49	170			
1134	NGUNS	INTEGER		REFS	117	122	176	DEFINED	113	116		
1124	NHITS	INTEGER		REFS	218	229	DEFINED	50	218			
1120	NIGHT	LOGICAL		REFS	11	97	190	194	DEFINED	45	78	
					84	99						
1125	NSHOTS	INTEGER		REFS	204	229	DEFINED	51	204			
1122	NTRG	INTEGER		REFS	157	182	211	229	DEFINED	48	153	
					157							
460	NUMGT	INTEGER		REFS	111	116	DEFINED	25				
457	NUMTRG	INTEGER		REFS	52	154	DEFINED	25				
1130	SD	REAL		REFS	61	131	206	221	DEFINED	57	61	
1151	SS	REAL		REFS	207	222	DEFINED	206	221			
456	STAR	REAL		REFS	149	158	186	196	DEFINED	20		
1244	TCOORDS	REAL	ARRAY	REFS	15	2*214	2*215	2*222	DEFINED	2*155		
1410	THITS	REAL	ARRAY	REFS	15	189	190	212	217			

```
VARIABLES      SN  TYPE            RELOCATION
                                                  DEFINED      53      189      190
 1114  TRG        LOGICAL                           REFS       11       94      105      151      181      210
                                                  DEFINED      42       71       95
 1121  T100       REAL                              REFS       30      232
 1152  T99        REAL                              REFS      231      232      233  DEFINED      232
 1140  X          REAL                              REFS    2*199      207  DEFINED      168
    2  XMAX       REAL                 BOUND        REFS        6      126      199      214
    0  XMIN       REAL                 BOUND        REFS        6      126      199      214
 1141  Y          REAL                              REFS    2*200      207  DEFINED      168
    3  YMAX       REAL                 BOUND        REFS        6      126      200      215
    1  YMIN       REAL                 BOUND        REFS        6      126      200      215
       VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS          TYPE   ARGS       REFERENCES
       EOF        REAL      1            59       134      148      156      165      169
       SCATPL               4           207       222
       SECOND               1            30       231
       SQRT       REAL      1 LIBRARY   206       221

INLINE FUNCTIONS   TYPE   ARGS        DEF LINE  REFERENCES
       FLOAT      REAL      1  INTRIN              206      221

STATEMENT LABELS              DEF LINE   REFERENCES
    0  10                        53        52
  471  15       FMT              37        36
   12  20                        40        35
    0  30                        68        66
   54  31                        71        67
   56  32                        74        67
   60  33                        77        67
   63  34                        82        67
   66  35                        86        67
   71  36                        90        67
   72  37                        91        64       67       72       75       80       84       88
  101  38                        97        94
  105  40                       103        97
  127  50                       115       111      112
  132  51                       117       114
  136  52                       122       117
  145  55                       124       108
  147  60                       126       123
  202  100                      146       149
    0  210                      159       154
  241  290                      164       151      166
  250  300                      168       158      197      199      200      208
  257  305                      173       196
    0  310                      178       176
  270  320                      181       174      177
    0  325                      184       182
  303  330                      189       183
  313  350                      191       181
  322  390                      196       179      191
  331  400                      210       169
  402  450                      223       211      212      214      215
  405  500                      226       210
  422  550                      236        59      134
  425  590                      239       148      156      165
```

STATEMENT LABELS			DEF LINE	REFERENCES			
701	600	FMT	241	32			
707	601	FMT	242	57			
712	602	FMT	243	132			
714	603	FMT	244	103			
724	604	FMT	246	105	106		
727	605	FMT	247	122			
734	606	FMT	248	124			
740	607	FMT	249	131			
745	608	FMT	250	137			
753	609	FMT	251	146	155	164	168
756	610	FMT	252	173			
762	611	FMT	253	229			
1007	612	FMT	258	130			
1014	613	FMT	259	126			
1024	700	FMT	260	141			
1026	701	FMT	261	142	226		
1030	901	FMT	262	161			
1040	902	FMT	264	186			
1053	904	FMT	266	233			
1062	905	FMT	267	236	239		
1073	906	FMT	269	119			

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES		
21	10	I	52 53	28	INSTACK		
35	37	I	64 91	368		NOT INNER	
37	30	J	66 68	158	INSTACK	EXITS	
124	50	I	111 115	48	INSTACK	EXITS	
217	210	I	154 159	208		EXT REFS	EXITS
265	310	I	176 178	28	INSTACK	EXITS	
276	325	I	182 184	28	INSTACK	EXITS	
353	450	I	211 223	328		EXT REFS	

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)			
IO	2	0 KARD (1)		1 KPRINT (1)	
BOUND	5	*0 XMIN (1)*		*1 YMIN (1)*	*2 XMAX (1)*
		3 YMAX (1)		4 BDS (1)	

EQUIV CLASSES	LENGTH	MEMBERS - BIAS NAME(LENGTH)
KBLNK	7	0 ICHAR (7)

STATISTICS

PROGRAM LENGTH	15638	883
CM LABELED COMMON LENGTH	76	7

600008 CM USED

```
      SUBROUTINE SCATPL(N,X,Y,SD)                                          SCATPL 2
C THIS ROUTINE PLOTS POINTS ACCORDING TO A NORMAL DISTRIBUTION AROUND THE
C TARGET AREA.  (CALLED FROM SUBROUTINE SCATTER)
      COMMON/IO/KARD,KPRINT                                                SCATPL 3
      COMMON/BOUND/XMIN,YMIN,XMAX,YMAX                                     SCATPL 4
C     XD AND YD STORE THE COORDINATES OF THE DOTS
C     NCALLS= NUMBER OF TIMES THE RANDOM NO. GENERATOR IS CALLED
C     NLEFT=NUMBER OF CALLS LEFT
      DIMENSION XD(1000),YD(1000),REP(1)                                   SCATPL 5
      DATA IOUT/4/                                                         SCATPL 6
      DATA MAXRN/1000/,LIMOUT/5/,NREP/1/                                   SCATPL 7
      DATA HGT/.1/,NVAR/1/,IVAR/1/,IPRNT/0/,IX/123456789/,IY/987654321/    SCATPL 8
C** ADDITIONAL DATA TO CONVERT TO NCS "RAND" (FROM NSROC "NRAND")           DE100379
      DATA RNOPT/1/,FMX/16777213/,FMY/16777219/                            DE100379
C                                                                          DE100379
C VALUE OF VARIABLES:  IOUT=4  LIMOUT=5  HGT=.1  IVAR=1  IX=123456789
C MAXRN=1000  NREP=1  NVAR=1  IPRNT=0  IY=987654321
      NCALLS=(N-1)/MAXRN                                                   SCATPL 9
C N IS THE VALUE SENT FROM SCATTER, WHILE PROCESSING ALL NOISE POINTS
C FOR ONE NOISE SOURCE.  NCALLS IS THE INTEGER VALUE OF THIS DIVISION STATEMENT.
      NLEFT=(N-1)-NCALLS*MAXRN                                             SCATPL10
      NRN=MAXRN                                                            SCATPL11
C GENERATE A DOT AT THE NOISE SOURCE.
      XDOT=X
      YDOT=Y
      WRITE(IOUT,1)XDOT,YDOT,HGT
      IF(N.LE.1)RETURN
   50 IF(NCALLS.GT.0)GO TO 100                                             SCATPL12
C     NO SOURCES LEFT-RETURN
      IF(NLEFT .LE. 0) RETURN
      NRN=NLEFT                                                            SCATPL14
      NLEFT=0                                                              SCATPL15
C**************************************************                        DE100379
C LIBRARY ROUTINE NRAND                                                    SCATPL16
C GENERATES PSEUDO-RANDOM NOS. - NORMALLY DISTRIBUTED                      SCATPL17
C ..... SOURCE                                                             SCATPL18
C MATH SCIENCE LIBRARY -- CDC PROPRIETARY PRODUCT                          SCATPL19
C VOL. 7, P. 7-151                                                         SCATPL20
C .....PARAMETERS                                                          SCATPL21
C NRAND(N,M,I,XM,SIG,IU,X,IP)                                              SCATPL22
C  N   = TOTAL NO. RANDOM NOS. TO BE GENERATED                             SCATPL23
C  M   = TOTAL NO. VARIABLES IN DATA ARRAY X                               SCATPL24
C  I   = RANDOM NOS. WILL BE STORED AS VARIABLE I IN THE MULTIPLEXED       SCATPL25
C        ARRAY X                                                           SCATPL26
C  XM  = MEAN VALUE                                                        SCATPL27
C  SIG = STANDARD DEVIATION                                                SCATPL28
C  IU = START MULTIPLIER -- MUST BE ODD                                    SCATPL29
C  IP  = PRINT INDICATOR -- .GT.0 = NOS. WILL BE PRINTED                   SCATPL30
C  X   = MULTIPLEXED DATA ARRAY                                            SCATPL31
C**************************************************                        DE100379
C** ABOVE ROUTINE "NRAND" IS NO LONGER IN USE                              DE100379
C** HAS BEEN REPLACED WITH NCS ROUTINE "RANDU"                             DE100379
C** WILL DOCUMENT IN FULL AT LATER DATE                                    DE100379
C                                                                          DE100379
C** OLD SUBROUTINE CALLS                                                  DE100379
C*100 CALL NRAND(NRN,NVAR,IVAR,X,SD,IX,XD,IPRNT)                           SCATPL32
C*    CALL NRAND(NRN,NVAR,IVAR,Y,SD,IY,YD,IPRNT)                           SCATPL33
```

```
      C                                                                 DE100379
      C** NEW SUBROUTINE CALLS                                          DE100379
   60   100 CALL RAND(IX,FMX,RNOPT,NRN,XD)                             DE100379
            CALL RAND(IY,FMY,RNOPT,NRN,YD)                             DE100379

      C** CONVERT NORMALLY DISTRIBUTED RANDOM NUMBERS W/ MEAN=0 AND
      C** SD=1, TO NORMALLY DISTRIBUTED RANDOM NUMBERS W/ MEAN=X(OR Y)
   65 C** AND SD="SD" (INPUT TO SUBROUTINE THROUGH PARAM LIST).
            DO 105 I=1,NRN
            XD(I)=SD*XD(I)+X
      105   YD(I)=SD*YD(I)+Y
      C                                                                 DE100379
   70 C KEEPS TRACK OF HOW MANY POINTS WE MUST COMPUTE.
            NCALLS=NCALLS-1                                            SCATPL34
            DO 200 I=1,NRN                                             SCATPL35
            NOUT=0                                                     SCATPL36
            XDOT=XD(I)                                                 SCATPL37
   75 C CHECK IF PT. IS WITHIN PLOT BOUNDARY                           SCATPL38
      110   IF((XDOT.GE.XMIN).AND.(XDOT.LE.XMAX))GO TO 150             SCATPL39
      C XDOT OUT OF BOUNDS -- TRY AGAIN 2                              SCATPL40
            NOUT=NOUT+1                                                SCATPL41
            IF(NOUT.GT.LIMOUT)GO TO 190                                SCATPL42
   80 C                                                                DE100379
      C** OLD DOCUMENTATION                                            DE100379
      C************************************************               DE100379
      C THE PARAMETERS SENT TO NRAND HAVE THE FOLLOWING USE IN THAT LIBRARY ROUTINE:
      C     NRN=N=TOTAL NO. OF RANDOM NUMBERS TO BE GENERATED
   85 C     NVAR=M=TOTAL NO. OF VARIABLES IN DATA ARRAY X
      C     IVAR=I=RANDOM NOS. WILL BE STORED AS I IN ARRAY X.
      C     X(Y)=XM=MEAN VALUE
      C SD=SIG=STANDARD DEVIATION
      C XD(YD)=PRINT INDICATOR--GT. 0--NOS. WILL BE PRINTED.
   90 C IX(IY)=START MULTIPLIER--MUST BE ODD.
      C IPRNT=X=MULTIPLEXED ARRAY
      C************************************************               DE100379
      C                                                                 DE100379
      C** OLD SUBROUTINE CALL                                          DE100379
   95 C*    CALL NRAND(NREP,NVAR,IVAR,X,SD,IX,REP,IPRNT)               SCATPL43
      C                                                                 DE100379
      C** NEW SUBROUTINE CALL                                          DE100379
            CALL RAND(IX,FMX,RNOPT,NREP,REP)                           DE100379
      C** CONVERT MEAN AND SD
  100       REP=SD*REP+X
      C                                                                 DE100379
            XDOT=REP(1)                                                SCATPL44
            GO TO 110                                                  SCATPL45
      150   NOUT=0                                                     SCATPL46
  105       YDOT=YD(I)                                                 SCATPL47
      160   IF((YDOT.GE.YMIN).AND.(YDOT.LE.YMAX))GO TO 180             SCATPL48
      C YDOT OUT OF BOUNDS -- TRY AGAIN                                SCATPL49
            NOUT=NOUT+1                                                SCATPL50
      C "WARNING--GENERATED SCATTER POINT FOR LOCATION (X,Y) OUT OF BOUNDS
  110 C AFTER (LIMOUT) TRIES; POINT IGNORED.
            IF(NOUT.GT.LIMOUT)GO TO 190                                SCATPL51
      C                                                                 DE100379
      C** OLD SUBROUTINE CALL                                          DE100379
      C*    CALL NRAND(NREP,NVAR,IVAR,Y,SD,IY,REP,IPRNT)               SCATPL52
```

```
                C                                                                DE100379
                C** NEA S AR  TIME CALL                                          DE100379
                     CALL NAME(IY,FMY,RNORM,NREP,REP)                            DE100379
                C** CONVERT REAL AND SD
                     REP=SD*REP+Y
                C                                                                DE100379
                     YDOT=REP(1)                                                 SCATPL53
                     GO TO 160                                                   SCATPL54
                C CREATE NASAPLOT TEXT CARD TO PUT OUT AT (XDOT,YDOT)            SCATPL55
                  190 WRITE(IOUT,1)XDOT,YDOT,MGT                                 SCATPL56
                    1 FORMAT(*TEXT*,2X,2F8.0,6X,F8.3,T48,*1,*)                   SCATPL57
                     GO TO 200                                                   SCATPL58
                C UNRECOVERABLE OUT OF BOUNDS CONDITION                          SCATPL59
                  190 WRITE(NPRINT,191)X,Y,LIMOUT                                SCATPL60
                  191 FORMAT(10H*****  ,* WARNING -- GENERATED SCATTER POINT FOR LOCATIO SCATPL61
                     * (*,F8.0,*,*,*,F8.0,*) OUT OF BOUNDS AFTER*,I3,* TRIES: PT. IGNORED*SCATPL62
                     2)                                                         SCATPL63
                  200 CONTINUE                                                  SCATPL64
                     GO TO 50                                                   SCATPL65
                     END                                                        SCATPL67
```

CARD NO. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

```
     100    I     REP       ARRAY NAME OPERAND NOT SUBSCRIPTED, FIRST ELEMENT WILL BE USED.
     118    I     REP       ARRAY NAME OPERAND NOT SUBSCRIPTED, FIRST ELEMENT WILL BE USED.
     119    I     REP       ARRAY NAME OPERAND NOT SUBSCRIPTED, FIRST ELEMENT WILL BE USED.
     119    I     REP       ARRAY NAME OPERAND NOT SUBSCRIPTED, FIRST ELEMENT WILL BE USED.
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 SCATPL 1 27 30

VARIABLES	SN	TYPE	RELOCATION								
157 FMX		REAL		REFS	60	98	DEFINED	14			
160 FMY		REAL		REFS	61	117	DEFINED	14			
150 MGT		REAL		REFS	26	124	DEFINED	12			
235 I		INTEGER		REFS	2*67	2*68	74	105	DEFINED	66	72
134 IOUT		INTEGER		DEFINED	10	I/O REFS	26	124			
155 IPRNT	*	INTEGER		DEFINED	12						
152 IVAR	*	INTEGER		DEFINED	12						
154 IX		INTEGER		REFS	60	98	DEFINED	12			
155 IY		INTEGER		REFS	61	117	DEFINED	12			
0 *ABS		INTEGER	ID	REFS	4						
1 *PRINT		INTEGER	ID	REFS	4	I/O REFS	128				
140 LIMOUT		INTEGER		REFS	79	111	128	DEFINED	11		
135 *BLNK		INTEGER		REFS	18	21	22	DEFINED	11		
2		INTEGER	F.P.	REFS	14	21	27	DEFINED	1		
226 .CALLS		INTEGER		REFS	21	24	71	DEFINED	18	71	
227 .LEFT		INTEGER		REFS	30	31	DEFINED	21	32		

```
      SUBROUTINE SCATPL      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE      4

VARIABLES      SN  TYPE            RELOCATION
  234  NCUT        INTEGER                          REFS        78        79       108       111    DEFINED        73        78
                                                     104       108
  147  REP         INTEGER                          REFS        98       117    DEFINED        11
  23[illegible]  [illegible]  INTEGER                          REFS        60        61        66        72    DEFINED        22        31
  151  [illegible]  * INTEGER                        DEFINED        12
 4155  REP         REAL        ARRAY                  REFS         9        98       100       102       117       119       121
                                                    DEFINED       100       119
  156  [illegible]  REAL                              REFS        60        61        98       117    DEFINED        14
    6  SD          REAL                  F.P.         REFS        67        68       100       119    DEFINED         1
    0  X           REAL                  F.P.         REFS        24        67       100       128    DEFINED         1
  235  XD          REAL        ARRAY                  REFS         9        60        67        74    DEFINED        67
  231  XDOT        REAL                              REFS        26      2*76       124    DEFINED        24        74       102
    2  XMAX        REAL                  BOUND        REFS         5        76
    0  XMIN        REAL                  BOUND        REFS         5        76
    0  Y           REAL                  F.P.         REFS        25        68       119       128    DEFINED         1
 2205  YD          REAL        ARRAY                  REFS         9        61        68       105    DEFINED        68
  232  YDOT        REAL                              REFS        26     2*106       124    DEFINED        25       105       121
    3  YMAX        REAL                  BOUND        REFS         5       106
    1  YMIN        REAL                  BOUND        REFS         5       106
       VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS          TYPE   ARGS       REFERENCES
       RAND                5             60        61        98       117

STATEMENT LABELS              DEF LINE   REFERENCES
  175  1        FMT             125        26       124
   24  50                        28       133
   30  100                       60        28
    0  105                       68        66
   51  110                       76       103
   65  150                      104        76
   70  160                      106       122
  104  180                      124       106
  107  190                      128        79       111
  210  191      FMT             129       128
  111  200                      132        72       126

LOOPS  LABEL     INDEX     FROM-TO     LENGTH     PROPERTIES
   40  105       I           66 68        4B       INSTACK
   46  200       I           72 132       46B                EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       IO            2              0 KAPI    (1)                1 KPRINT (1)
       BOUND         4              0 XMIN    (1)                1 YMIN   (1)                2 XMAX   (1)
                                    3 YMAX    (1)

STATISTICS
  PROGRAM LENGTH                 4166B     2166
  CM LABELED COMMON LENGTH          6B        6
        600008 CM USED
```

```
SUBROUTINE STOPP      74/175  OPT=2 ROUND=+-*/                FTN 4.8  508        80/10/30. 12.45.43        PAGE     1

                    SUBROUTINE STOPP                                                  STOPP  2
                    COMMON /IO/KARD,KPRINT                                            STOPP  3
                    DATA IOUT/55/                                                     STOPP  4
                    WRITE(KPRINT,10)                                                  STOPP  5
                 10 FORMAT(1H1///T15,*.....      STOP      .....*)                     STOPP  6
                    WRITE(IOUT,100)                                                   STOPP  7
                100 FORMAT(4HSTOP)                                                    STOPP  8
                    WRITE(KPRINT,200)                                                 STOPP  9
                200 FORMAT(////T13,*NASAPLOT INPUT FILE COMPLETE.*)                   STOPP 10
                    RETURN                                                            STOPP 11
                    END                                                               STOPP 12


      SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS      DEF LINE      REFERENCES
    1  STOPP           1          10

VARIABLES      SN  TYPE            RELOCATION
   11  IOUT        INTEGER                          DEFINED        3    I/O REFS       6
    0  KARD        INTEGER              IO            REFS         2
    1  KPRINT      INTEGER              IO            REFS         2    I/O REFS       4         8
       VARIABLES USED AS FILE NAMES, SEE ABOVE

STATEMENT LABELS                DEF LINE    REFERENCES
   15  10       FMT                5          4
   25  100      FMT                7          6
   32  200      FMT                9          8

COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
       IO            2                0 KARD    (1)                  1 KPRINT (1)

STATISTICS
  PROGRAM LENGTH                  40B       32
  CM LABELED COMMON LENGTH         2B        2
          60000B CM USED
```

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Blast Noise Prediction/by Paul D. Schomer...et al. -- Champaign, IL : Construction Engineering Research Laboratory ; available from NTIS, 1981.
2v. (Technical report ; N-98)

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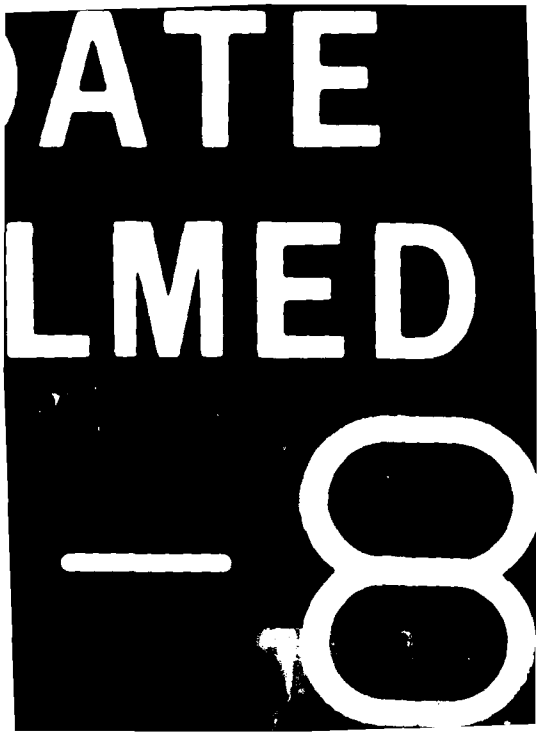
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