Title

THE LBL SOCIO-ECONOMIC-ENVIRONMENTAL-DEMOGRAPHIC INFORMATION SYSTEM (SEEDIS). COMPUTER MAPPING SYSTEMS WORKBOOK III. PROGRAMS: DOBEDO-MAPEDIT-CARTE

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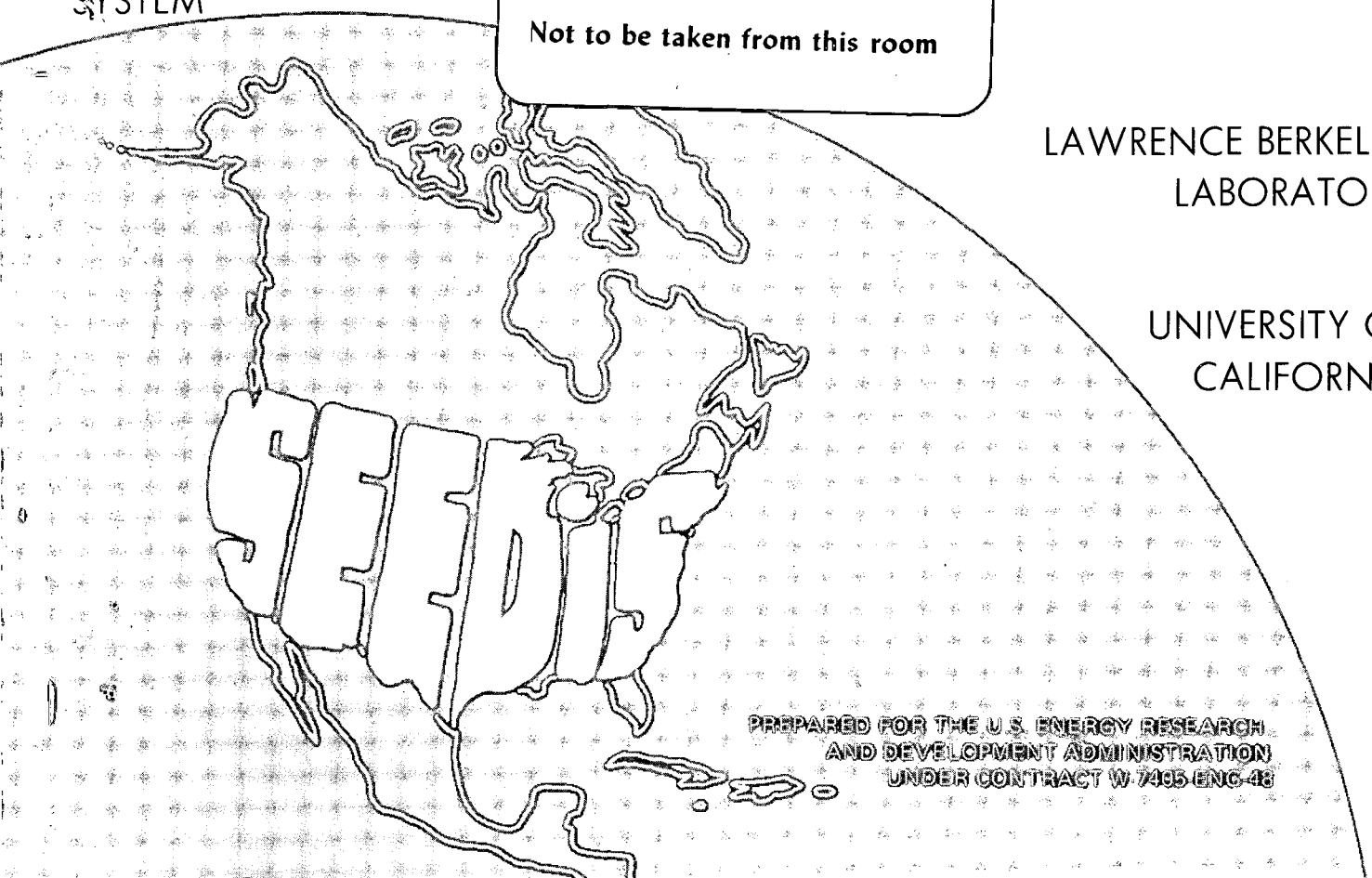
Work Book III

COMPUTER MAPPING SYSTEMS

PROGRAMS: MAPEDIT - DOBEDO - CARTE

SOCIO-
ECONOMIC-
ENVIRONMENTAL-
DEMOGRAPHIC

INFORMATION
SYSTEM



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THE LBL SOCIO-ECONOMIC-ENVIRONMENTAL-DEMOBRAPHIC INFORMATION SYSTEM (SEEDIS)

COMPUTER MAPPING SYSTEMS WORKBOOK III

Programs

DOBEDO - MAPEDIT - CARTE

Prepared by
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through the support of
Energy Research and Development Administration
and
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Employment and Training Administration

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FOREWARD

The art of graphic display at Lawrence Berkeley Laboratory has evolved greatly since 1972 when the first LBL computer mapping program was developed for the study of 1970 Census demographic characteristics. A thematic mapping program resulted that produces high-quality, color-separation negatives at a fraction of the cost in time and money of producing them by hand.

A second major development was the digitization of the boundaries of the 1970 Census tracts for the United States. This has resulted in geographic base files for the census tracts, SMSA's, counties, Bureau of Economic Affairs and Air Quality Control Regions and states, and a good set of computer programs for editing geographic base files.

A concurrent development was the acquisition of geocoded data bases and the development of interactive retrieval programs. These data bases include a major portion of the 1970 Census, the 1969 Census of Agriculture, the 1972 Brookhaven energetics of the U.S., and the City County Data Book.

Interactive graphic analysis programs have enhanced the use of the LBL SEEDIS data. CHART is used for graphic analysis of tabular data, making pie and bar charts, besides traditional tables. Interactive CARTE has reduced the time and difficulty of designing and producing a thematic map. Both programs allow post-retrieval data modification by arithmetic operations. The SEEDIS MONITOR system provides access to these programs and data bases.

This writeup is intended to provide a guide to making maps from the geographic base files and geocoded data bases in SEEDIS. Knowledge of programming is not required, although an insight into some of the basic BKY computer procedures is assumed.

Peter Wood

Berkeley, 1977

PREFACE

The primary aim of this writeup is to provide an analyst with sufficient information to make computer maps of socio-economic-or environmental data.

It is hoped that the arrangement of the writeup and the selection of programs will make the reader comfortable in his/her trip through the SEEDIS Computer Mapping System. The writeup is concerned primarily with the execution of these programs rather than a comprehensive and exhaustive treatment of theoretical details. Illustrative examples are included for the major programs, including a visual step-by-step map design workbook for the CARTE program.

The writeup is divided into three parts. Part A describes the LBL Socio-Economic-Environmental-Demographic Information System, of which the computer mapping system is a part. Part B, a tutorial, covers the polygon based mapping system and its component programs. Part C gives an illustrated introduction to the grid-based mapping system at LBL.

The Appendices include a User Manual for the batch mode versions of the programs MAPEDIT, ZING, and CARTE. Appendix D includes a variety of color maps produced from various projects using the SEEDIS data base.

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PART A

SEEDIS

THE LBL SOCIO ECONOMIC ENVIRONMENTAL DEMOGRAPHIC INFORMATION SYSTEM

PART A

SOCIO-ECONOMIC-ENVIRONMENTAL-DEMOGRAPHIC INFORMATION SYSTEM (SEEDIS)

1. Introduction[1]

The development of the LBL Socio-Economic-Environmental-Demographic Information System (SEEDIS) over the past four years has succeeded in providing ERDA with a valuable resource necessary to carry out its broadened mission in energy assessment and environmental impact studies. Many LBL projects contribute significantly to the SEEDIS system by supporting research and development of retrieval, analysis and display programs; others utilize existing software but contribute new data resources.

The expansion of SEEDIS proceded in the areas of acquisition and installation of data bases required for specific projects and the implementation and investigation of data retrieval, analysis, and display techniques. The new data bases acquired or developed this year included:

a. The complete set of annual Current Population Surveys for 1969-1976 (statistically selected samples of approximately 45,000 households containing information on employment by occupation, ethnic and educational characteristics, etc.);
b. Quarterly data on employment and wages by establishment for the eight Western states for 1974, 1975, and the first quarter 1976 (similar in content to County Business Patterns, but more current, comprehensive and finely disagregated);
c. Population projections to 1976 by county from the Bureau of the Census;
d. Employment Service data giving characteristics of unemployed persons in the labor force (includes quarterly data for all states at the state level, and for Federal Region IX by local area);
e. An economic/environmental data base containing 150 variables for each county in the U.S., from the Brookhaven Atlas on the Energetics of the United States;
f. Estimates of 1972 U.S. Employment (1) by industry and occupation and (2) by state and industry, for use in input-output analysis.

2. Data Bases

In addition, other data bases have been added to SEEDIS by staff and other laboratory departments. These include:

1972 U.S. Input-Output Table, 404 sectors
1972 California Input-Output Tabel, 404 sectors
1971 Energy Use, 5 energy types, 367 I/O sectors
County Business Patterns, complete, 1962-1972
1972 Census of Transportation
1968, 1969, 1970 I/O Tables, U.S., 87 sectors
1967 I/O Tables, 9 Western states, 367 sectors
MERES Environmental data base
Bechtel data base of Energy Technology Coefficients
Brookhaven National Laboratory Energy Model data base
BNL-CAC Energy I/O Model
GRID Geothermal data base
CALERDI data base (California Energy-Related Research & Development projects)
Dunn and Bradstreet File, 1972
Energy Conservation data base
Metropolitan Transportation Commission data bases

Other current data bases at LBL include:

1960 Census of Population
1970 Census of Population and Housing (1st count)
1970 Census of Population and Housing (2nd count)
1970 Census of Population (4th count)
1970 Census of Housing for California (1st and 6th counts)
1970 Census of Population (5th count)
1970 Census of Population (6th count)
1970 Public Use Sample
1970 Census Geographic data base: State, SMSA, County, Tract boundaries.

There are additional data bases in SEEDIS in the broad fields of

Demography and Social Science
Geography
Business Enterprise
Employment
Labor force, Employment and Earnings

Transportation
Agriculture and Health
Environmental and Natural Resources.

The widespread use of SEEDIS necessitates constant communication within and outside LBL, to avoid duplication of effort and encourage maximum utilization of existing resources. Within LBL, the Computer Science and Applied Mathematics (CSAM) department members regularly attend meetings of the Regional Studies Group (E & E Division) and the Information Research Group (Technical Information Department).

Additional fruitful contacts are maintained with numerous other LBL groups, especially in the Energy and Environment Division. Outside LBL, CSAM's leadership role in the Interlaboratory Working Group for Data Exchange and ERDA Network Investigators Panel ensures constant awareness of the availability of SEEDIS related resources.

3. SEEDIS Mapping Systems

With the large increase in the amounts of information available for use by analysts, not only does the possible complexity of the study grow, but also the difficulty of communicating the results, if only numerical tables are used. Graphic display systems, such as computer mapping, are useful tools for the management and study of complex systems.

It is convenient to divide computer mapping systems into two basic approaches, depending upon the form in which input data is supplied: polygon-based systems, where the input is tied to geographic entities (for example, the input may be the outlines and population densities of the counties of a region); and grid-based systems, in which the input is a uniform cell of an arbitrary grid projected upon the surface of the earth. Both approaches are in use at LBL.

The polygon-based system is useful for displaying the geocoded data in SEEDIS, particularly because of the large set of geographic base files available. With this system, data attached to areas, lines, or points may be presented in thematic maps using the display module CARTE. No knowledge of programming is necessary for the use of the system and emphasis is on interactive analysis and design of thematic maps. Other programs are available, but require some programming knowledge (see Appendices or authors for assistance). A list of completed computer mapping projects, using the polygon approach is included in PART A.

The grid-based display system at LBL is part of the Integrated Data Display System (IDDS).[2] This is a set of FORTRAN subroutines which supply a variety of display techniques for gridded data, including grey-scale, contour, 3D perspective, stream-line and point location (see PART C).

A grid-based analysis system is the planning system WILLIAM primarly developed at LBL by the UCB Space Sciences Laboratory. It is an image processing system using LANDSAT satellite images as primary input. Graphic output has been produced in black and white using the subroutines of IDDS and CARTE as well as color output on the NOVA system at the Space Sciences Laboratory in Berkeley.

Color output will soon be available bor both systems on-line at LBL with the arrival of a video frame buffer. The video frame buffer is a television-based display system to be used for a variety of graphic displays. The use of an interactive system allows the user to immediately explore and experiment with analysis and display techniques for his or her data. The use of full color will add a fresh dimension to the information content of the display.

LBL COMPUTER MAPPING PROJECTS 1973 - PRESENT

MANPOWER INDICATOR ATLAS FOR REGION IX

300 color maps and corresponding tables of Federal Region IX by county showing socio-economic-demographic data extracted from the 1970 census.

ADMINISTRATIVE ATLAS

18 black and white cross-hatched maps and corresponding tables of Federal Region IX by county indicating dollars and manpower slots authorized by the U.S. Department of Labor for contracts active March 31, 1973.

PILOT LAND USE INFORMATION SYSTEM: PART III, VOLUME V

13 black and white cross-hatched and color maps showing property values of about 500 parcels of land about a quarter-mile radius around a rapid transit station in Walnut Creek, California.

MANPOWER INDICATOR ATLAS - DENVER/BOULDER SMSA

57 color maps and 19 corresponding tables showing socio-economic-demographic data extracted from the 1970 census; for each of the 19 data items selected there are 3 maps; one of the entire Denver/Boulder SMSA by census tract, one Denver area inset by census tract, and one Boulder area inset by census tract.

MANPOWER INDICATOR ATLAS - PHOENIX SMSA

Similar to the Denver/Boulder atlas, 24 color maps and 12 corresponding tables.

NORTHWEST REGIONAL PROFILE

14 color maps and corresponding tables of Federal Region X by county showing socio-economic-demographic data extracted from the 1970 census.

CETA ADMINISTRATIVE MAPS

5 color maps: two U.S. by state, one U.S. by county, one U.S. by SMSA, and one for Federal Region IX by county. Corresponding tables show the allocation of fiscal year 1974 Federal funds under the terms of the Comprehensive Employment and Training Act (CETA) of 1973, Title II.

ENVIRONMENTAL IMPACT STUDY MAPS

A series of 37 black and white cross-hatched maps for the U.S. Army Corps of Engineers showing selected socio-economic-demographic data for SMSA's from 5 states and combined county corridor areas bordering the upper Mississippi and Illinois rivers.

ENERGETICS ATLAS OF THE UNITED STATES

A series of 31 color maps, U.S. by county, describing the U.S. energy system. Characteristics include demographic and economic variables, production and uses of fuels, electric and refinery capacities, and emissions of air pollutants from fuel use. Available from BNL.

ENDANGERED SPECIES STUDY

A series of 7 color maps showing endangered species by county in the U.S. Maps include an inventory of mammals, fish, birds and a total map of endangered animal species. Available from BNL.

ENERGY AND ENVIRONMENT REGIONAL STUDIES PROJECT: ERDA

A series of black and white cross-hatched maps, state by county, showing projections of water requirements, power plant emissions and energy requirements for California, Nevada and Hawaii. Data will eventually be plotted for Air Quality Control Regions and Hydrologic Study Areas.

Power plant siting criteria will also be studied with the aid of computer generated maps.

CERCDC: CALIFORNIA ENERGY RESOURCE CONSERVATION AND DEVELOPMENT COMMISSION

A State of California project to study energy related impacts of the present 1976-1977 drought: factors to be considered include, reduction of hydroelectric generating capability and increased pumping requirements of agricultural areas. Black and white maps will be presented by hydrologic study area.

BACKCOUNTRY USE PATTERN STUDY

A series of line and symbol black and white maps for the Forestry Department of the University of California showing the various alternative use patterns from changing constraints in a linear programming model of back country use.

PARAP: POPULATIONS AT RISK TO AIR POLLUTION PROJECT

An EPA sponsored project that includes a series of black and white maps by county: SAROAD air quality data characteristics, cancer mortality rates and survey data, and various 1970 census socio-economic-demographic characteristics. These are planned activities for 1977.

The creation of an integrated data base of air pollution and pollutants, morbidity and mortality statistics, and other socioeconomic and demographic characteristics will also be completed.

URBAN ATLAS

12 color maps, 17x22, for each of the 65 largest SMSA's from the 1970 Census. The maps show the spatial distribution of selected census socioeconomic characteristics. Map insets are provided for the larger SMSA's. The project sponsored by the Census Bureau, Department of Labor and LBL.

PART B

POLYGON BASED MAPPING SYSTEM

PART B

POLYGON BASED MAPPING SYSTEM

4. Introduction

The graphic display of tabular data can be a valuable aid to understanding. This writeup primarily describes choropleth mapping, in which geographic entities are described by polygons.

There are three subsystems: DO BE DO, for preparing data for mapping; MAPEDIT, for preparing a geographic base file; and CARTE, for combining the two to produce thematic maps. Although DO BE DO and MAPEDIT are completely independent programs, their output is required input to CARTE. A detailed flow chart of the relationship of the subsystems is given in Figure 1. This mapping system will be explained fully with detailed examples in the Tutorial Map Session of this writeup.

Despite the apparent complexity of the process, computer mapping is easy when step-by-step procedures are followed. The mapping steps in the tutorial have been designed to operate in a fail-safe mode. The User should approach this fundamental mapping process with confidence. With practice, a firm foundation in computer mapping can be built.

A summary of the programs' capabilities are given in Figure 2. Knowledge of these figures is not necessary for successful mapping; they are included to aid in the understanding and operations of the mapping system.

SEEDIS Polygon Mapping System

The flow chart can be divided into three essential parts:

1. Preparing the data, program DO BE DO
2. Preparing the map file, program MAPEDIT
3. Constructing the map, program CARTE

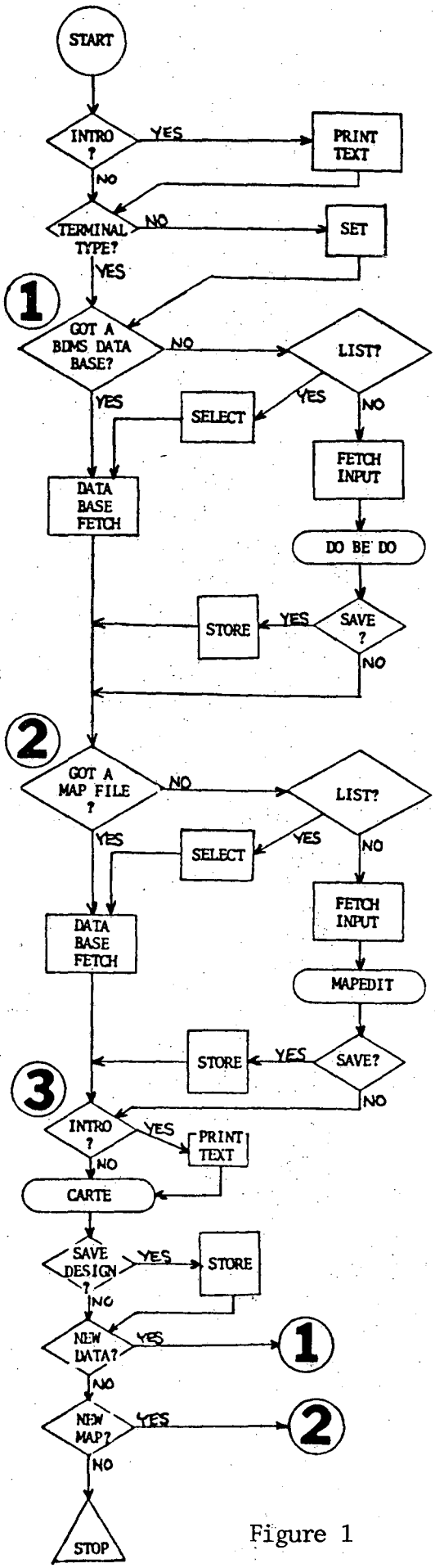


Figure 1

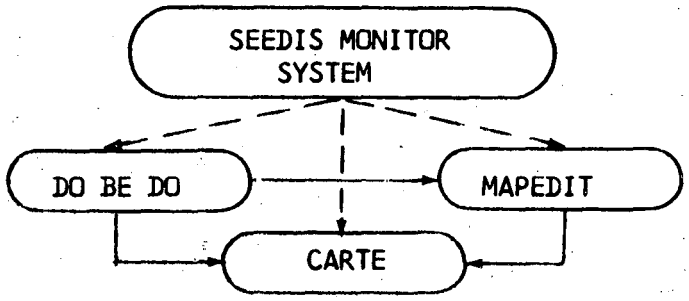


Figure 2. Summary of Mapping System Capabilities

DO BE DO Converts data into and out-of a standard mapping format

Operations: Creation, Conversion and Editing
Acceptable Formats:
Organized as all geocodes and characteristics for an area
BCD unit records
Binary records
Organized as one geocode or characteristic for all areas (inverted)
Binary records
Standard - BDMS inverted data base consisting of:
Named characteristic record(s)
Area name records (optional)
Named key record(s)
Data base ID record with:
Area name
Data base name
Key record names and corresponding MAPEDIT descriptor number.

MAPEDIT Modifies map files, and does format conversions

Combinations of maps
Selection of subsets
Projections - conic, equirectangular
Coordinate operations - translation, scaling, rotation, 'distortion', and line straightening.
Formats - nickel (CARTE standard), tencents (U.S. like)

CARTE Combines data and base map under user guidance to produce thematic maps.

Data input - BDMS inverted data base
Map input - Nickel file
Map output - thematic maps on graphics terminals, calcomp plotters, microfiche and 35mm film
Analysis - arithmetic computations on data set variables
Design features - windowing of base map by rectangle or geocode into one or more insets; interactive title and legend specification; user drawn figures/symbols
Symbolism types: points - user-drawn symbol scaled by data value
lines - user set expansion of line width
areas - character at centroid or textures from parallel or cross-hatched lines.

5. The MONITOR System[3]

The SEEDIS MONITOR System provides access to the various mapping programs. Within the larger LBL-BKY operating system, MONITOR is a smaller system that provides many helps to the User. These helps include simplified tape staging, PSS storing and retrieving, and MSS operations. MONITOR replaces all of the difficult control card sequences, and hardware access routines. MONITOR also gives descriptions of the programs, prompts for running them, and lists other sources of information.

The BKY System is the overall LBL computing network, and is identified as BKY. Information as to system hardware and software, user services, running batch and interactive jobs, storage media, charges, accounting and other information is available in a Computer Center document, WRITEUPS, Users Introduction.[4] This information is required for the new User, as instructions for logging on the computer, valid account numbers, and other details must be completed before use of the LBL computer can begin. For further details, write or call

Mr. Eric Beals
415-843-2740 Ext. 5351.

6. Getting Started - MONITOR and CARTE

The computer mapping sequence: data base formulation (DO BE DO), map file creation (MAPEDIT), and the actual map construction (CARTE) is initiated with the following MONITOR commands. See Figure 1, the LBL-CSAM CARTE Mapping System Flow Chart, for an overview of all operations.

Begin by logging on the computer:

>LOG,JOB NAME,PRIORITY,TIME.ACCOUNT NUMBER,USER NAME! (MONITOR commands and prompts will be printed in "Italics")

↑LOAD,MONITOR,SEEDIS!

↑RUN!

when loaded, enter the word

CARTE!

after a short delay, the User is greeted with

WELCOME TO THE CARTE MAPPING SYSTEM

DO YOU WANT A BRIEF INTRODUCTION?

answer Yes or No

ENTER TERMINAL TYPE

answer 4012, 4014, or GT40

DO YOU HAVE A DATA BASE ALREADY PROCESSED THRU THE DO BE DO PROGRAM?

answer Yes or No: if YES, the User will be prompted to either enter the mag tape number, PSS, or Common File on which the data base has been stored. The User then proceeds to the MAPEDIT phase.

if NO, continue to the next prompt.

DO YOU HAVE DATA READY FOR PROCESSING THRU THE DO BE DO PROGRAM?

answer Yes or No: if YES, again the User will be prompted to enter the storage device information on which the data resides - proceed to page 17.

if NO, continue.

DO YOU WANT TO SEE A LIST OF AVAILABLE DATA BASES?

answer Yes or No: If YES, a display will be produced, showing a list of data bases, each with a distinct Index Number. The User will then be prompted to select a data base from the list - enter it's Index Number, and then proceed to MAPEDIT.

if NO, it is now assumed that the User has not prepared input data on mag tape or PSS for processing thru DO BE DO, and want's to terminate the run.

The next set of MONITOR questions or prompts concern MAPEDIT.

DO YOU HAVE A MAP FILE ALREADY PROCESED THRU THE MAPEDIT PROGRAM?

answer Yes or No: if YES, the User will be prompted to either enter the mag tape number, PSS, or MSS information on which the map file has been stored. The User then proceeds to CARTE, page 37.

if NO, continue to the next prompt.

DO YOU WANT THE DEFAULT MAPFILE, FEDERAL REGION IX BY COUNTY?

answer Yes or No: if YES, the default map will be fetched, and the User will proceed to CARTE.

if NO, the User will select a mag tape or MSS subset from the SEEDIS data base for mapping. Proceed to program MAPEDIT, page 22.

This concludes the initial MONITOR prompts and questions.

7. Creating a Data File - Program DO BE DO

Preparing the Data Sets

Data for CARTE must initially be in a machine readable form of known structure. Historically, input for the batch mode version was in a fixed format, (I3,I5,I4,I8,3A10,3F10.1). An explanation of this format and the batch version of CARTE will be found in APPENDIX C. This is a useful writeup, in that many of the features in program DO BE DO and interactive CARTE have evolved along similar lines of development.

348000	1419	1391	-28	-2.0	4679	4285	-394	-8.4	18690	28284	9594	51.3
349000	2035	2090	55	2.7	6191	5528	-663	-10.7	14088	18858	4770	33.9
350000	1750	2101	351	20.1	4314	5162	848	19.7	10879	16843	5964	54.8
351100	3483	4651	1168	33.5	5537	6919	1382	25.0	10095	11806	1711	16.9
351200	1537	1602	65	4.2	5631	5372	-259	-4.6	17091	23186	6095	35.7
352100	1308	2019	711	54.4	5837	7451	1614	27.7	15354	27380	12026	78.3
352200	2216	2924	708	31.9	7408	8021	613	8.3	18694	24243	5549	29.7
353000	2336	2400	64	2.7	7691	7183	-508	-6.6	18255	24923	6668	36.5
354000	2119	2476	357	16.8	7065	7346	281	4.0	20007	29451	9444	47.2
355100	387	597	210	54.3	1381	2139	758	54.9	11514	14954	3440	29.9
355200	22	25	3	13.6	74	89	15	20.3	0	0	0	0.0
355300	2075	3110	1032	49.7	7859	10148	2289	29.1	14818	20389	5571	37.6
356000	337	654	317	94.1	1123	1983	860	76.6	13703	18999	5296	38.6
357000	1449	1420	-29	-2.0	3698	3281	-417	-11.3	9343	11129	1786	19.1
358000	1741	1723	-18	-1.0	5356	4685	-671	-12.5	8374	11337	2963	35.4
359100	2373	2832	459	19.3	7982	8150	168	2.1	11660	15248	3588	30.8
359200	1288	1792	504	39.1	4659	6272	1613	34.6	13652	19800	6148	45.0
360100	1335	1429	94	7.0	4713	4472	-241	-5.1	13648	18136	4488	32.9
360200	1371	1569	198	14.4	4369	4310	-59	-1.4	12153	15500	3347	27.5
361000	1009	1094	85	8.4	3277	3083	-194	-5.9	12076	14780	2704	22.4
362000	1314	1298	-16	-1.2	4138	3607	-531	-12.8	11493	14762	3269	28.4
363000	1635	1784	149	9.1	5221	5009	-212	-4.1	11746	14573	2827	24.1

For the interactive version of DO BE DO and CARTE, the workbook data example will have a format of, (I6,12F6.0). A portion of that data base in BCD mode is shown above.

A data set may have zero or more header (descriptive) alphanumeric cards preceding each data set; our example will have none. A project with many data sets needs some dividing and identification to minimize errors.

Actual data cards can consist of 4 keys, 3 words of name, and 1 or more data values. A minimum of 1 key and 1 data value is required. Format of key and data items is variable, although their form must be entered as

KEYS	in I Format
WORDS (names of records)	in A Format
DATA	in F Format.

In the data base above, there is 1 key and 12 data items.

When the data set(s) are finalized/verified and on mag tape or PSS, the next step is conversion to the Berkeley Data Management System (BDMS) via program DO BE DO. The BDMS manual is available as LBL-4683, however it is not necessary for successful completion of this workbook.

User input will be entered in free-format as answers to prompts generated by MONITOR and the DO BE DO program.

Getting Started - Program DO BE DO

After the initial MONITOR requests have set up the data file from mag tape, or PSS, the dialogue continues into the DO BE DO phase of the CARTE Mapping System.

```
ARE WE MAKING OR DUMPING BDMS RECORDS?
i dont know!
 UNRECOGNIZABLE COMMAND, PLEASE RETRY.
huh!
 THERE ARE   3 VALID COMMANDS
 MAKING      DUMPING     STOP
making!
IS TAPE3 BCD, REGULAR OR INVERTED BINARY?
bcd!
ENTER NUM HEADER CARDS TO SKIP !
?!
 ENTER NUMBER FOR BCD          HDR CARDS
0!
 ENTER ROW (OR DATA ITEM) FORMAT - BCD CARD IMAGE
(16,3f6.0)!
 ENTER STUDY AREA NAME
contra costa county!
 ENTER NUMBER FOR TOTAL        SUBAREAS
60!
 ENTER TEXT FOR DATA SOURC NAME
bruce burkhart!
 ENTER NUMBER FOR INPUT FILE FLDS/LINE
4!
 ENTER COLUMN FOR FIRST KEY!
1!
 ENTER NAME OF COLUMN
tracts!
 ENTER NAME OF COLUMN
 !
 ENTER CORRSPONDING MAP DESCRIPTOR
    1=STATE, 2=SMSA, 4=COUNTY, 8=TRACT
8!
 ENTER COLUMN FOR NEXT  KEY!
 !
 ARE WE INCLUDING NAMES FOR EACH ROW?
are we?!
 UNRECOGNIZABLE COMMAND, PLEASE RETRY.
kua!
 THERE ARE   2 VALID COMMANDS
 YES         NO
so?!
 THERE ARE   2 VALID COMMANDS
 YES         NO
 ENTER AN EMPTY LINE TO EXIT!
no!
 ENTER COLUMN FOR FIRST DATA CHARACTERISTIC
2!
 ENTER NAME OF COLUMN
housing, 1970!
 ENTER NAME OF COLUMN
 !
 ENTER COLUMN FOR NEXT  DATA CHARACTERISTIC
3!
 ENTER NAME OF COLUMN
housing, 1975!
 ENTER NAME OF COLUMN
 !
 ENTER COLUMN FOR NEXT  DATA CHARACTERISTIC
4!
 ENTER NAME OF COLUMN
numeric change, 1970-75!
 ENTER NAME OF COLUMN
 !
ENTER COLUMN FOR NEXT  DATA CHARACTERISTIC
!
FINISHED?
yes!
```

MONITOR queries,

WELCOME TO THE DO BE DO SYSTEM

The next and remaining prompts will be illustrated in the actual computer run at the left. The output is reproduced from the screen of a 4014 Tektronix display console. Note, that in the example, several errors have been entered as answers to the program's prompts. This is included to show what helps will appear when the input is incorrect.

ARE WE MAKING OR DUMPING BDMS RECORDS?

Enter MAKING when creating a new data base; DUMPING or STOP may also be entered.

IS TAPE3 BCD, REGULAR OR INVERTED BINARY?

Enter BCD if input on PSS or tape is in IBM card image.

ENTER NUMBER OF HEADER CARDS TO SKIP

Enter 0,1,2, etc. For our example, a value of zero is entered.

ENTER ROW (OR DATA ITEM) FORMAT - BCD CARD IMAGE

The User may enter the actual format of the entire card image, or enter

a format that will convert just the part needed for mapping. In our example, only the first three data items were required, so the format was entered as (I6,3F6.0). In most cases, the entire card format should be entered.

ENTER STUDY AREA NAME

Enter a title in 30 or less spaces. We will enter Contra Costa County.

ENTER NUMBER FOR TOTAL SUBAREAS

This entry corresponds to the total number of tracts, counties, states, or other division on the map file that will be shaded or cross-hatched. In this example, the mapfile that corresponds to this data base has 60 tracts in the map. This number entry is critical, the User must know the correct count of his/her geoarea's.

ENTER TEXT FOR DATA SOURCE NAME

Enter a title in 30 or less spaces.

ENTER NUMBER FOR INPUT FILE FLDS/LINE

For making a new data base, the program needs the total number of keys, words, and data items in the format entered above. In our example, there is one key and three data items; enter 4.

ENTER COLUMN FOR FIRST KEY

This prompt and the next two will be repeated (in a cycle) for each key in the data base. In the example, I6 is the only key and is in the first position or column of the card image; enter 1.

ENTER NAME OF COLUMN

The program wants an alphabetic identification of the column just entered, since I6 is the tract number, enter the name TRACTS. Up to two names (30 spaces long) can be entered. If the second column name is to be omitted, enter a blank space and Return.

ENTER CORRESPONDING MAP DESCRIPTOR
1=STATE, 2=SMSA, 4=COUNTY, 8=TRACT

Enter the value 1, 2, 4, or 8 according to the type (key) of the geographic area just described; enter 8.

ENTER COLUMN FOR NEXT KEY

If there is a second, third, or fourth key to be entered - they would be entered just as the first key was processed. Since our example, does not have a second key, enter a blank space, and return.

ARE WE INCLUDING NAMES FOR EACH ROW?

If identification of the geoarea was included in the card image (in A Format), this ID which is usually the key being mapped is now entered. See APPENDIX C, page . Our example shows none, enter NO.

ENTER COLUMN FOR FIRST DATA CHARACTERISTIC

In the example, format (I6,3F6.0) indicates 3 data columns are to be used in the card image. Any one or all columns in any order may be put into BDMS at this point. For example, if the third data value, in column 4 (the single key in column 1 is counted), enter 4. Or if wanted in order of card image entries (1-3) start with the first data value; enter 2.

ENTER NAME OF COLUMN

Enter a text name of the data item just entered in 30 or less spaces. Again, a second name is permited, if none; enter a blank line and return.

ENTER COLUMN FOR NEXT DATA CHARACTERISTIC

If there is a second, third, or more data columns to be entered - they would be entered just as the first data item was processed. In our example, enter 3. When all of the data columns have been entered, enter a blank line, and return.

FINISHED?

In our example, all entries have been processed, enter YES.

------ Return to the MONITOR System -------

Now that the data base has been processed thru DO BE DO, the file can be displayed, then saved (or rejected) on a storage device for future input to the CARTE program. Presently these files may be saved only on mag tape or PSS. MONITOR now queries:

DO YOU WANT TO VIEW THE DATA BASE(S) JUST COMPLETED?

answer Yes or No: if YES, the data will be displayed and written to the output file. See the following page for a YES response.

if NO, next query

DO YOU WANT TO SAVE THE DATA BASE JUST COMPLETED?

answer Yes or No: if YES, proceed to next query.

if NO, the data base is retained only for the duration of the computer run; proceed to MAPEDIT.

```
*         I DONT KNOW
*         HUH
*         MAKING
*         BCD
*         7
*         0
*         (I6,3F6.0)
*         CONTRA COSTA COUNTY
*         60
*         BRUCE BURKHART
*         4
*         1
*         TRACTS
*
 RECORD 1
 RECORD NAME = TRACTS          5 7      5 8

 TYPE = 1

 KEY VECTOR = 301000,302000,303100,303200,304000,305000,306000,307100,30
              7200,308000,309000,310000,311000,312000,313100,313200,3141
              00,314200,315000,316000,317000,318000,319000,320000,321100
              ,321200,322000,323000,324000,325000,326000,327000,328000,3
              29000,330000,331000,332000,333100,333200,334000,335000,336
              100,336200,337100,337200,337300,338100,338200,338300,33900
              0,340000,341000,342000,343000,344000,345100,345200,346100,
              346200,347000

*         8
*
*         ARE WE?
*         KUA
*         SO?
*         NO
*         2
*         HOUSING, 1970
*
 RECORD 2
 RECORD NAME = HOUSING, 1970           5 8

 TYPE = 2

 DATA VECTOR = 1177.00,1470.00,1102.00,655.00,448.00,2164.00,2531.00,195
               6.00,1834.00,894.00,1507.00,1488.00,1054.00,496.00,976.00
               ,1581.00,2186.00,1174.00,241.00,573.00,981.00,1241.00,213
               8.00,1447.00,2228.00,544.00,1589.00,1318.00,2180.00,1889.
               00,804.00,1229.00,330.00,2080.00,2091.00,2063.00,2360.00,
               1432.00,1906.00,1721.00,1284.00,2488.00,2216.00,442.00,16
               22.00,1714.00,1973.00,1652.00,2430.00,2520.00,3412.00,145
               0.00,1308.00,3463.00,944.00,1957.00,2037.00,898.00,1755.0
               0,984.00

*         3
*         HOUSING, 1975
*

 DATA VECTOR = 1208.00,1793.00,1464.00,905.00,550.00,2344.00,2761.00,227
               1.00,3411.00,1166.00,1192.00,1419.00,1062.00,490.00,2397.
               00,2137.00,2622.00,1432.00,291.00,573.00,998.00,1223.00,2
               213.00,1549.00,3526.00,1302.00,1739.00,1428.00,2598.00,19
               18.00,1040.00,2749.00,396.00,2185.00,2045.00,2213.00,2603
               .00,1936.00,1972.00,2901.00,1266.00,3850.00,2645.00,442.0
               0,2618.00,1866.00,2678.00,3877.00,2946.00,4028.00,4123.00
               ,1682.00,1367.00,4429.00,914.00,5057.00,3282.00,1353.00,2
               512.00,1233.00

*         4
*         NUMERIC CHANGE, 1970-75
*
 RECORD 4
 RECORD NAME = NUMERIC CHANGE, 1970-75

 TYPE = 2

 DATA VECTOR = 31.00,323.00,362.00,250.00,102.00,180.00,230.00,315.00,15
               77.00,272.00,-315.00,-69.00,8.00,-6.00,1421.00,556.00,436
               .00,258.00,50.00,0.,17.00,-18.00,75.00,102.00,1298.00,758
               .00,150.00,110.00,418.00,29.00,236.00,1520.00,66.00,105.0
               0,-46.00,150.00,243.00,504.00,66.00,1180.00,-18.00,1362.0
               0,429.00,0.,996.00,152.00,705.00,2225.00,516.00,1508.00,7
               11.00,232.00,59.00,966.00,-30.00,3100.00,1245.00,455.00,7
               57.00,249.00

*
*         YES
 RECORD 5
 RECORD NAME = DBID

 TYPE = 0

 KEY VECTOR = 60,1970,3,81604380783

 AREA NAME.1 = CONTRA COSTA COUNTY

 AREA NAME.2 = BRUCE BURK

 AREA NAME.3 = WDS/NAME

 AREA NAME.4 = TRACTS          5 7      5 8
```

This output is included to show the BDMS format of the User input.

MONITOR continues to query,

STORE THE DATA ON TAPE OR PSS?

answer Tape or PSS: if TAPE, enter the LBL active library tape number. When using tapes, the User name and account number must be in the LBL Library System owner table before tapes can be used. Refer to the writeup - LIBTAPE. Contact the tape librarian

Jewel Walczak
415-843-2740 Ext. 6219.

if PSS, enter the PSS library and subset names separated by commas, for example, MASTER,FILEA. Similar to tape procedures, PSS space must also be arranged with the LBL Computer Center. Details for both tape and PSS use can be found in the Users Introduction referred to on page 14.

After the files have been successfully written to tape or PSS, the User is returned to the MONITOR System for the next phase in map making - MAPEDIT, page 15.

If the User wants to end the computer run at this point, enter STOP!

8. Creating A Map File - Program MAPEDIT[5]

Introduction

This program creates the map file for input to CARTE. Although MAPEDIT supports a variety of mapping operations, the programs use and examples here will be directly linked with the mapping program CARTE.

Presently, MAPEDIT has two sources of input, magnetic tape and the Mass Storage System (MSS). If the User intends to input and execute MAPEDIT interactively, make certain the MSS device is operational and running. There are

UCLBL Computer Center
Preventative Maintenance Schedule*

CDC 7600	S - MFE	...	1700 - 2400	IBM Data Cells	T, Th (if required)	...	0700 - 0900
	M - MFE	...	0000 - 0500	IBM Chip Store	M,T,W,F	...	0700 - 0900
	M	...	0500 - 0845		Th	...	0700 1100
	T - MFE	...	2100 - 2400	CDC 854 Disk Drives	W (if required)	...	0700 - 0900
	W - MFE	...	0000 - 0600	Datagraphix 4460	T	...	0700 0900
	Th	...	0600 - 0845	IBM 7044	F	...	0800 - 1000
	Th - MFE	...	2100 - 2400	IBM 1401	F	...	1000 - 1200
	F - MFE	...	0000 - 0600	ARPA IMP	M, First full week of the month	...	1200 - 1400
CDC 6600B	T	...	0500 - 0845				
CDC 6400C	M	...	0500 - 0845				
HCS COPE	Th	...	0700 - 0800				

Systems Programmer's Scheduled Time: W, F when requested ... 0600 - 0800
RECC: W when requested ... 0600 - 0800

Principal period of maintenance is 0800 - 1700 M - F for all CDC machines,
0700 - 1600 M - F for all IBM machines,
0630 - 1530 M - F for COPE Controller.

scheduled hours of maintenance for this device and other hardware at LBL. See the maintenance schedule above.

See the MSS Subset Listing on page 25 for available tract outline SMSA's. A list of magnetic tapes is also included, showing available geographic map outlines.

Getting Started - MAPEDIT

After the User has completed DO BE DO, or has proceded directly from the initial MONITOR requests, the dialogue continues into the MAPEDIT phase of the CARTE Mapping System. MONITOR queries,

WELCOME TO THE MAPEDIT SYSTEM

WILL THE MAP FILE BE ON TAPE OR MSS?

answer Tape or MSS: if TAPE, enter the LBL active library tape number.

*This schedule is subject to change without notice.

For tape information, refer to page 21.
if MSS, enter the MSS subset name found in the table on pages 25 thru 30.

ENTER INPUT DATA

If the User has selected the magnetic tape input option above, see Example 4 below. If MSS is selected, see Examples 1-3. Additional details on the use of tape and MSS also follow. The examples will be found on pages 31 to 36.

Example 1: the User accesses the MSS to create a special Census tract map of a small section of a county.

Example 2: the User accesses the MSS again, to create a much larger special Census tract portion of a county.

Example 3: the User uses MSS to pull an entire SMSA map.

Example 4: the User selects a magnetic tape with the U.S. state outlines, to make a six state map.

After the User has entered the input data to MAPEDIT, as per the examples, the input must be executed with the command (entered twice)

*QUIT
*QUIT

This command will usually follow the *PLOT or *GRID card in the input string. After a successful MAPEDIT run, the User is returned to the MONITOR System with the query,

DO YOU WANT TO SAVE THE MAP FILE JUST COMPLETED?

answer Yes or No: if YES, proceed to the next query.
if NO, the mapfile is temporarily saved for the computer run.

STORE THE MAP FILE ON TAPE OR PSS?

answer Tape or PSS: if TAPE, enter the LBL active library tape number.
if PSS, enter the PSS library and subset names, separated by commas.

After the map file has been successfully written to a storage medium, the User will to advanced to the next phase in the CARTE Mapping System - CARTE.

If the User wants to end the computer run at this point, enter STOP.

The Geographic Data Base - Magnetic Tape

The mapfile data base contains several magnetic tapes, produced by the Graphics Group in CSAM, and are available for use. However, the tapes are subject to parity errors, purge, or removal to inactive status without notice.

TAPE LIST

LBL Tape Number	Projection	Content
09703	Conic	U.S., State outlines, SMSA outlines (no tracts) *See Example 4, page 36 for use of this tape.*
17268	"	U.S. by county/state
27493	"	U.S. by county with state outlines, entire U.S.
00261	Long/Lat	Continental state outlines (not Hawaii, etc.)
05336	"	AQCR outlines (Air Quality Control Regions)
11471	"	BEA areas (Bureau of Economic Analysis)
10472	"	U.S. by county (with file marks between states)
14292	"	Hawaii, Alaska, Puerto Rico by "county"

There are several other special map files now in production, including a portion of the World Data Bank II. This geodata includes several files which include all North America and it's coast lines, islands, and lakes; rivers; and international boundaries. Plans call for the entire data bank to be implemented in 1977.

Users are encouraged to contact the Graphics Group for all available map files, and are also urged to submit their own special map files for the SEEDIS data base at LBL.

The Geographic Data Base - BKY Chip Store (MSS)

The Mass Storage System (MSS) at LBL contains an extensive geodata base which includes all of the 1970 Census definations of the Standard Metropolitan Statistical Areas (SMSA's) in the country.

A listing of these SMSA's are found in the Table that follows. The MSS Subset Name is used as input in the MAPEDIT program.

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
0040	41	1458	Abilene, TX	ABILENE
0080	128	3157	Akron, OH	AKRON
0120	30	1372	Albany, GA	ALBANYG
0160	161	5876	Albany-Schen-Troy, NY	ALBANY
0200	55	1893	Albuquerque, NM	ALBUQUE
0240	125	5071	Allentown-Beth, NJ-PA	ALLENTO
0280	36	1613	Altoona, PA	ALTOONA
0320	62	1484	Amarillo, TX	AMARILL
0360	322	10105	Anaheim, Santa Ana, CA	ANAHIEM
0400	38	877	Anderson, IN	ANDERSO
0440	64	1779	Ann Arbor, MI	ANNARBO
0460	78	2758	Appleton-Oshdosh, WI	APPLETO
0480	36	4642	Ashville, NC	ASHEVIL
0520	233	13607	Atlanta, GA	ATLANTA
0560	77	3340	Atlantic City, NJ	ATLANTI
0600	51	2345	Augusta, GA-SC	AUGUSTA
0640	37	2532	Austin, TX	AUSTIN
0680	84	2350	Bakersfield, CA	BAKERSF
0720	542	25327	Baltimore, MD	BALTIMO
0760	65	2481	Baton Rouge, LA	BATONRO
0800	28	1003	Bay City, MI	BAYCITY
0840	91	3305	Beaumont-Port Arthur, TX	BEAUMON
0880	29	2053	Billings, MT	BILLING
0920	36	2348	Biloxi-Gulfport, MS	BILOXI
0960	70	2764	Binghamton, NY-PA	BINGHAM
1000	149	11312	Birmingham, AL	BIRMING
1040	23	332	Bloomington-Norma, IL	BLOOMIN
1080	33	1892	Boise City, ID	BOISECI
1120	544	19584	Boston, MA	BOSTON
1160	106	7000	Bridgeport,CT	BRIDGEP
1170	12	672	Bristol, CT	BRISTOL
1200	35	2009	Brockton, MA	BROCKTO
1240	43	2941	Brownsville-Harli TX	BROWNSV
1260	16	1127	Bryan-College Station, TX	BYRONCO
1280	279	6913	Buffalo, NY	BUFFALO
1320	85	2858	Canton, OH	CANTON
1360	39	2110	Cedar Rapids, IA	CEDARRA
1400	33	544	Champaign-Urbana, IL	CHAMPAI
1440	79	7220	Charleston, SC	CHARLSC
1480	61	6795	Charleston, WV	CHARLWV
1520	87	5287	Charlotte, NC	CHAROLE
1600	1410	16225	Chicago, IL	CHICAGO
1640	318	16269	Cincinnati, OH-KY-IN	CINCINN
1680	459	9034	Cleveland, OH	CLEVELA
1720	58	2871	Colorado Springs, CO	COLORAD
1740	20	1547	Columbia, MO	COLUMBM

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
1760	82	5844	Columbia, SC	COLUMBS
1800	67	3749	Columbus, AL-GA	COLUMBA
1840	237	6200	Columbus, OH	COLOMBO
1880	76	4089	Corpus Christi, TX	CORPUSC
1920	367	2047	Dallax, TX	DALLAS
2000	209	5000	Dayton, OH	DAYTON
2040	32	1053	Decatur, IL	DECATUR
2080	349	7932	Denver-Boulder, CO	DENVER
2120	66	1492	Des Moines, IA	DESMOIN
2160	1028	12432	Detroit, MI	DETROIT
2200	18	1187	Dubuque, IA	DUBUQUE
2240	92	5131	Duluth-Superio, MN-WI	DULUTH
2280	47	3768	Durham, NC	DURHAM
2320	61	2071	El Paso, TX	ELPASO
2360	52	1117	Erie, PA	ERIE
2400	54	6178	Eugene-Springfield, OR	EUGENE
2440	66	2656	Evansville, IN-KY	EVANSVI
2480	35	1819	Fall River, MA-RI	FALLRIV
2520	23	3032	Fargo-Moorhead, ND-MN	FARGOMO
2560	37	3482	Fayetteville, NC	FAYETTE
2600	24	1738	Fitchburg, MA	FITCHBU
2640	111	3180	Flint, MI	FLINT
2680	126	1905	Ft. Lauderdal-Hol, FL	FTLAUDE
2720	37	3746	Fort Smith, AR-OK	FORTSMI
2760	65	1593	Fort Wayne, IN	FORTWAY
2800	176	9933	Fort Worth, TX	FORTWOR
2840	96	3444	Fresno, CA	FRESNO
2880	31	3503	Gadsden, AL	GADSDEN
2900	22	1517	Gainsville, FL	GAINESV
2920	55	2950	Galveston-Texasci,TX	GALVEST
2960	108	2756	Gary-Hammond-E.Ch, IN	GARYHAM
3000	125	3179	Grand Rapids, MI	GRANDRA
3040	30	2670	Great Falls, MT	GREATFA
3080	44	2384	Green Bay, WI	GREENBA
3120	157	8287	Greensboro-Winsto, NC	GREENSB
3160	58	5623	Greenville, SC	GREENV
3200	55	3077	Hamilton-Middleto, OH	HAMILTO
3240	110	4419	Harrisburg, PA	HARRISB
3280	175	3334	Hartford, CT	HARTFOR
3320	165	9610	Honolulu, HI	HONOLUL
3360	348	16187	Houston, TX	HOUSTON
3400	68	5006	Huntington-Ashlan, OH	HUNTING
3440	71	3668	Huntsville, AL	HUNTSVI

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
3480	253	4495	Indianapolis, IN	INDIANA
3520	32	893	Jackson, MI	JACKMIC
3560	61	5584	Jackson, MS	JACKMIS
3600	105	3777	Jacksonville, FL	JACKSON
3640	159	5114	Jersey City, NJ	JERSEY
3680	67	4086	Johnstown, NJ	JOHNSTO
3720	51	2076	Kalamazoo, MI	KALAMAZ
3760	357	8156	Kansas City, MO-KS	KANSASC
3800	30	524	Kenosha, WI	KENOSHA
3840	94	6993	Knoxville, TN	KNOXVIL
3880	21	1212	Lafayette, LA	LAFAYEL
3920	29	705	Lafayette-WLAFAYE	LAFAYEI
3960	40	2113	Lake Charles, LA	LAKECHR
4000	82	6464	Lancaster, PA	LANCAST
4040	100	2132	Lansing, MI	LANSING
4080	19	507	Laredo, TX	LAREDO
4120	70	1683	Las Vegas, NV	LASVEGA
4160	51	2364	Lawrence-Haver, MA-NH	LAWRENC
4200	24	604	Lawton, OK	LAWTON
4240	19	1415	Lewiston-Auburn-ME	LEWISTO
4280	42	1395	Lexington, KY	LEXINGT
4320	55	1088	Lima, OH	LIMA
4360	45	844	Lincoln, NE	LINCOLN
4400	58	4357	Little Rock-NLitt, AR	LITTLER
4440	71	3430	Lorain-Elyria, OH	LORAINE
4480	1579	52	Los Angeles-Longb, CA	LOSANGE
4520	181	5495	Louisville, KY-IN	LOUISVI
4560	46	1790	Lowell, MA	LOWELL
4600	42	1180	Lubbock, TX	LUBBOCK
4640	29	3563	Lynchburg, VA	LYNCHBU
4680	51	3333	Macon, GA	MACON
4720	77	3825	Madison, WI	MADISON
4800	30	589	Mansfield, OH	MANSFIE
4840	22	2726	Mayague, Puerto Rico	MAYAGUE
4880	43	1184	Mcallen-Pharr-Edi, TX	MCALLEN
4920	141	3761	Memphis, TN-AR	MEMPHIS
4960	17	560	Meriden, CT	MERIDEN
5000	232	4079	Miami, FL	MIAMI
5040	16	282	Midland, TX	MIDLAND
5080	373	6729	Milwaukee, WI	MILWAUK
5120	506	12801	Minneapolis-StPau, MN	MINNEAP
5160	126	8288	Mobile, AL	MOBILE
5170	49	2381	Modesto, CA	MODESTO
5200	34	2462	Monroe, LA	MONROE

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
5240	55	3653	Montgomery, AL	MONTGOM
5280	27	530	Muncie, IN	MUNCIE
5320	46	1893	Muskegon-M.Height, MI	MUSKEGO
5360	114	6535	Nashville-Davidso, TN	NASHVIL
5400	41	1621	New Bedford, NA	NEWBEDF
5440	32	1501	New Britain, CT	NEWBRIT
5480	77	3294	New Haven-W.Haven, CT	NEWHAVE
5560	264	5144	New Orleans, LA	NEWORLE
5600	357	6367	Bronx,Cnty 5, NYC	BRONX
5600	800	8582	Kings,Cnty 47, NYC	KINGSCO
5600	518	16910	Nassau,Cnty 59, NYC/Suffolk	NASSAU
5600	296	5083	NY Co, Cnty 61, NYC	NEWYOCO
5600	683	10841	Queens, Cnty 81, NYC	QUEENS
5600	100	3347	Richmond,Cnty 85, NYC	RICHNYC
5600	36	1822	Rockland,Cnty 87, NYC	ROCKNYC
5600	208	9965	Westchester,C119, NYC	WESTCHE
5640	404	13179	Newark, NJ	NEWARK
5680	58	5691	Newport News, VA	NEWPORT
5720	185	185	Norfolk-Portsmout, VA	NORFOLK
5760	39	2869	Norwalk, CT	NORWALK
5800	26	385	Odessa, TX	ODESSA
5840	35	1509	Ogden, UT	OGDEN
5880	210	2728	Oklahoma City, OK	OKLAHOM
5920	134	2468	Omaha, NE,IA	OMAHA
5960	101	3538	Orlando, FL	ORLANDO
6000	90	4744	Oxnard-Ventura, CA	OXNARD
6040	213	6472	Patterson, Clifton, NJ	PATTERS
6080	52	3869	Pensacola, FL	PENSACO
6120	78	2263	Peoria, IL	PEORIA
6160	1140	30534	Philadelphia, NJ-PA	PHILADE
6200	233	2634	Phoenix, AZ	PHOENIX
6240	21	1287	Pine Bluff, AR	PINEBLU
6280	713	29834	Pittsburgh, PA	PITTSBU
6320	15	796	Pittsfield, MA	PITTSFI
6360	32	2483	Ponce, Puerto Rico	PONCE
6400	63	3478	Portland, ME	PORTLAM
6440	271	11806	Portland, OR-WA	PORTLAO
6480	203	8240	Providence-Paw, RI-MA	PROVIDE
6520	40	2604	Provo, UT	PROVO
6560	42	2706	Pueblo, CO	PUEBLO
6600	26	642	Racine, WI	RACINE
6640	55	4470	Raleigh, NC	RALEIGH
6680	82	3433	Reading, PA	READING
6720	34	1362	Reno, NV	RENO
6760	142	4932	Richmond, VA	RICHMOV
6800	37	3395	Roanoke, VA	ROANOKE

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
6820	22	978	Rochester, MN	ROCHESM
6840	228	6292	Rochester, NY	ROCHEST
6880	69	1665	Rockford, IL	ROCKFOR
6920	172	4733	Sacramento, CA	SACRAME
6960	53	1083	Saginaw, MI	SAGINAW
7040	425	13906	St. Louis, MO-IL	STLOUIS
7080	46	3450	Salem, OR	SALEM
7120	62	5986	Salinas-Monterey, CA	SALINAS
7160	116	4548	Salt Lake-Ogden, UT	SALTLAK
7200	17	851	San Angelo, TX	SANANGE
7240	175	6361	San Antonio, TX	SANANTO
7280	217	7045	SanBernadino-Ri, CA	SANBERN
7320	318	6278	San Diego, CA	SANDIEG
7360	739	26740	San Francisco-Oak, CA	SANFRAN
7400	210	7401	San Jose, CA	SANJOSE
7440	169	9256	San Juan, Puerto Rico	SANJUAN
7480	58	5375	Santa Barbara, CA	SANTABA
7500	43	4250	Santa Rosa	SANTARO
7520	73	3370	Savannah, GA	SAVANNA
7560	60	2282	Scranton, PA	SCRANTO
7600	311	10647	Seattle-Everett, WA	SEATTLE
7640	19	1355	Sherman, TX	SHERMAN
7680	68	5163	Shreveport, LA	SHREVEP
7720	29	1334	Sioux City, NE-IA	SIOUXCI
7760	23	909	Sioux Falls	SIOUXFA
7800	70	1404	South Bend, IN	SOUTHBE
7840	90	5150	Spokane, WA	SPOKANE
7880	40	1446	Springfield, IL	SPRINIL
7920	52	967	Springfield, MO	SPRINGM
7960	42	2262	Springfield, OH	SPRINGO
8000	90	3196	Springfield-Chico, MA	SPRINGF
8040	46	4113	Stamford, CT	STAMFOR
8080	48	3569	Steubenville-W., OH-WV	STEUBEN
8120	72	3990	Stockton, CA	STOCKTO
8160	181	4482	Syracuse, NY	SYRACUS
8200	80	3955	Tacoma, WA	TACOMA
8240	42	1415	Tallahassee, FL	TALLAHA
8280	240	1536	Tampa-St. Petersbu, FL	TAMPA
8320	45	1672	Terre Haute, IN	TERREHA
8360	27	2342	Texarkana, TX-AR	TEXARKA
8400	196	4308	Toledo, MI-OH	TOLEDO
8440	41	1122	Topeka, KS	TOPEKA
8480	61	2153	Trenton, NJ	TRENTON
8520	66	2984	Tuscon, AZ	TUCSON
8560	139	4103	Tulsa, OK	TULSA
8600	25	3080	Tuscaloosa, AL	TUSCALO

SMSA Number	Number of Tracts	Number of Points	SMSA Name	MSS Subset Name
8640	23	1922	Tyler, TX	TYLER
8680	104	4538	Utica, NY	UTICA
8720	78	4642	Vallejo-Napa-Fair, CA	VALLEJO
8760	32	3271	Vineland, NJ	VINELAN
8800	44	3882	Waco, TX	WACO
8840	655	23245	Washington, D.C., MD-VA	WASHING
8880	51	3363	Waterbury, CT	WATERBU
8920	36	1600	Waterloo	WATERLO
8960	88	3300	West Palm Beach, FL	WESTPAL
9000	52	3902	Wheeling, OH-WV	WHEELIN
9040	106	2041	Wichita, KA	WICHITK
9080	40	2828	Wichita Falls, TX	WICHITT
9120	102	2660	Wilkes-Barre, PA	WILKESB
9160	143	8094	Wilmington, DE-MD-NJ	WILMIND
9200	33	2510	Wilmington, NC	WILMINN
9240	92	3750	Worcester, MA	WORCEST
9280	82	8691	York, PA	YORK
9320	135	4927	Youngstown, OH	YOUNGST

EXAMPLE 1

```
*A M
/CO=13,TR=301000
/CO=13,TR=302000
/CO=13,TR=303100
/CO=13,TR=303200
/CO=13,TR=304000
/CO=13,TR=355100
/CO=13,TR=314100
/CO=13,TR=314200
/CO=13,TR=310000
/CO=13,TR=311000
/CO=13,TR=312000
/CO=13,TR=313100
/CO=13,TR=313200
/CO=13,TR=305000
/CO=13,TR=306000
/CO=13,TR=307100
/CO=13,TR=307200
/CO=13,TR=308000
/CO=13,TR=309000
```

Specific area information is to be extracted from the Oak-San Francisco SMSA tract map file data base.

In the input data at the left, 19 tracts from county 13 are to be "gathered" to form a special map file for input to CARTE.

*A maximum of 20 detail cards per *A M card can be used in MAPEDIT. See Example 2 for a job with more than 20 detail cards.*

```
 121.651   38.025    6    7360    0    13    247    0    65  301000
 121.700   37.995    6    7360    0    13      0    0    20  302000
 121.691   37.941    6    7360    0    13    330    0    20  303100
 121.728   37.941    6    7360    0    13    330    0    20  303200
 121.657   37.880    6    7360    0    13      0    0    20  304000
 121.823   37.863    6    7360    0    13     85    0    15  355100
 121.937   38.032    6    7360    0    13   3096    0    10  314100
 121.985   38.042    6    7360    0    13      0    0    10  314200
 121.675   38.082    6    7360    0    13    247    0    65  301000
 121.628   38.082    6    7360    0    13    247    0    65  301000
 121.894   38.030    6    7360    0    13   2175    0    80  310000
 121.899   38.025    6    7360    0    13   2175    0    80  311000
 121.874   38.020    6    7360    0    13   2175    0    80  312000
 121.880   38.005    6    7360    0    13   2175    0    80  313100
 121.919   38.009    6    7360    0    13   2175    0    80  313200
 121.833   38.019    6    7360    0    13     85    0    15  305000
 121.784   38.007    6    7360    0    13     85    0    15  306000
 121.823   37.999    6    7360    0    13     85    0    15  307100
 121.845   38.001    6    7360    0    13     85    0    15  307200
 121.785   37.996    6    7360    0    13     85    0    15  308000
 121.883   38.031    6    7360    0    13   2175    0    80  309000
 121.871   38.044    6    7360    0    13   2175    0    80  309000
 121.855   38.049    6    7360    0    13   2175    0    80  309000
 121.655   38.059    6    7360    0    13    247    0    65  301000

GLOBAL LIMITS      121.52881200      37.73203400      122.00773300      38.10310500
NPOLY      24, PTS IN       0, PTS OUT      992
*P
*G
*QUIT
*QUIT
```

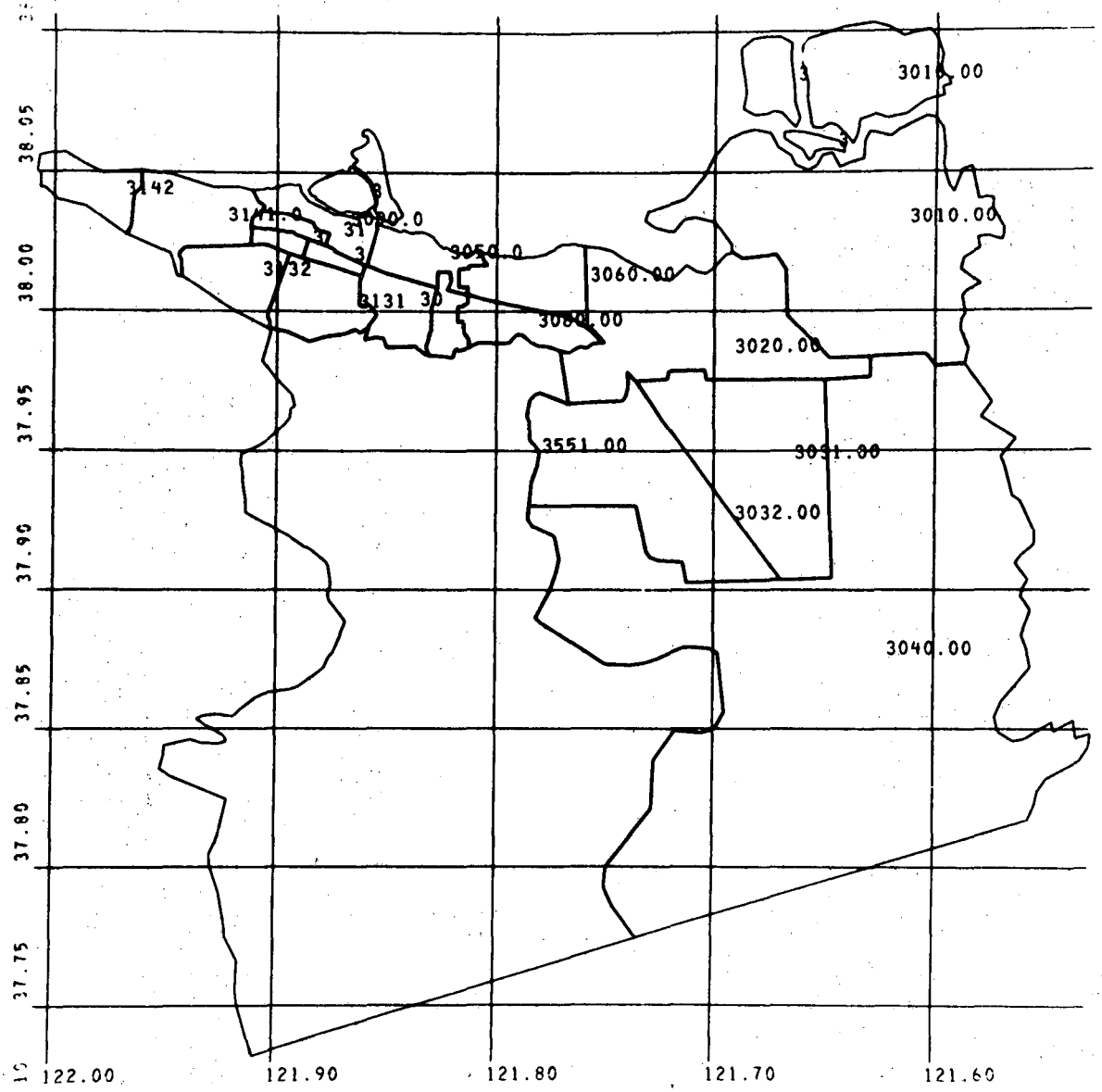
The computer printout above was generated by MAPEDIT from the input data in the box.

First, the data input is echoed; then a line of geocode ID is printed for each polygon generated by the input. Although 19 tracts were requested, 24 polygons were generated. This indicates one or more tracts have split areas or "islands". Notice that tract 301000 has four entries in the printout. This tract has four areas or polygons that describe it.

At the end of the listing, the number of polygons is listed (NPOLY=24) and the total number of points (992). The *P and *G are echoed input.

After all of the input has been entered, execute by *QUIT
*QUIT

EXAMPLE 1 (continued)



The mircofiche film reproduction above was generated by MAPEDIT with the two input cards

```
*P
*G
```

The *G or *GRID data entry is optional, if left out, the map is drawn without the grid.

Note, the four "islands" of tract 301000 described on the previous page. This is a good example of a split tract. Tract 309000 also has two parts.

EXAMPLE 2

```
*A M
/TR=315000
/TR=354000
/TR=353000
/TR=352200
/TR=352100
/TR=351100
/TR=351200
/TR=316000
/TR=317000
/TR=318000
/TR=319000
/TR=320000
/TR=321100
/TR=321200
/TR=322000
/TR=323000
/TR=324000
/TR=325000
/TR=326000
/TR=327000
```

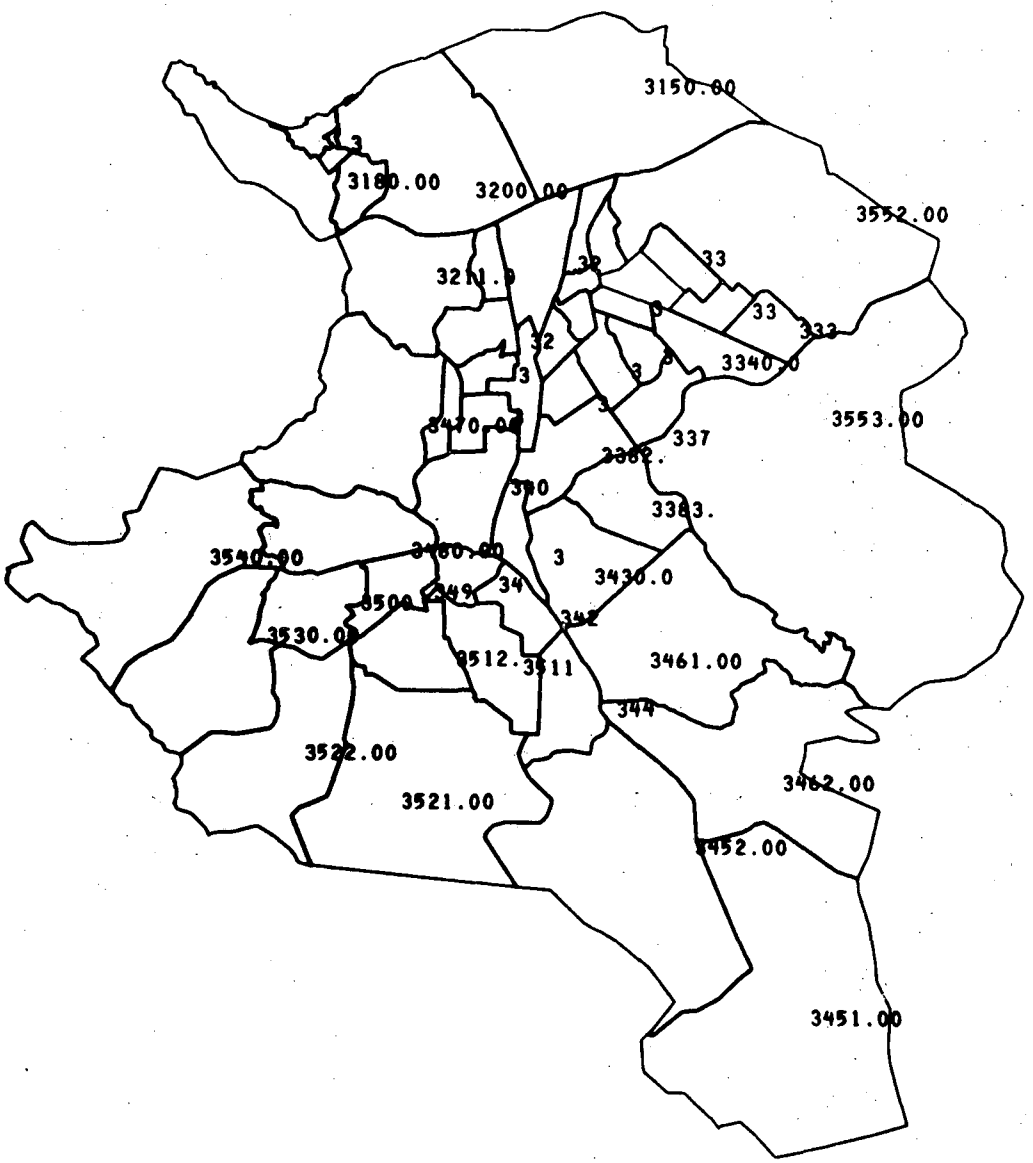
If the User needs more than 20 data entries to describe the map, they would be submitted (entered) as 20 or less, with each group separated by a *A M entry.

The MAPEDIT output below shows a portion of the input submitted for such a long job.

```
 122.030  38.032        6    7360    7360      13     595        0      35  315000
 122.198  37.891        6    7360    7360      13    1415        0      55  354000
 122.179  37.867        6    7360    7360      13    1415        0      55  353000
 122.154  37.840        6    7360    7360      13    1847        0      70  352200
 122.094  37.834        6    7360    7360      13    1847        0      70  352100
 122.072  37.868        6    7360    7360      13    3030        0     110  351100
 122.099  37.872        6    7360    7360      13    1415        0      55  351200
 122.143  38.023        6    7360    7360      13    1710        0      60  316000
 122.131  38.018        6    7360    7360      13    1710        0      60  317000
 122.161  38.017        6    7360    7360      13    1710        0      60  318000
 122.121  38.005        6    7360    7360      13    1710        0      60  319000
 122.092  38.020        6    7360    7360      13    1710        0      60  320000
 122.102  37.978        6    7360    7360      13    1710        0      60  321100
 122.072  37.986        6    7360    7360      13    2210        0      85  321200
 122.077  37.965        6    7360    7360      13    2210        0      85  322000
 122.073  37.954        6    7360    7360      13    2210        0      85  323000
 122.062  37.950        6    7360    7360      13     595        0      35  324000
 122.073  37.938        6    7360    7360      13    2210        0      85  325000
 122.089  37.941        6    7360    7360      13    2210        0      85  326000
 122.054  37.985        6    7360    7360      13     595        0      35  327000
GLOBAL LIMITS      121.96797200      37.80059400      122.24898000      38.05963600
NPOLY      20, PTS IN       0, PTS OUT     959
```

```
*A M
/TR=328000
/TR=329000
/TR=330000
/TR=331000
/TR=337200
/TR=332000
/TR=333100
/TR=333200
/TR=334000
/TR=335000
```

EXAMPLE 2 (continued)



The microfiche reproduction above was generated by MAPEDIT from the input on the previous page.

Note, this job did not have the *G entry.

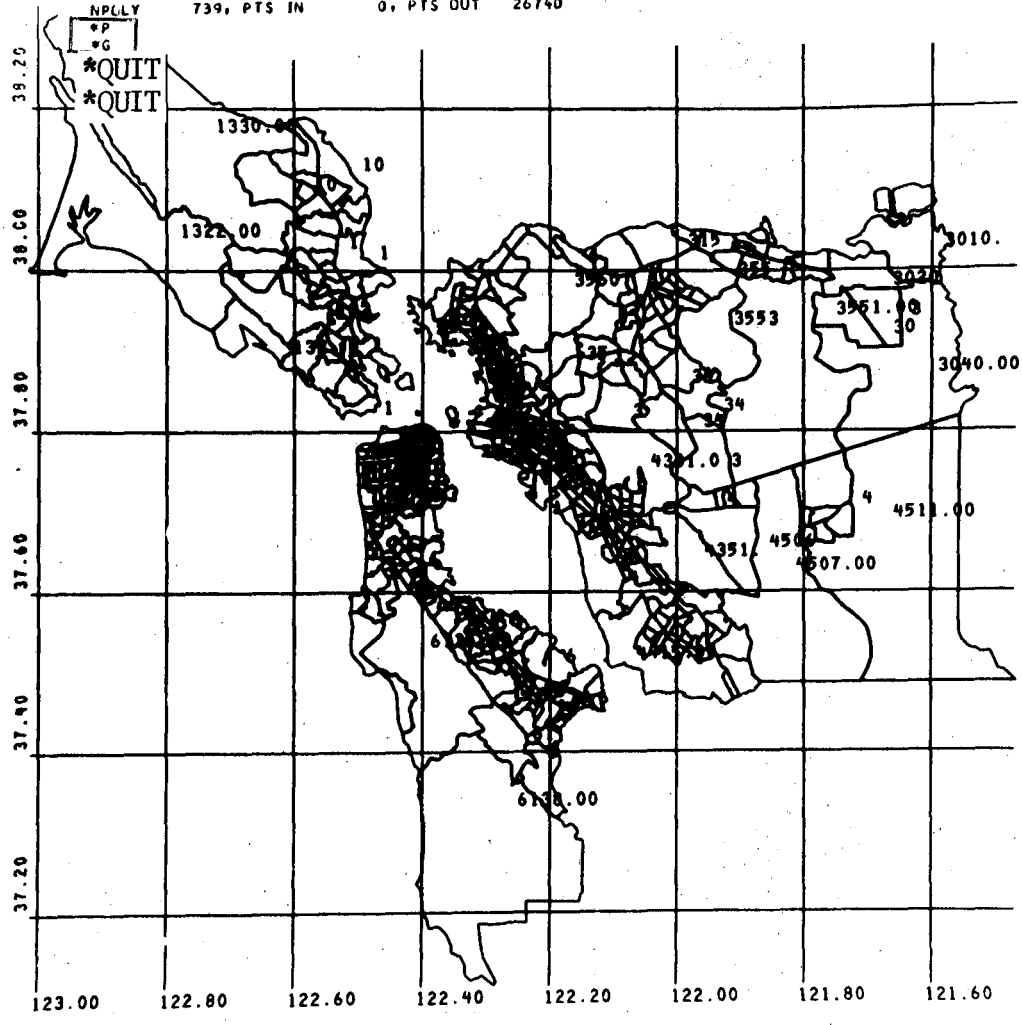
EXAMPLE 3

```
*A M
/SM=7360
121.651   38.025      6    7360
121.700   37.995      6    7360
121.691   37.941      6    7360
121.728   37.941      6    7360
121.657   37.880      6    7360
121.623   37.863      6    7360
121.565   37.956      6    7360
121.542   37.918      6    7360
121.537   38.032      6    7360
121.585   38.042      6    7360
122.030   38.032      6    7360
122.206   38.037      6    7360
122.254   38.041      6    7360    1.
122.541   38.135      6    7360    73
122.600   38.151      6    7360    73
   .         .        .      .       .
   .         .        .      .       .
   .         .        .      .       .
122.033   37.541      6    7360    7360
122.027   37.540      6    7360    7360
122.010   37.526      6    7360    7360
122.200   37.517      6    7360    7360      81
122.245   37.540      6    7360    7360      81    230
122.242   37.749      6    7360    7360       1     10      0          65  301000
121.655   38.059      6    7360       0      13    247      0
GLOBAL LIMITS        121.46716000        37.10969600        123.01382400        38.32468700
NPOLY      739, PTS IN        0, PTS OUT    26740
```

With one entry, /SM=7360, the entire Oakland-San Francisco SMSA can be fetched and stored from MSS.

The dashed lines in the output indicate that some of the intermediate printout was omitted to save space.

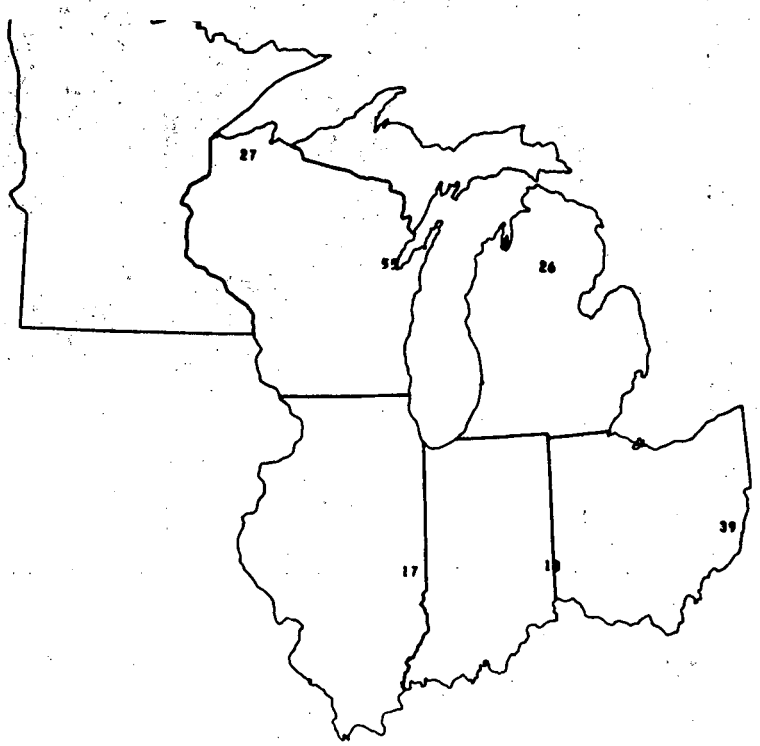
The map reproduction is also shown.



EXAMPLE 4

```
*A M
/ST=17,SM=0
/ST=18,SM=0
/ST=26,SM=0
/ST=27,SM=0
/ST=39,SM=0
/ST=55,SM=0
*PLOT
*QUIT
*QUIT
```

```
*A M
/ST=17,SM=0
/ST=18,SM=0
/ST=26,SM=0
/ST=27,SM=0
/ST=39,SM=0
/ST=55,SM=0
   2.489  -9.142      18       0       0       0          18
   2.101  -8.707      27       0       0       0          27
   2.271  -8.818      55       0       0       0          55
   2.322  -9.155      17       0       0       0          17
   2.401  -8.700      26       0       0       0          26
   2.553  -8.863      26       0       0       0   0      0       0       0       0
   2.665  -9.081      39       0       0       0          39
GLOBAL LIMITS        1.92050733      -9.34850907      2.78014854      -8.50458097
APCLV        7, PTS IN        0, PTS OUT     2407
*PLOT
```



This example shows how six state outlines were extracted from tape 09703.

9. Making Thematic Maps - Program CARTE[6]

Introduction

There are two versions of CARTE available to Users, the Batch Mode and the Interactive Mode. Information on the Batch Mode program will be found in APPENDIX C. The interactive version of CARTE is a significant extension of the batch version developed by and successfully used in the past years at LBL. The new version has incorporated design features for instant choropleth mapping via several CRT hardware configuration at BKY.

The interactive version of CARTE can be run under two options, normal and default. In the normal mode, the User has constant control over each step of the mapping process. If the default mode is selected, several preprogrammed sections of the code take over the User input. This default mode was created to speed up some of the mapping steps. Automatic data binning, preselected shade patterns, and legend display are included in the default mode.

As the mapping process evolved it became apparent that the User should be able to modify the existing data base for the map. This feature is available as Data Base Arithmetic; it is now possible to perform arithmetic on two or more characteristics in the data base. There is a special section on this CARTE option.

As a general guide to the workbook sections for mapping, the User will find

Normal CARTE mapping in Pictures 1-32
Insets in Pictures 33-46
Default CARTE mapping in Pictures 47-52
Data Base Arithmetic in Pictures 53-63.

Getting Started - Program CARTE

Map construction begins after the User has a data file converted thru DO BE DO and a mapfile processed by MAPEDIT. These files must have been fetched in the initial mapping sequence, DO BE DO, MAPEDIT, and CARTE. The dialogue continues with MONITOR saying

WELCOME TO THE CARTE SYSTEM
DO YOU WANT THE DEFAULT MAP DESIGN?

answer Yes or No: if YES, the User should proceed to Picture 47 and begin map construction, after reading the remaining CARTE "front matter" in this section.

if NO, the User will proceed to Picture 1 and begin.

After the User answer, CARTE will display a "base" rectangle or working space and a menu of eleven directives on the screen. The layout of the screen is slightly different for the normal and default mode. The order of selection of the directives and how to make a map will be explained in the following step-by-step picture section.

In the "workbook" example that follows, a Tektronix 4014 is connected to the BKY System. The smaller screen 4012 may be used, however map design may be a bit more crowded in the working space. A Tektronix 4610 hard-copy unit was used to produce the pictures in this book.

Order of Selection

In the normal mode of operation, the first four directives, DATA, INTERVALS, SHADING, and TITLES should be chosen in that order. The directive FINIS terminiates the program.

The INSETS directive - it's use and examples are shown in Pictures 33-46.

The first five directives in the menu are the only ones used for actual map design. Those that remain are used for "housekeeping" functions. It is convenient at this point to define them; the User should refer back to these directives when appropriate.

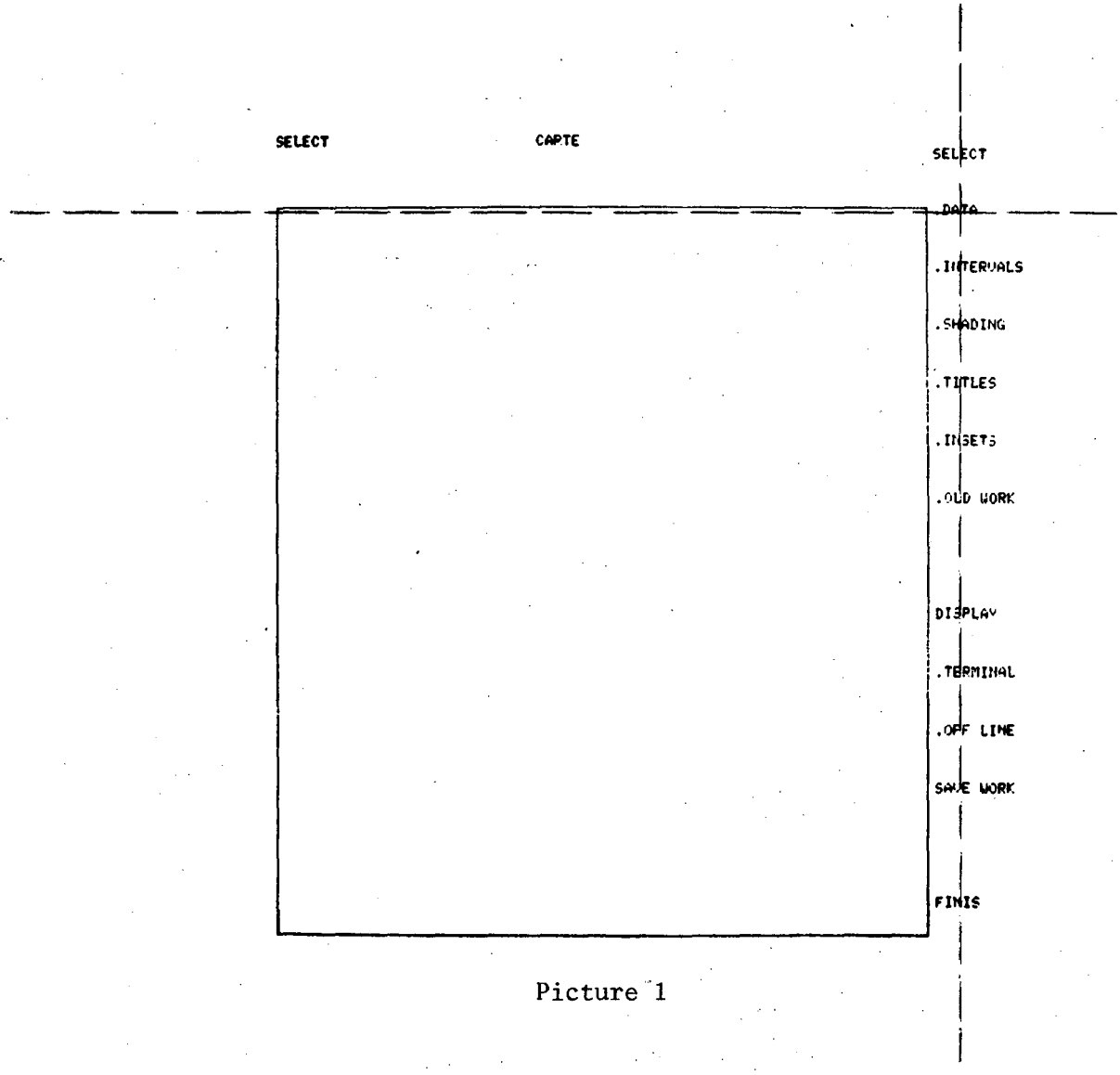
OLDWORK - returns the User to the last saved state of the map design.
DISPLAY - "do nothing"
TERMINAL - draws the User map in the current state of design.
HARDCOPY - disposes a copy of the map on a film output file.
SAVE WORK - stores current state of map design.

Detailed Design Sequence

.DATA - Data File Display

Execute the .DATA directive by centering the cross-hairs (represented by the dotted lines in Picture 1) on the word .DATA, now hit the space bar and then the Carriage Return key.

The User has an option with the DATA directive to do simple arithmetic on the data base characteristics. For further details see the Data Base Arithmetic section.



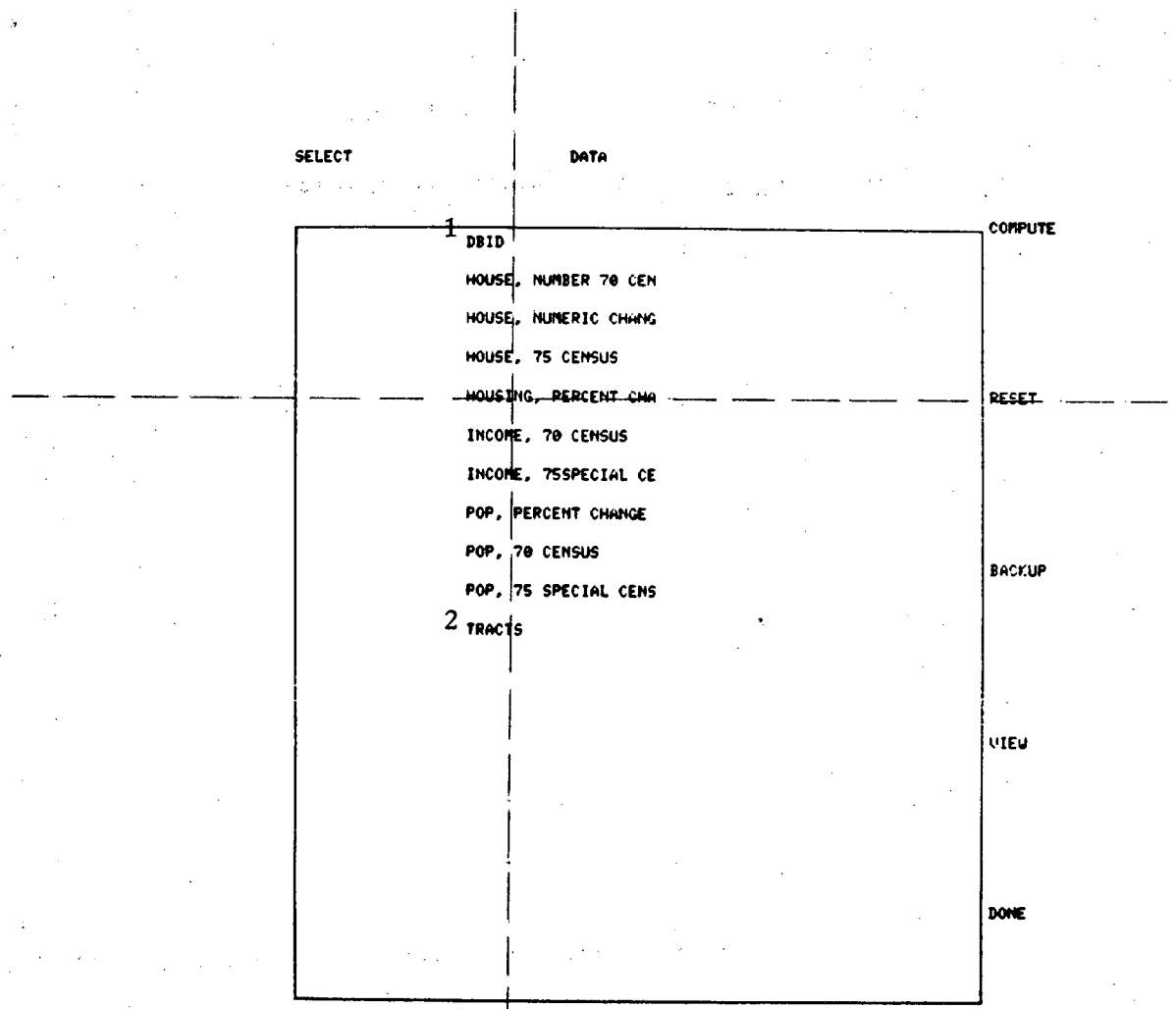
Picture 1

The screen will reset (clear) and display a new rectangle and list the data set(s) produced in Program DO BE DO. In Picture 2, a new set of directives are produced; COMPUTE, RESET, BACKUP, VIEW, and DONE.

Now, select the first data set to be binned. Set the cross-hairs on the data item desired (see Picture 2), hit the space bar and Return key. The data characteristics may be chosen in any order.

BACKUP - If the User wants to remove the last data tabulation selected, execute BACKUP. This directive does just that, it backs up and eleminates the last data tabulation selected.

RESET - If the User wants to disregard the complete list of selections, execute RESET. This command clears all the selections made, and the User may begin as if the .DATA option was reinitialized.



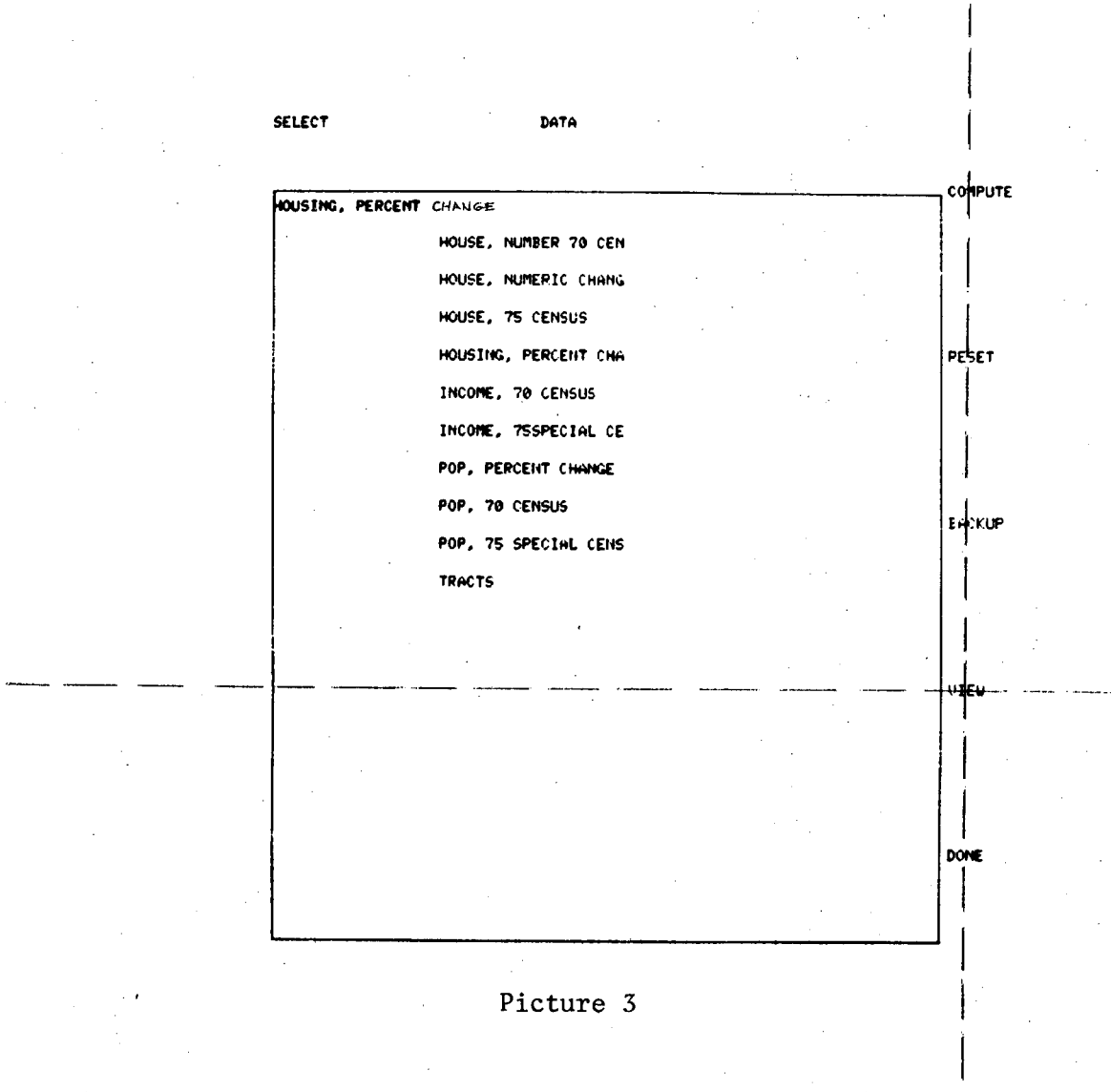
[1]DBID = Data base identification Picture 2

[2]TRACTS was the first (and only) key produced in DO BE DO

The screen is redrawn with the name of the data set just selected and printed in the top left corner of the work area.

Additional data sets may be selected at this time. Just repeat the previous step, and the data sets will reappear, in the order selected, at the left side of the workarea.

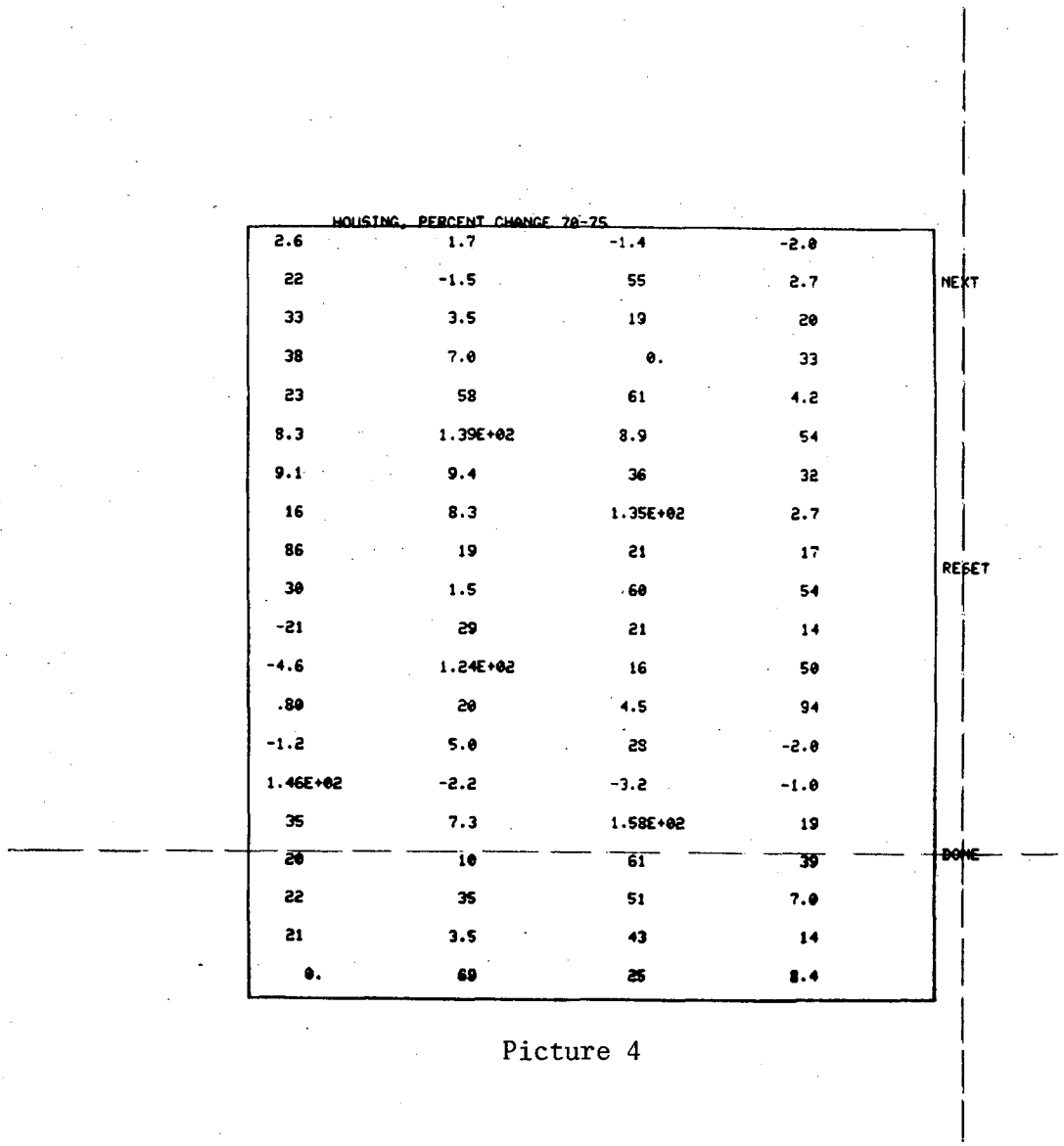
The User has the option of verifying the actual data values of any tabulation, selected, by executing VIEW. Although this option is usually not necessary, it will be shown for our writeup example. Center the cross-hairs on VIEW (see below) hit the space bar and Return.



Picture 3

The screen now displays the actual data values for the first data item just selected in the list. If the User has selected four sets to be mapped, by centering the cross-hairs on NEXT, and executing - the second data set values will be displayed. Repeat this procedure for all the data sets.

When finished reviewing the data, execute DONE (as shown below) in the menu.

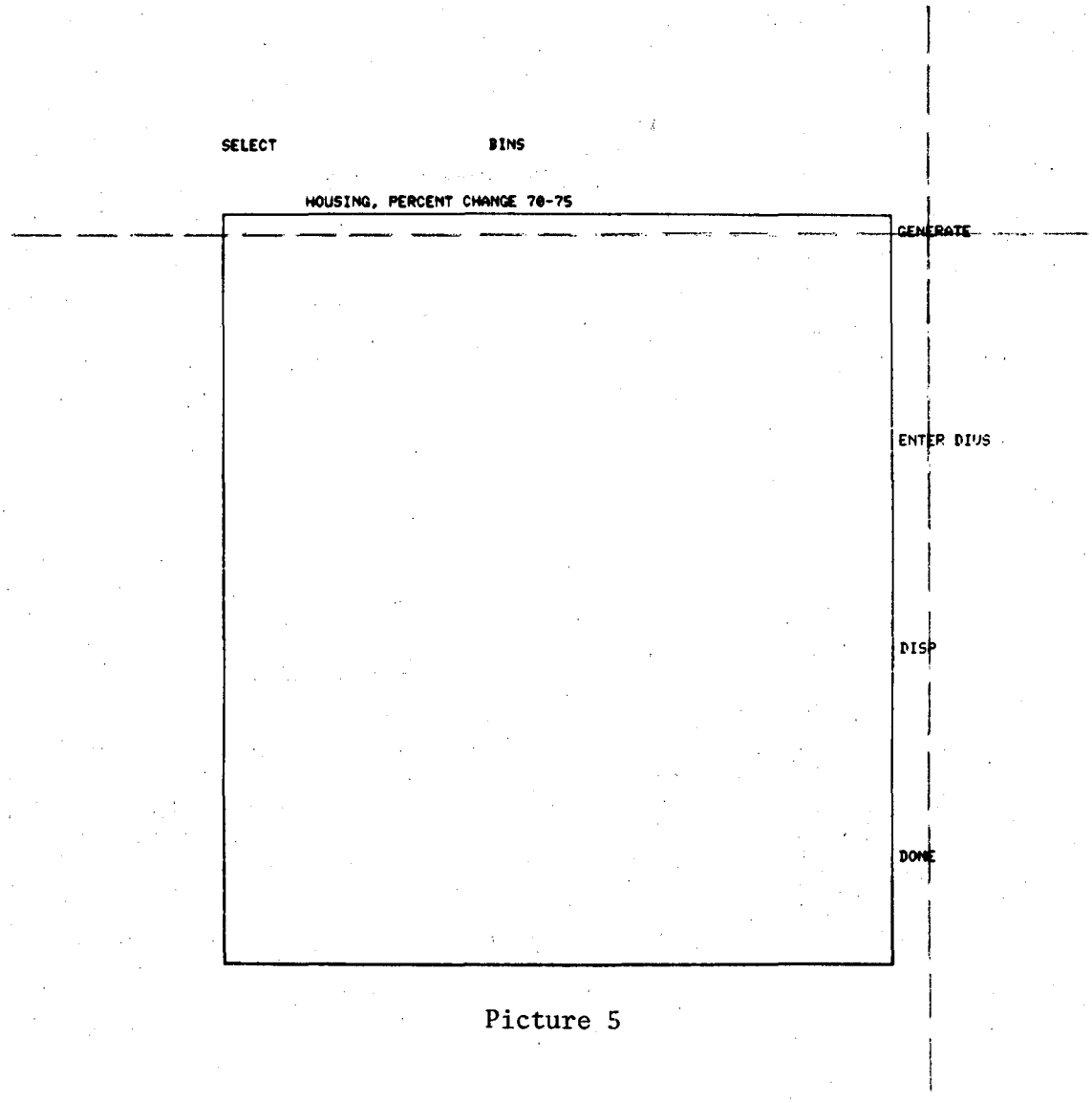


Picture 4

The program sets up the first data item for division of data or binning. The data set name is at the top of the empty work space; this name will appear for all subsequent operations in CARTE until a new characteristic is selected.

A choice must be made at this point. The computer can automatically bin the data with GENERATE or the data divisions can be entered manually with the command ENTER DIVS. For this writeup, both options will be tried.

First, center the cross-hairs on GENERATE (see below), hit space, Return.

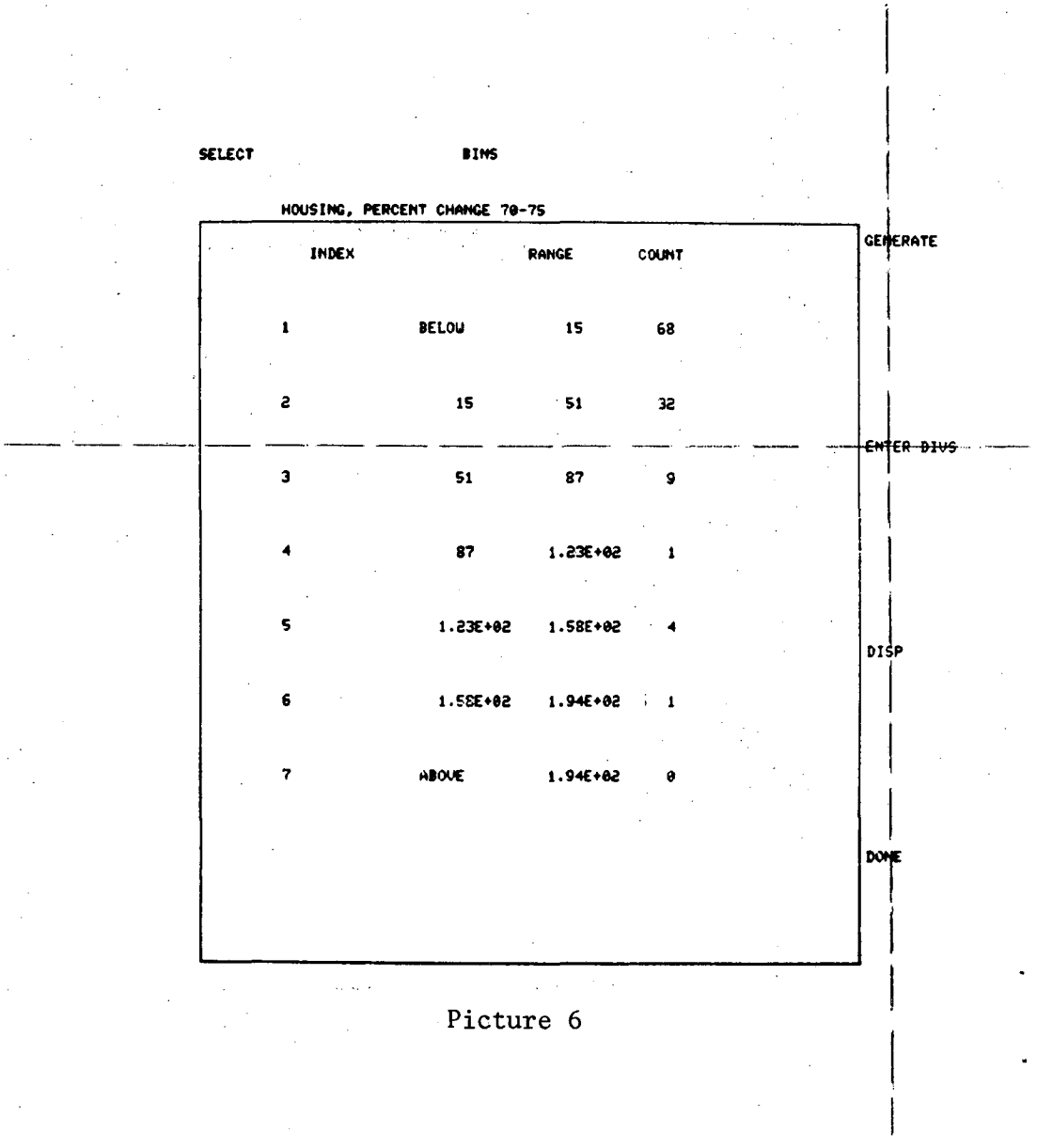


Picture 5

The results of the automatic binning algorithm are now displayed in Picture 6. The default of seven (Index) divisions (Column 1) are produced. The second and third columns are the Range of data values calculated; below 15, 15 to 51, etc. The last row is the Count of data values in each Range.

Now the User must determine if this division or number of data items per map shade will visually provide a useful, easy to read map. The example shows 100 of the 115 data items in the first two bins. Most map makers would agree that this would poorly display the data. Clearly, this example of automatic binning shows that the data values or divisions must be entered manually.

Center the cross-hairs on ENTER DIVS, hit space, Return.

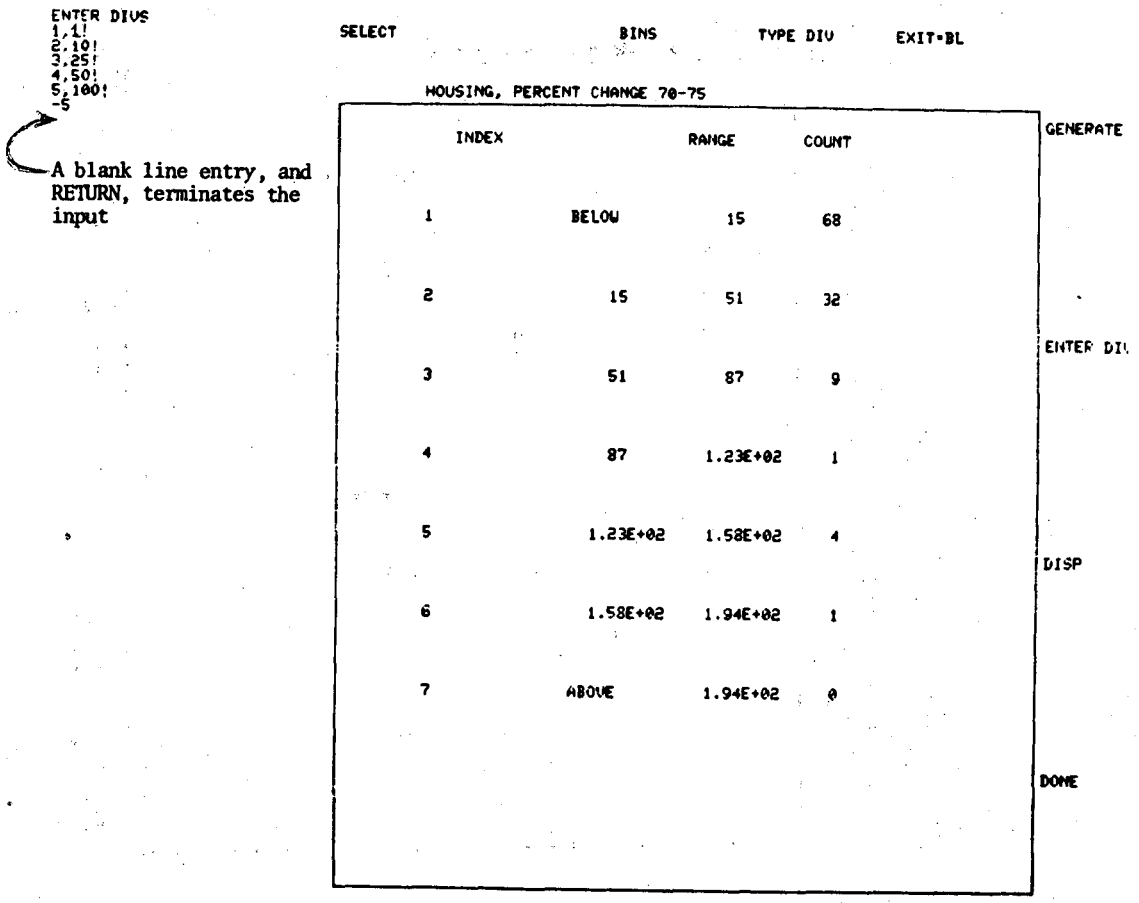


Picture 6

The versility of CARTE allows the User to quickly try various divisions and see the results immediately; finally settleing on a good distribution of data values.

How many boxes or shades should be selected? Usually the data will determine this choice; a range of 4 to 5 divisions will nicely display most data. However, with an almost unlimited choice of cross-hatching patterns, 6 and 7 divisions are possible in many mapping projects.

For our example, we will try 6 divisions for values of: below 1, 1 to 10, 10 to 25, 25 to 50, 50 to 100, and above 100. Enter the lowest value first (1,1), then the next highest value, (2,10), etc. Note how the values are entered below, to the left of the work area. Terminate the input with a negative integer value equal to the number of entries, in this case -5. The program will execute the input with a "blank line entry" and Return.

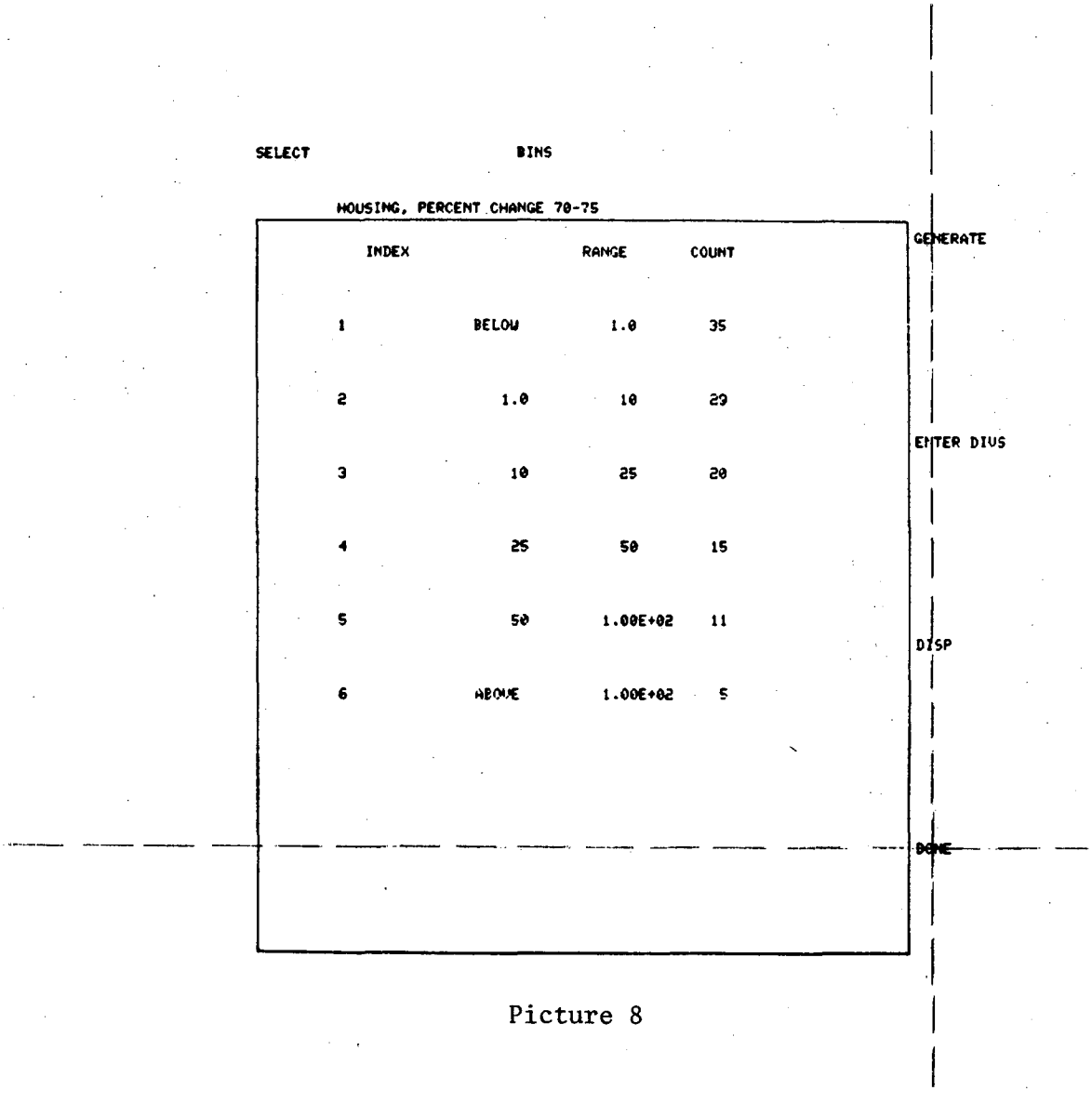


Picture 7

The new display in the work area below, now shows a better data division distribution in the Count column than the previous automatic calculation.

If the distribution (for the User's data) is still unacceptable, try new division numbers and repeat the previous steps by executing ENTER DIVS again.

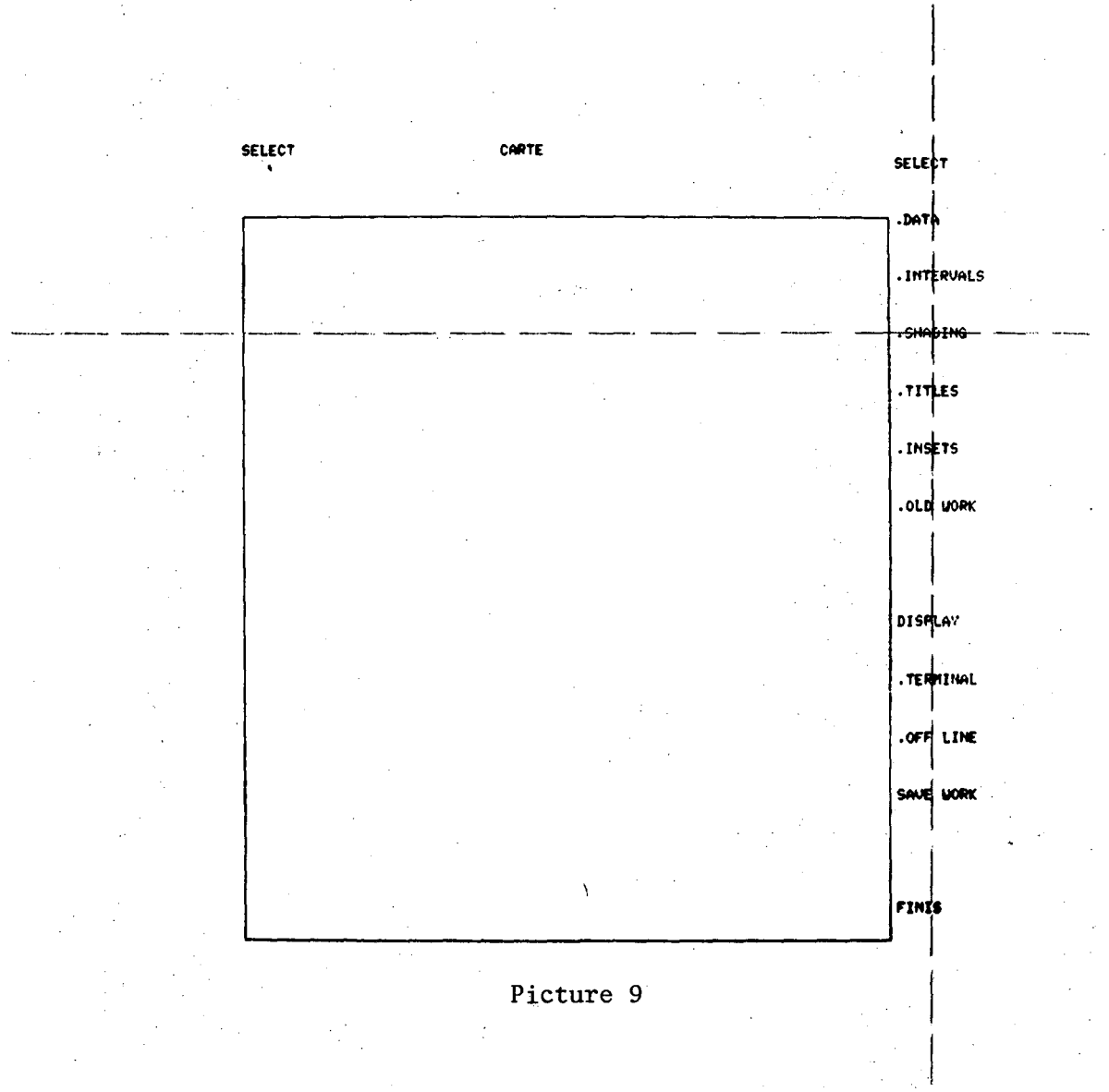
However, for our example, the divisions are pretty good. Terminate by executing the directive DONE.



Picture 8

The next normal mapping operation is selection of the cross-hatching patterns for the data divisions just calculated.

Execute the program directive, .SHADING (see below).



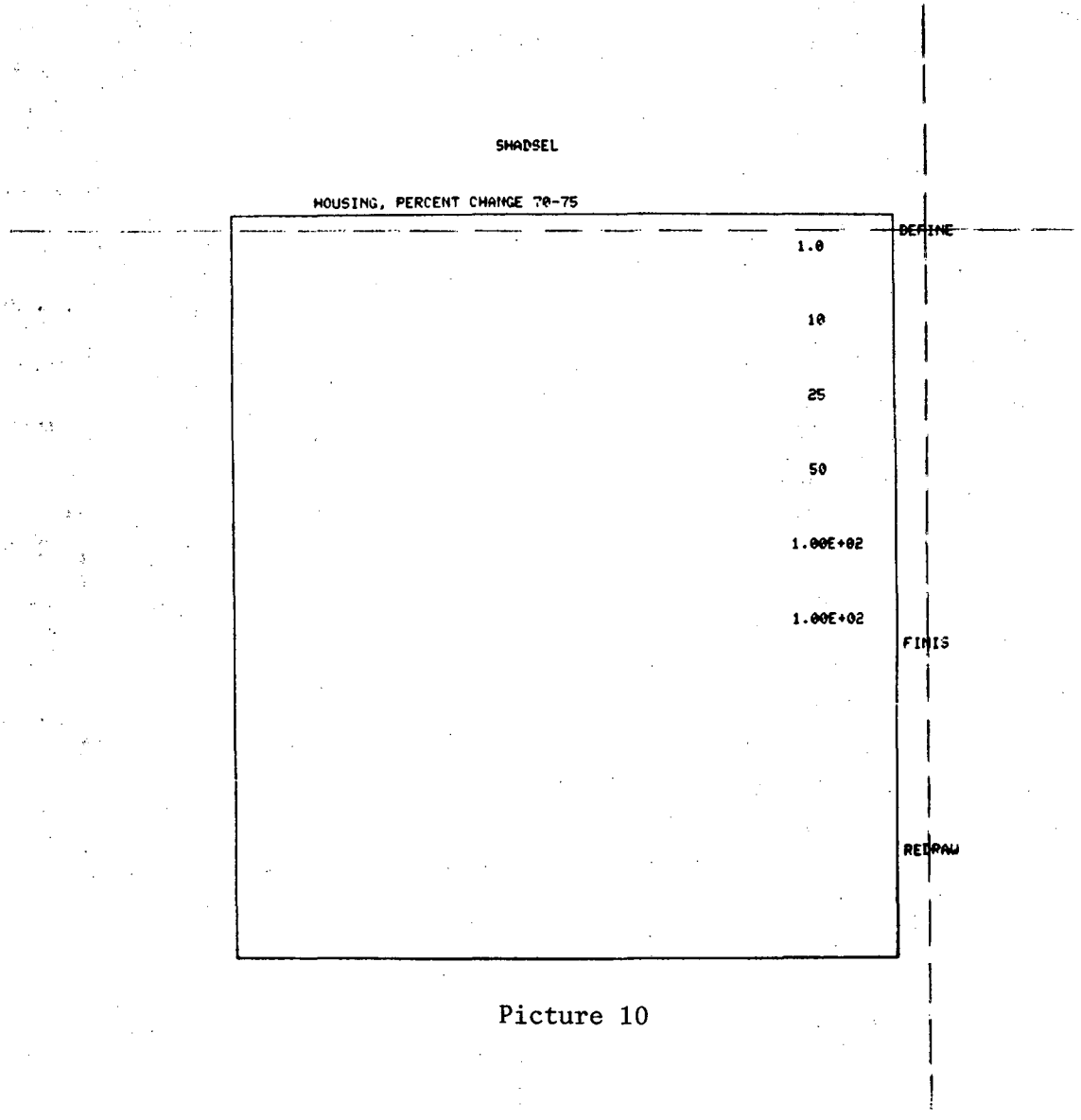
Picture 9

Three new directives appear with .SHADING: DEFINE, FINIS, and REDRAW.

Begin this operation by executing DEFINE (see Picture 10).

Note that the six data divisions previously selected, appear in the right section of the CARTE work area.

NOTICE: A zero value will appear if the data has not been previously binned.



Picture 10

Area Shading

The parameters for SHADE selection are

(Index), (Type), (P1), (P2), ...

INDEX, 1, "character"! (this is line 1 of input in Picture 11)
Type 1 is used when inputing a symbol or character.

INDEX, 2, V1, V2, V3!
Type 2 generates parallel lines (at 45) oriented by V1 and V2. Their width is set by the parameter V3. Values for V3 are:

0=solid lines
1=small dashes
2=
3=
4=long dashes

For example, line 2 of our example in Picture 11 prints the second box in the CARTE work space; its parameters are 2,2,.009,.009,1

LIMITATIONS: The range of V1 , V2 must be less than .03; one value may be zero, but not both. As the values of V1 and V2 become smaller, the lines will become closer together.

HINT: For a diagonal line: V1 = V2 or V1 = -V2
For a horizontal, vertical line: V1 = 0, V2 ≠ 0
V1 ≠ 0, V2 = 0

INDEX, 3, V1, V2, V3!
Type 3 generates parallel lines that cross (at two 45) oriented by V1 and V2. The other parameters are the same as for Type 2.

(Line 3 of the sample input in Picture 11 uses Type 3 crossing parallel lines)

Line Shading

INDEX, 4, P1, P2!
Type 4 generates line shading. P1 sets the line thickness.

Point Shading

INDEX, 5, (falls under TITLE SEL)

Picture 11 shows input for six shade selections and their resulting cross-hatch patterns.

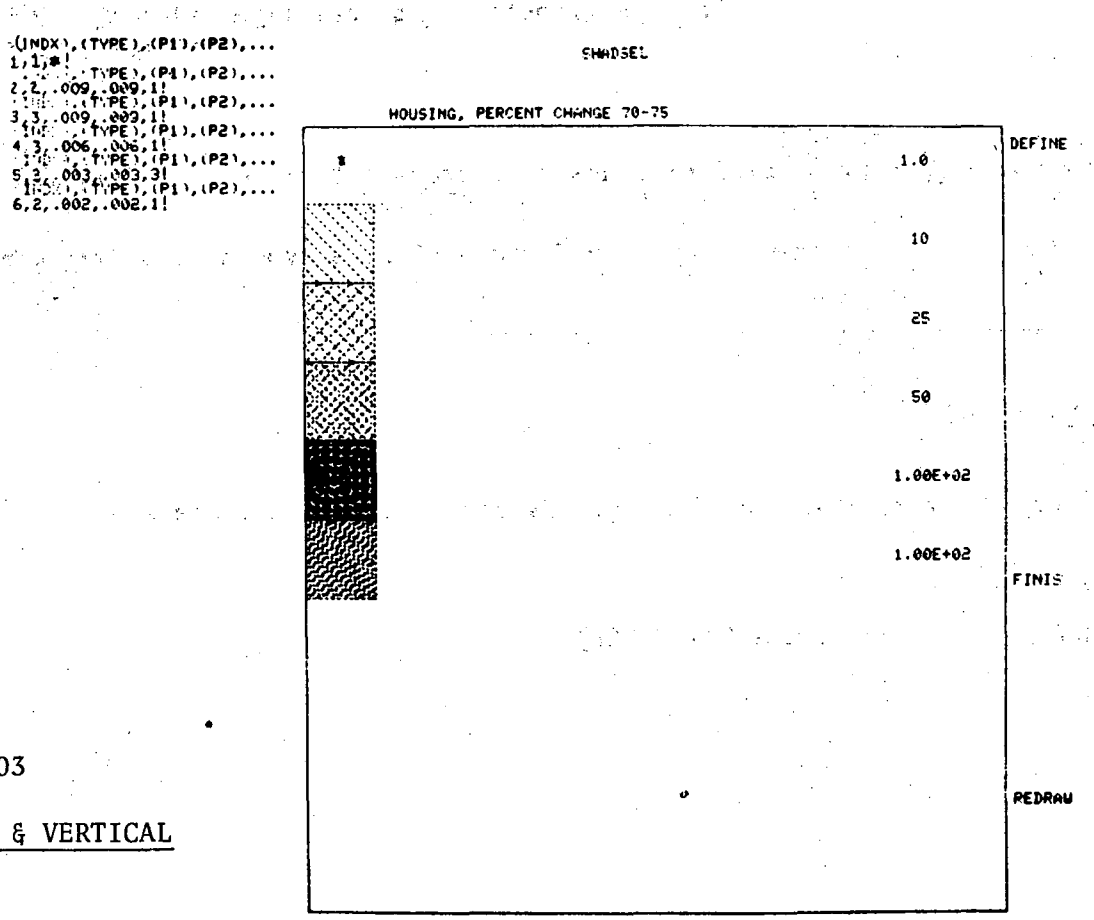
See the previous page for the SHADSEL options and parameter defination.

When all the shade patterns are displayed, in our example - six types, the User may begin to align a pattern with a data value range, see next page.

Samples of additional shading patterns have been listed below, try them.

DEFINE must be executed (with the cross-hairs) each time a pattern is entered. This directive initializes the input parameters

(INDEX),(TYPE),(P1),(P2),.....



HORIZONTAL

7,2,0,.03
8,2,0,.02

VERTICAL

9,2,.03,0
10,2,.02,0

DIAGONAL

11,2,.03,.03

HORIZONTAL & VERTICAL

12,3,.03,0

TWO DIAGONALS

13,3,.03,.03

Picture 11

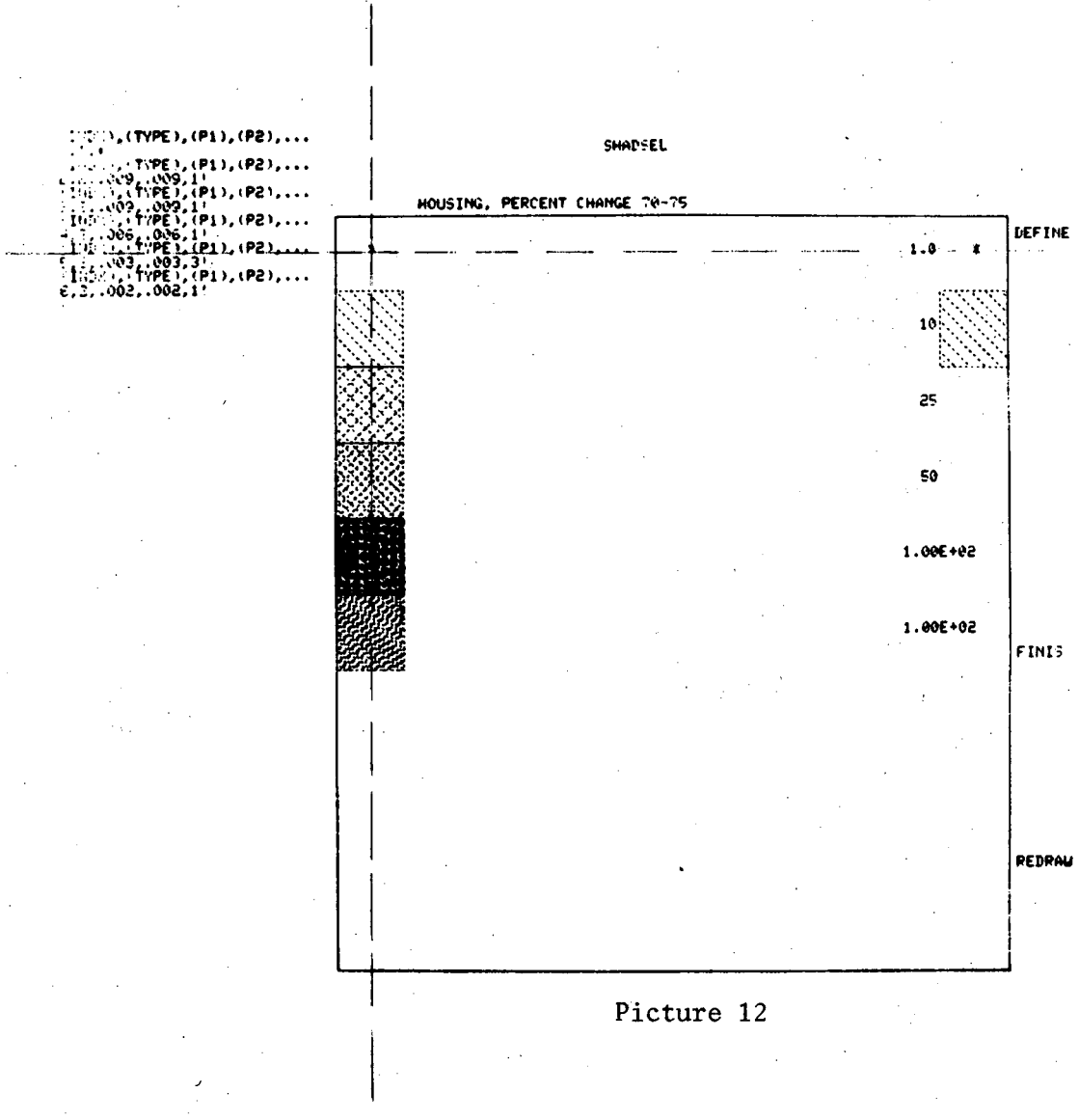
After entering and generating the last pattern, do not execute DEFINE again. The cross-hairs will be used for selecting the patterns to the data values.

This is a two step process:

1. Center cross-hairs on character or pattern desired at the left of the CARTE rectangle work space - hit the character key, Return (see Picture 12).

2. When the cross-hairs reappear, center them in the area to the right of the data value desired (see Picture 13).

Repeat the two step process to fill in the remaining data values. Note, the patterns may be selected in any order of the list and may be placed at a data value in any order.

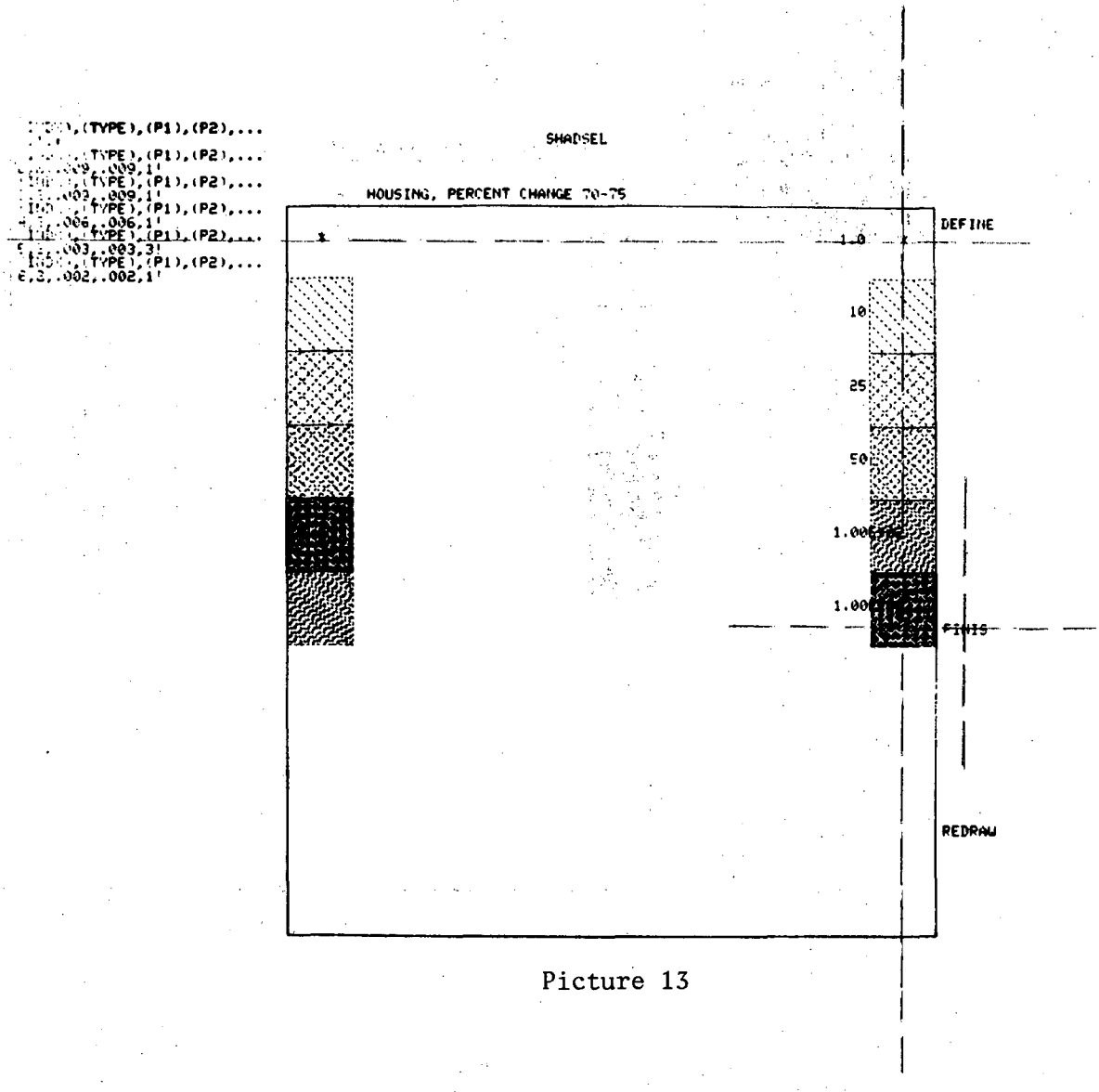


Picture 12

When all of the values have character or shade selections, execute FINIS.

REDRAW - This directive simply redraws, in order of selection, all the characters or patterns inputed. It does not redraw the input parameters.

This command is used to "clean up" a messy work area that has many overlapping entries or patterns, in the input stage.



Picture 13

After binning and cross-hatch selection are complete, the User may view the shaded map by executing, .TERMINAL (see Picture 14).

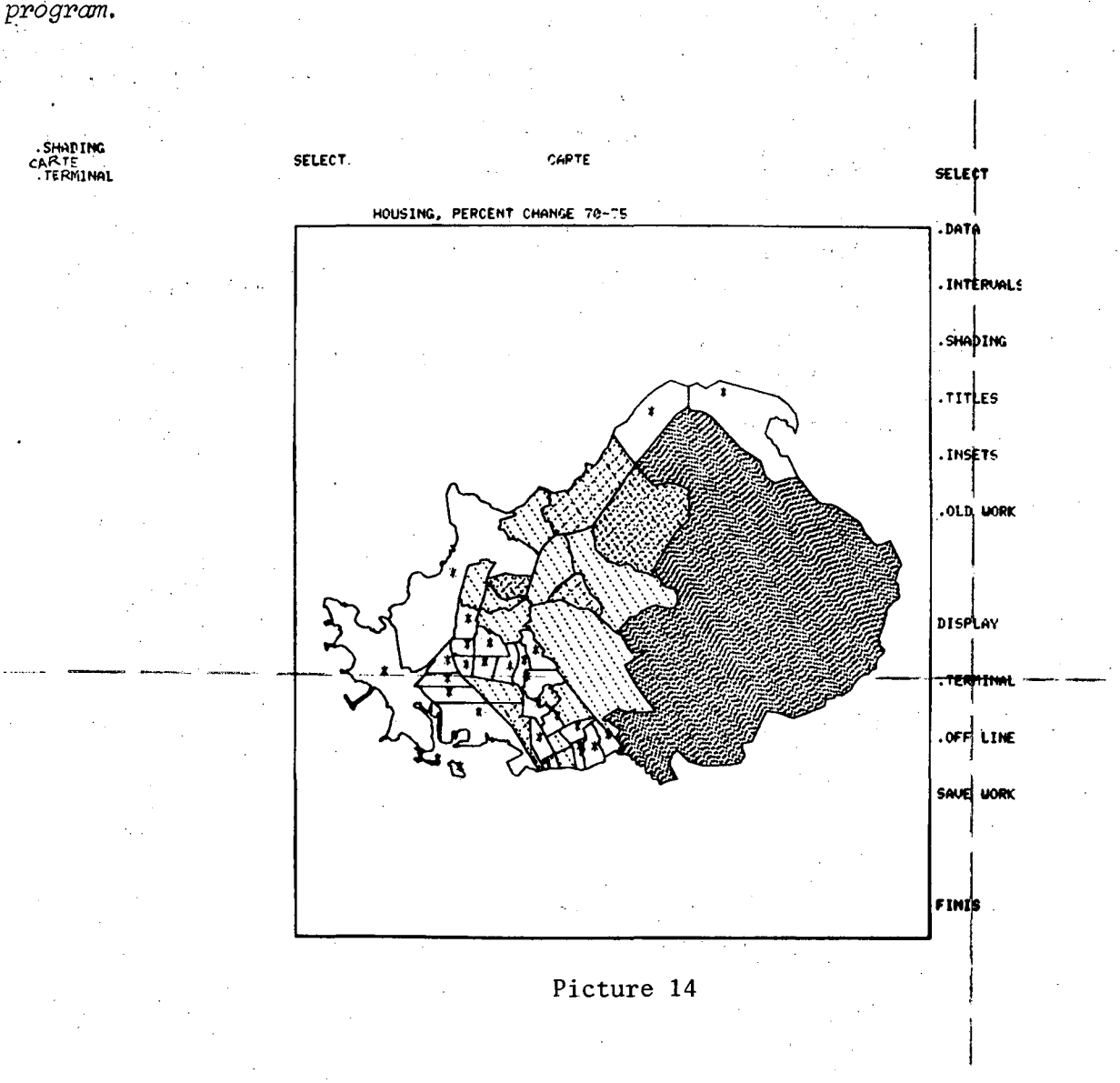
The next normal step is the addition of titles to the map. Execute .TITLES.

NOTE: At this point, make sure that all area's (polygons) have characters or shades. If all area's are so marked, proceed to the next page.

If an area did not shade - there is an error in either the map file (MAPEDIT) or the data file (DO BE DO). Check both.

Every polygon must have a data value to be shaded. However, there may be more data items in each characteristic than polygons in the map file. This is the case for this workbook example; 115 data values are stored for each tabulation.

In the map file below only a portion of those 115 values were selected by CARTE for shading. The values not having a matching map geo-code are ignored by the program.



Picture 14

The parameters for TITLES are

(INDEX), (SIZE), (FONT), (TXT)

INDEX Each title must be associated with a unique number, the Legend must also have a separate, unique number. The titles are usually put in a normal assending numerical order, 1, 2, 3, etc.

In the example, there will be 14 titles, of which number 6 will be the Legend record.

INPORTANT: Always keep a record of each title number (index), and also note the Legend index number.

SIZE This is the number of characters that would fill a line accross the CARTE work space rectangle. For example, if the title had 20 letters (including spaces) and 20 was entered as the SIZE parameter, the result would be a 20 character text string completely streching accross the work space. The width or vertical size of the lettering would also be rather large.

Until the User becomes familar with this parameter, several trys may be necessary before good balance, spacing and letter size is achieved.

FONT
0 = default or hardware characters
1 = Roman, lower case
2 = " upper case
3 = Greek, lower case
4 = " upper case
5 = Script, lower case
6 = " upper case
7 = Gothic, lower case
8 = " upper case

(see Picture 20)

Vector characters

TXT This is the text string to be plotted. Font changes can be made in TXT:

$U capitalize all characters until next change
$L lower case " " " " "
$C capitalize only the next character, e.g.,

$UU.S. $Lof $CAmerica = U.S. of America

To exit from TITLE input, enter a blank line, Return.

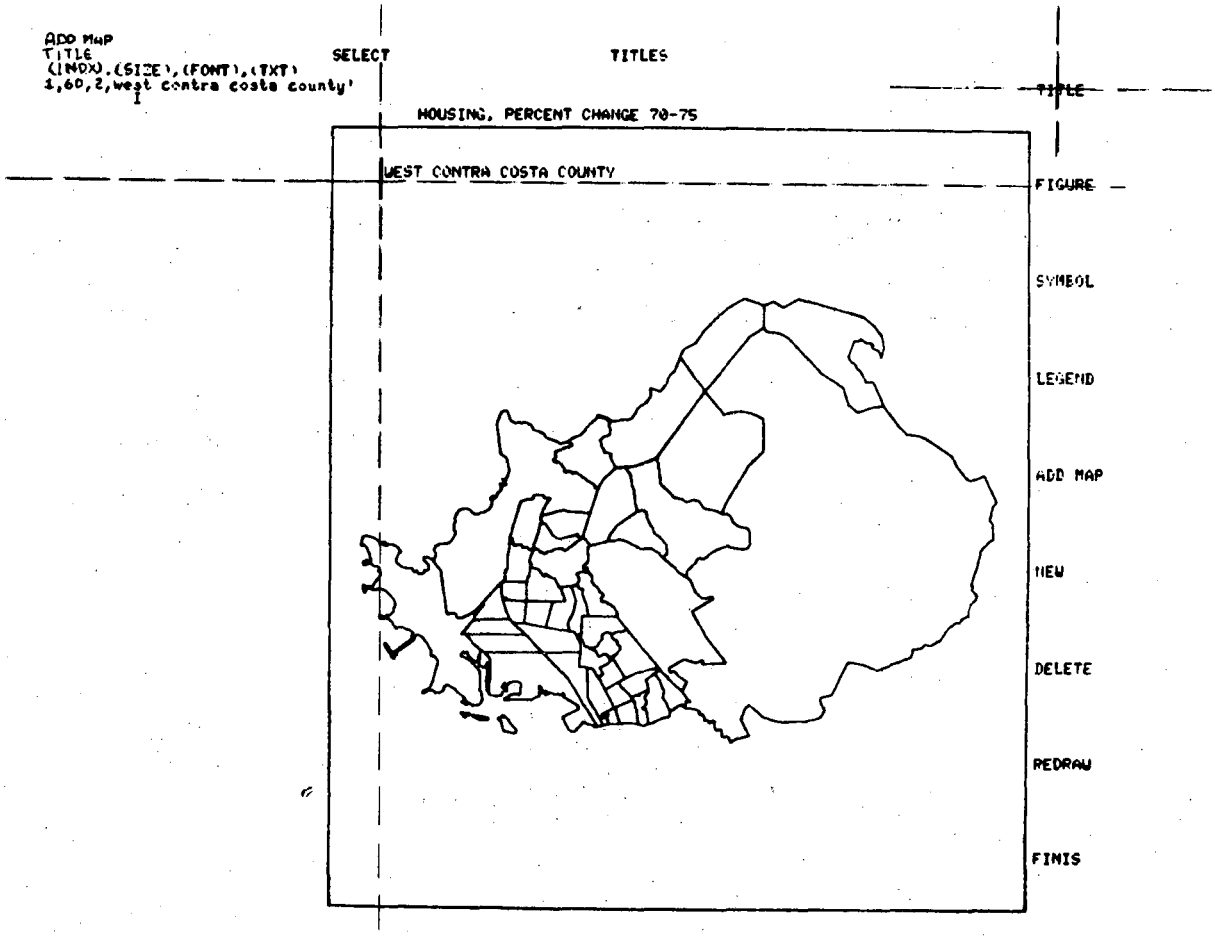
After .TITLES is executed, a new set of directives and a empty work space appear. Text (map titles) could immediately be inputed, however, it is suggested that ADD MAP be executed first. Do this if there are relatively few polygons to be plotted. By inserting the geographic area in the working space, titling will be much easier. Note, the map is not shaded at this time; this is a time saving step.

Title 1: To input the first string of information - position the cross-hairs on TITLE, hit character, Return. The word Title and the parameter instructions will appear to the left of the workspace; the User may enter the parameters at this point.

In Picture 15 below, the parameters were entered as

1,60,2,WEST CONTRA COSTA COUNTY!

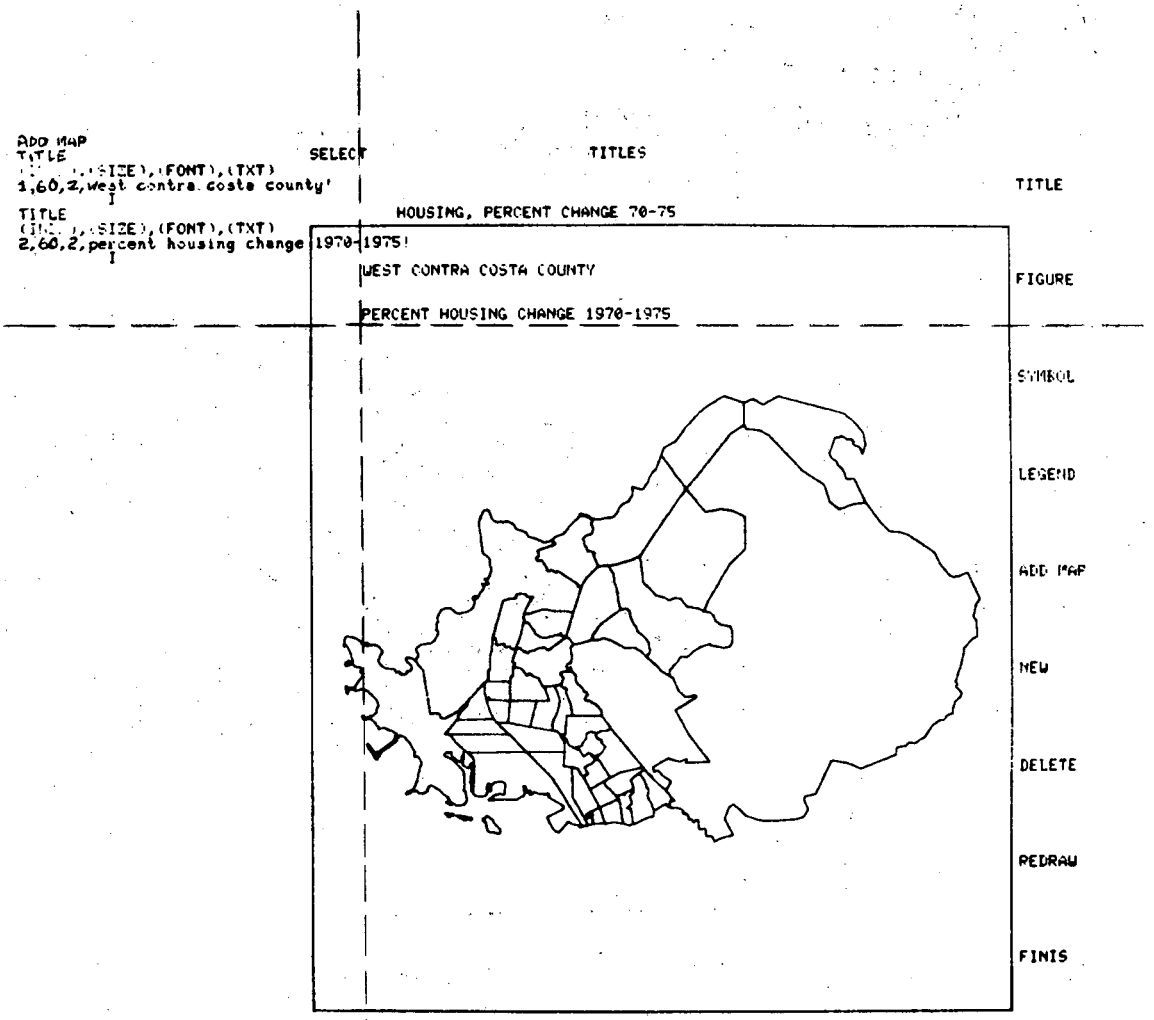
After this string is entered (see defination on previous page), the cross-hairs will appear, ready for the (TXT) area location. Pinpoint the hairs in the rectangle where the text string is desired - hit the space bar and Return. (Next page)



Picture 15

The text string will appear (in standard hardware characters only) in the position of the cross-hairs shown in Picture 15. If the User has selected a special vector character font, it can be displayed with REDRAW.

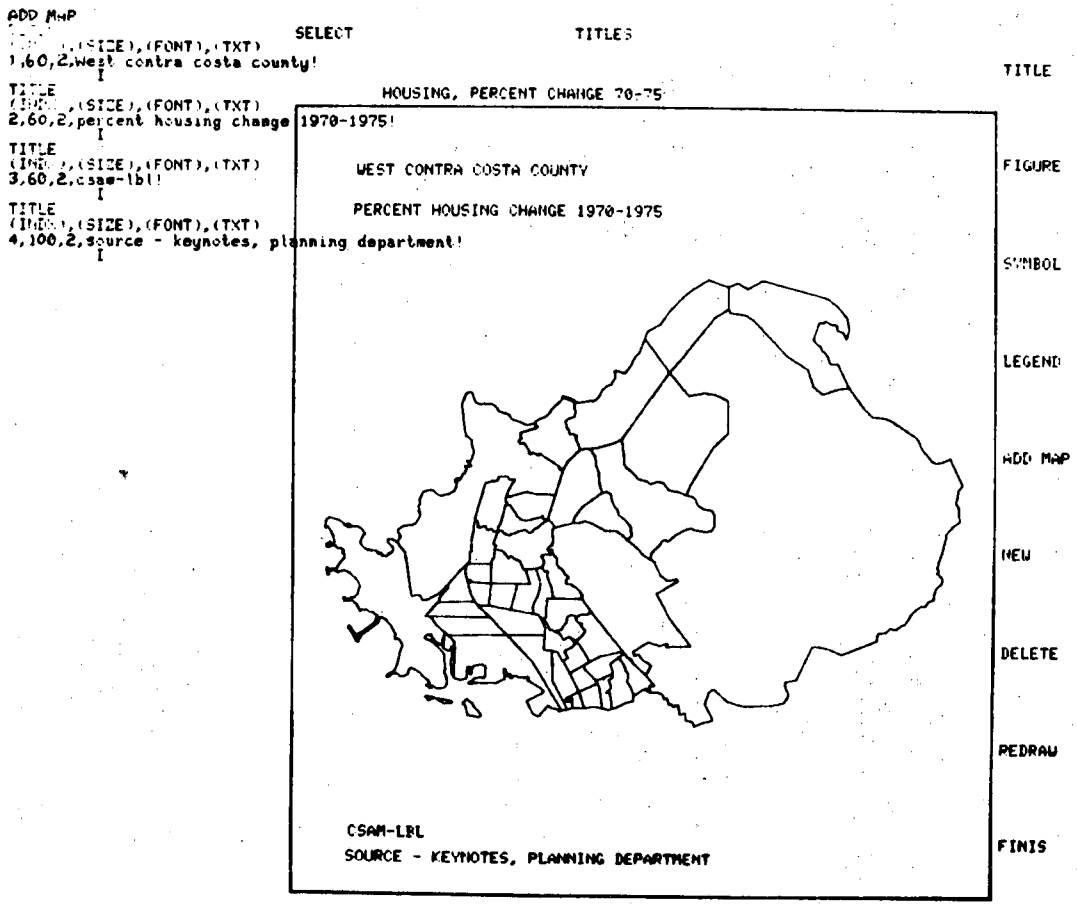
Enter the second title or text string as shown below. See Picture 17 for titles 3 and 4.



Picture 16

Four titles have now been entered. Notice in Title 4, the size (SIZE) has been set to 100. This will cause the character string to be written smaller than the previous value of 60.

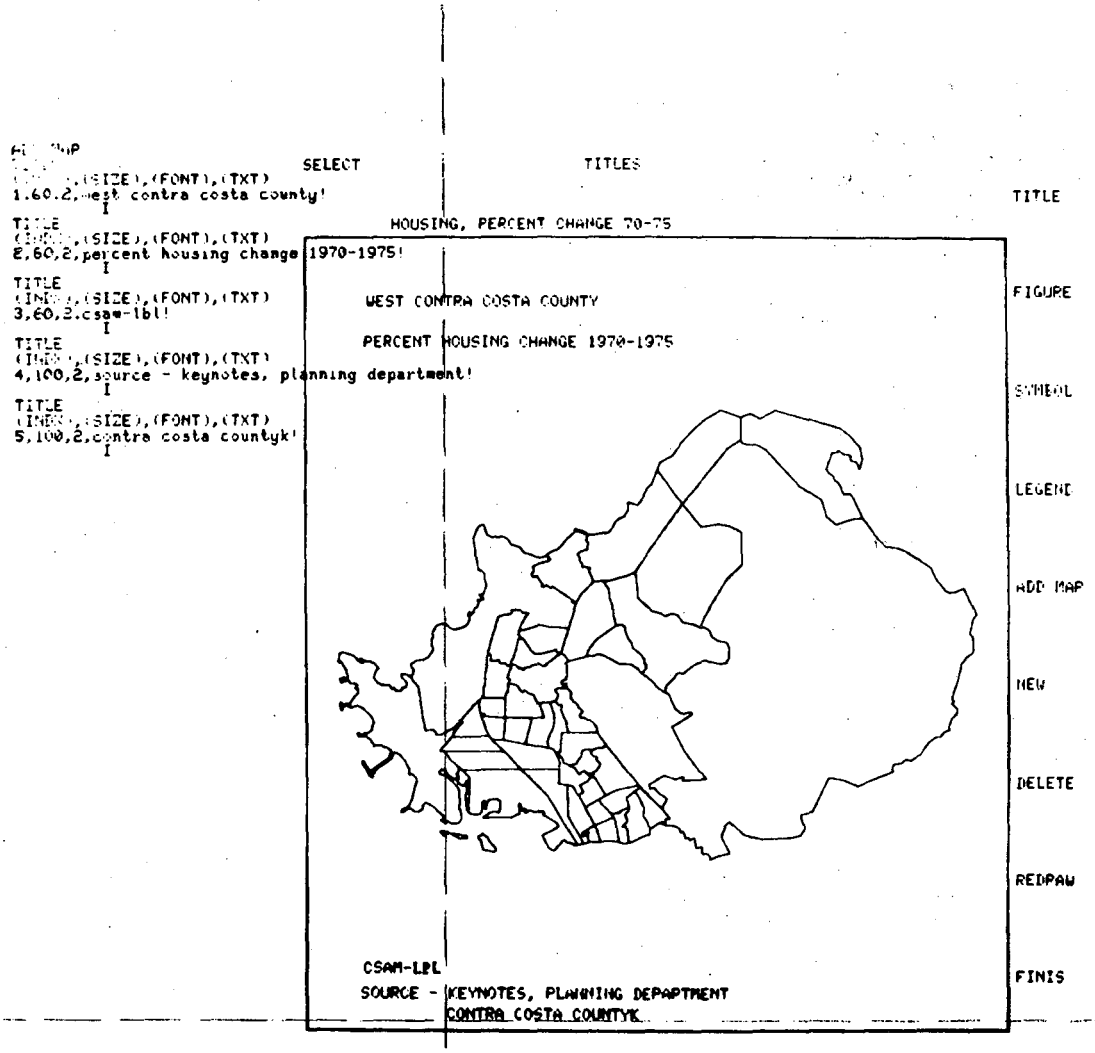
To input additional text on the map, continue to Picture 18.



Picture 17

A fifth title has been entered, and after it has been executed - it is observed to have an incorrect spelling in a word "COUNTYK".

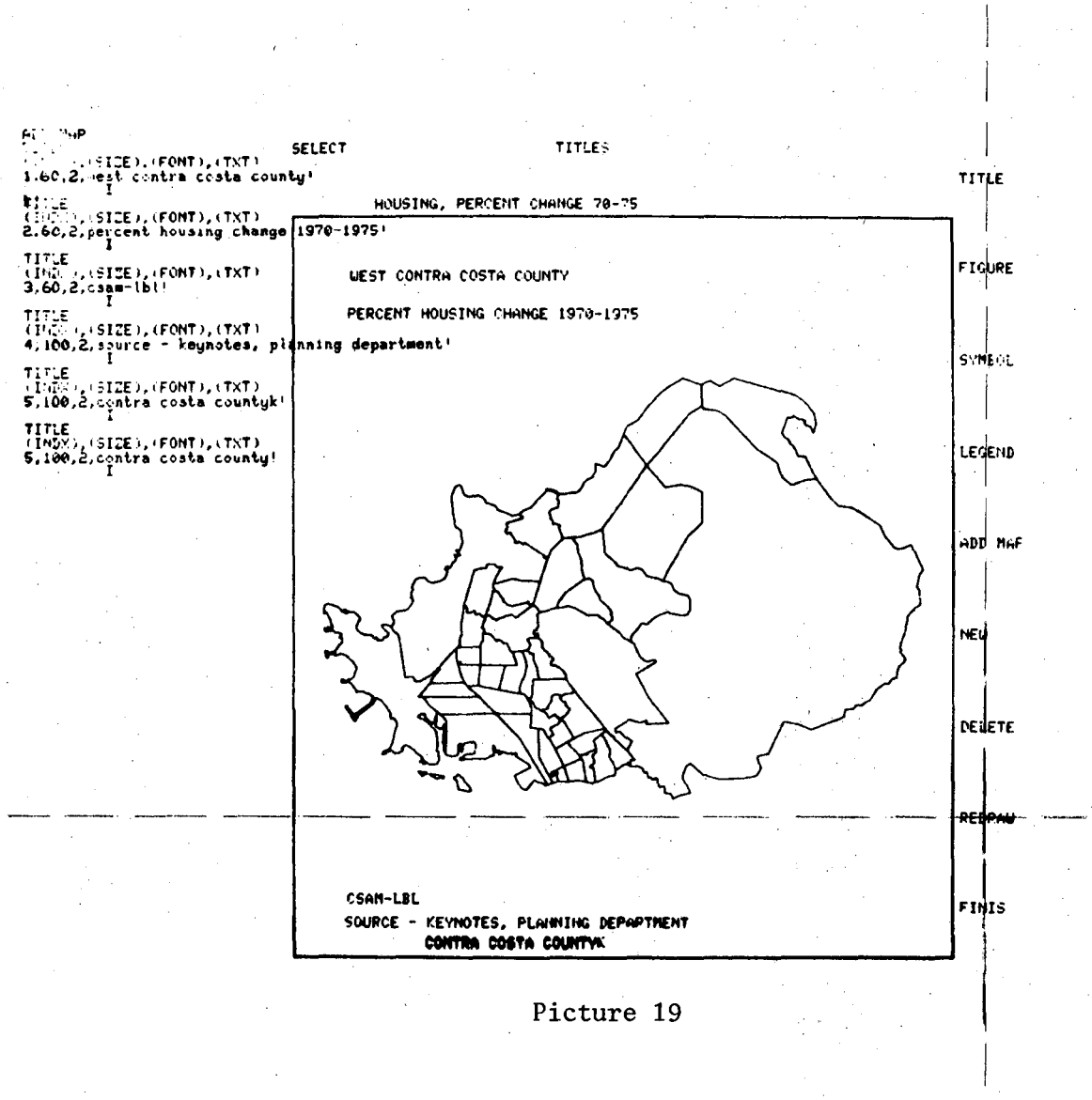
To correct this error, see Picture 19.



Picture 18

Any text string may be replaced or corrected in part by re-entering the title with the same INDEX number (in our Example, 5) and a new text string. The new text string may be placed with the cross-hairs in the same locations (as per our example) or a completely new location.

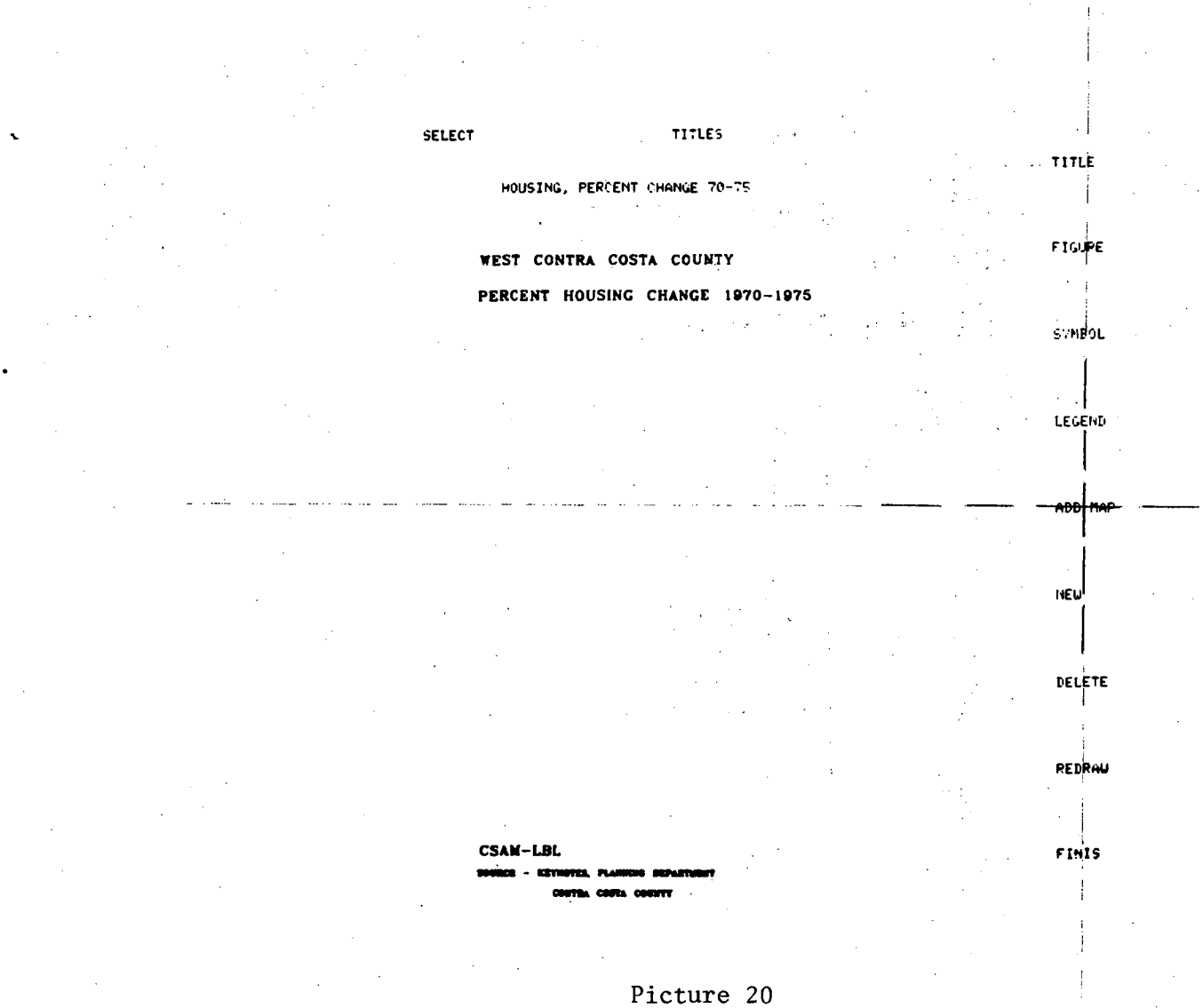
After all titling is complete, execute REDRAW (see cross-hairs below) and all of the latest titling will be redrawn.



Picture 19

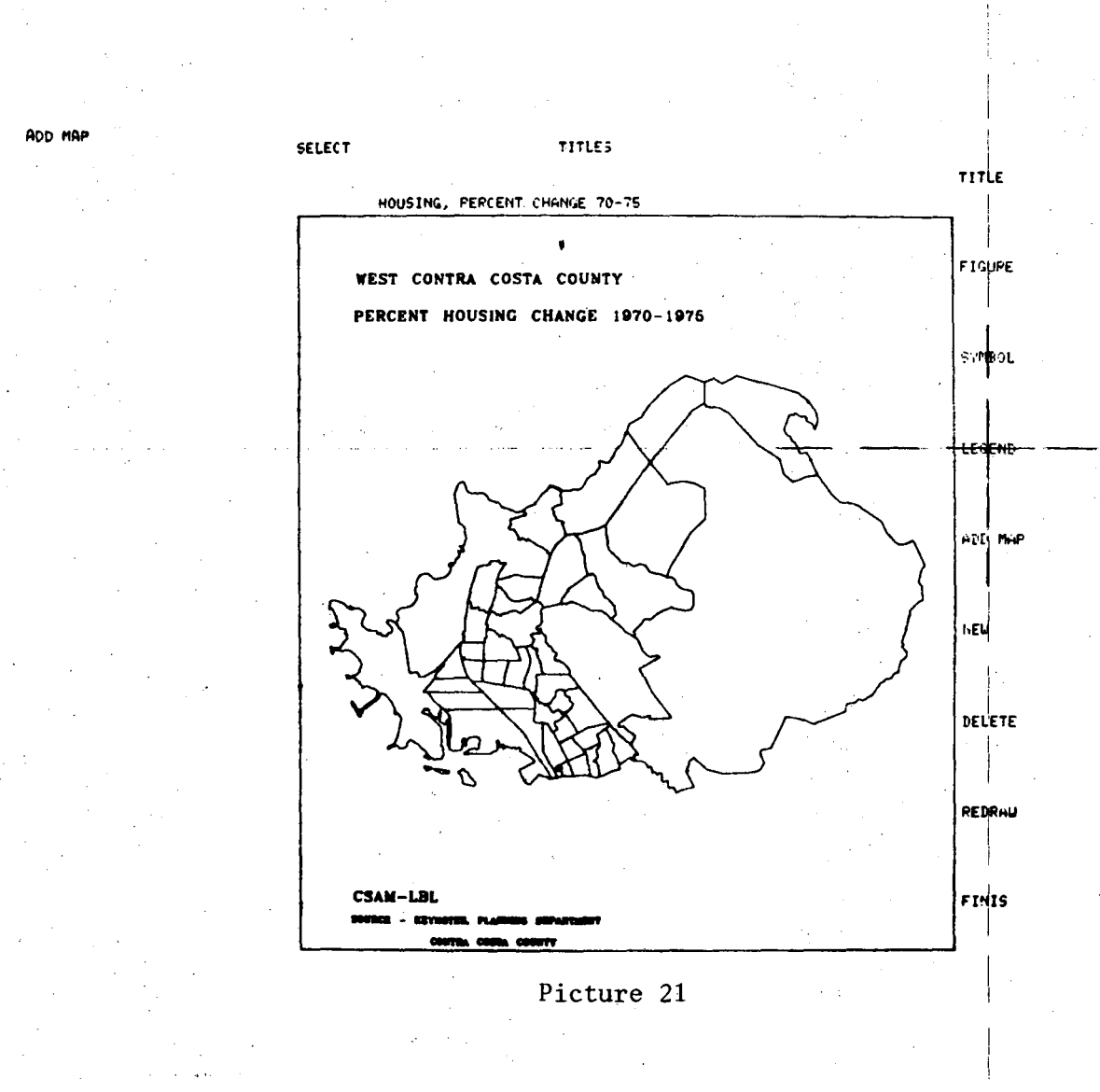
When REDRAW is executed, the screen clears previous input and displays the title input (including previous replacements or corrections) in the font selected.

Again, the geographic area may be put in by executing ADD MAP (see cross-hairs below). This step may be necessary if the User wants a Legend in the map.



Picture 20

To create a Legend for comparing shading and data values - execute LEGEND as shown below.



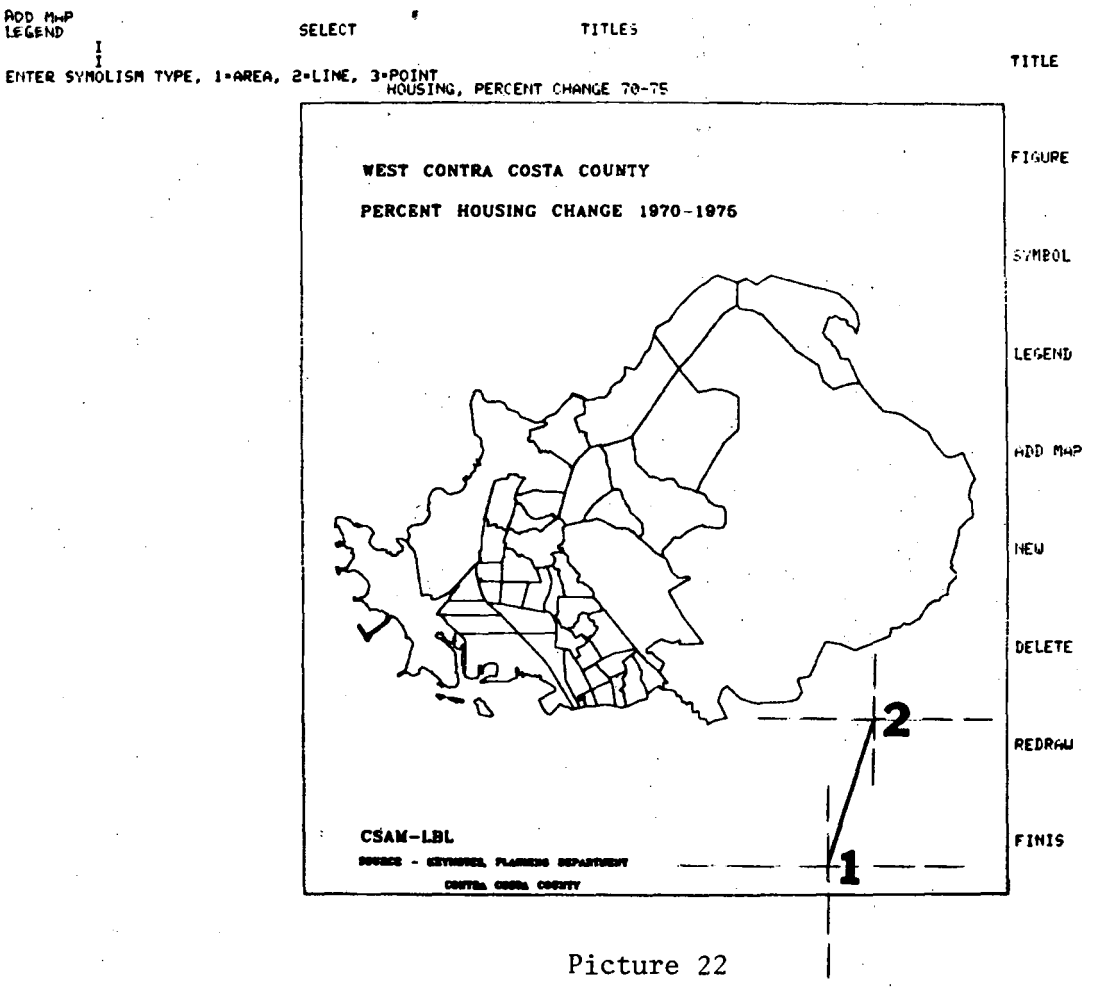
Picture 21

After LEGEND is executed, the cross-hairs will appear and wait User input for two point of a diagonal that will define a 6-box shade rectangle.

In a suitable area of the map, place the cross-hairs at point **1**, hit the space bar, and Return. The cross-hairs will reappear and then placed at point **2**.

A diagonal line will be displayed and text will appear in the left upper portion of the working area requesting the Symbolism Type. Since the example will be an "area" type, enter 1 and Return (see Picture 23).

NOTICE: Line and Point symbolism is discussed elsewhere in this writeup.



Picture 22

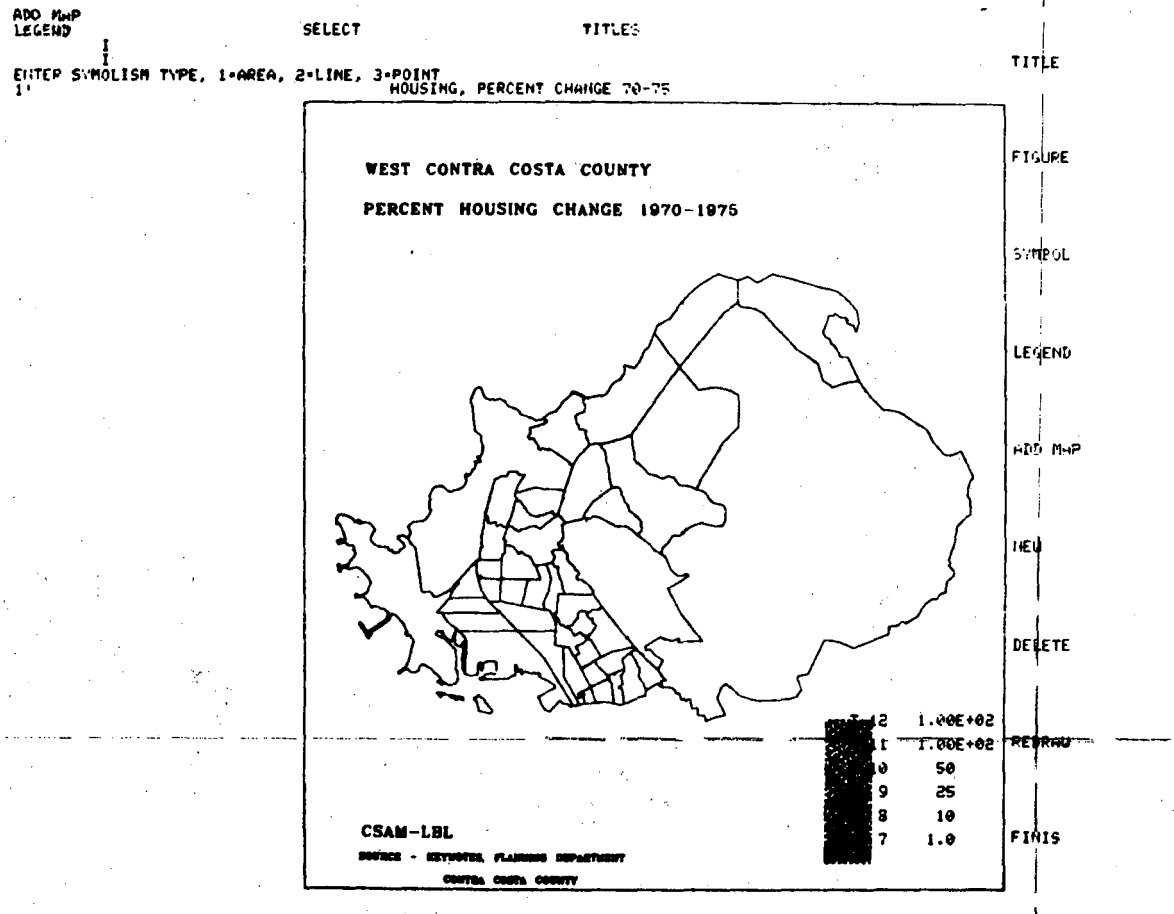
After the Symbolism Type is entered, a heavy shaded rectangle will be displayed, previously defined by points 1 and 2.

The data divisions will also be displayed in the order:

lowest value (Point 1) to

highest value (Point 2).

The shades selected in Picture 13 will be drawn by executing REDRAW (see cross-hairs below).



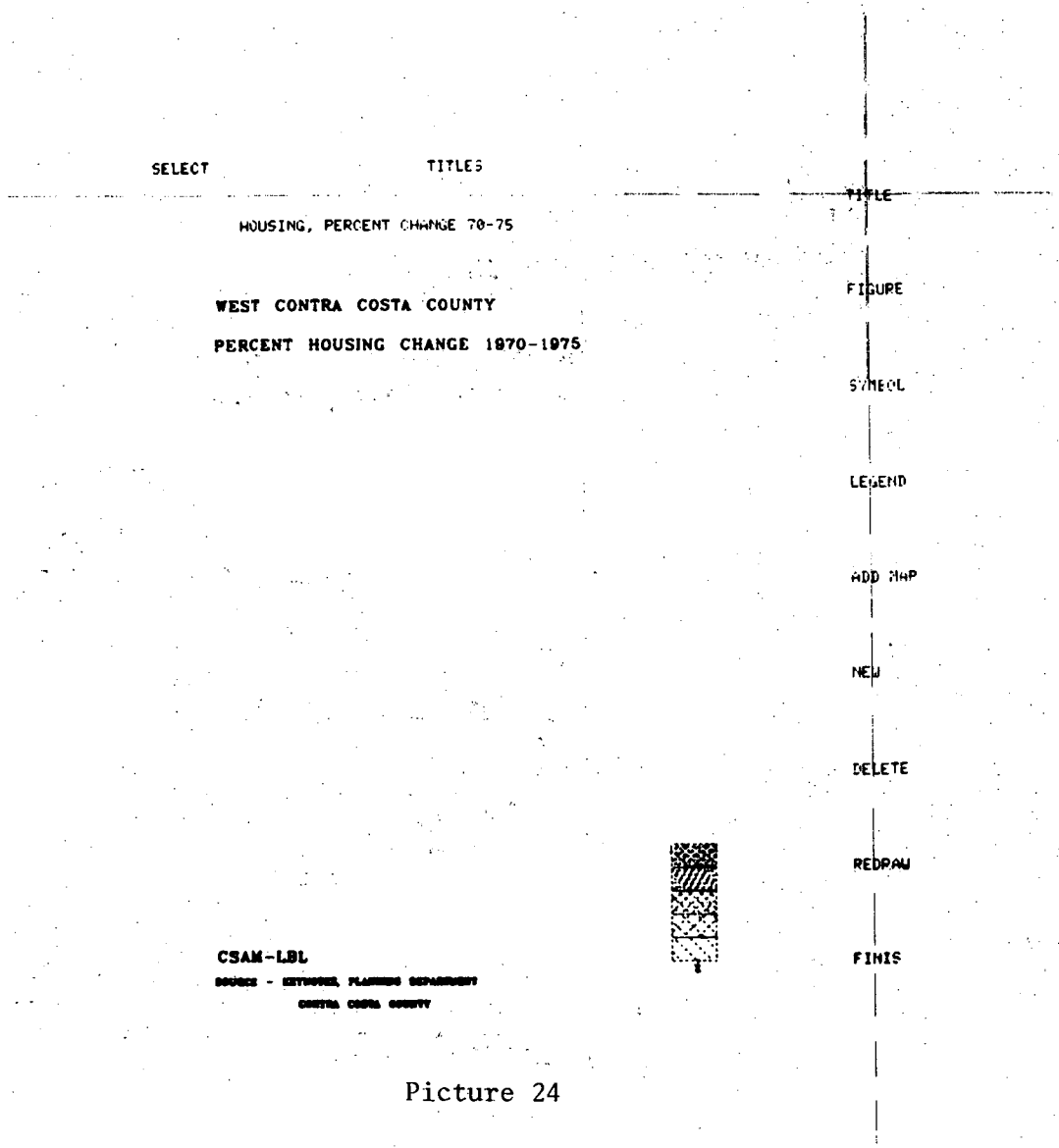
Picture 23

The display below is similar to Picture 20, in that the map may be inserted by ADD MAP; however, it is unnessary for our example.

The cross-hatch patterns are displayed, in order lowest data value (bottom) to highest data value (top) of the "stack" of patterns.

Since the Legend is rather incomplete without defining the numerical data values that go with the shade pattern - more titles must be added. These Legend titles will be placed either to the left or right of the stacked patterns.

Execute .TITLE (see cross-hairs below).



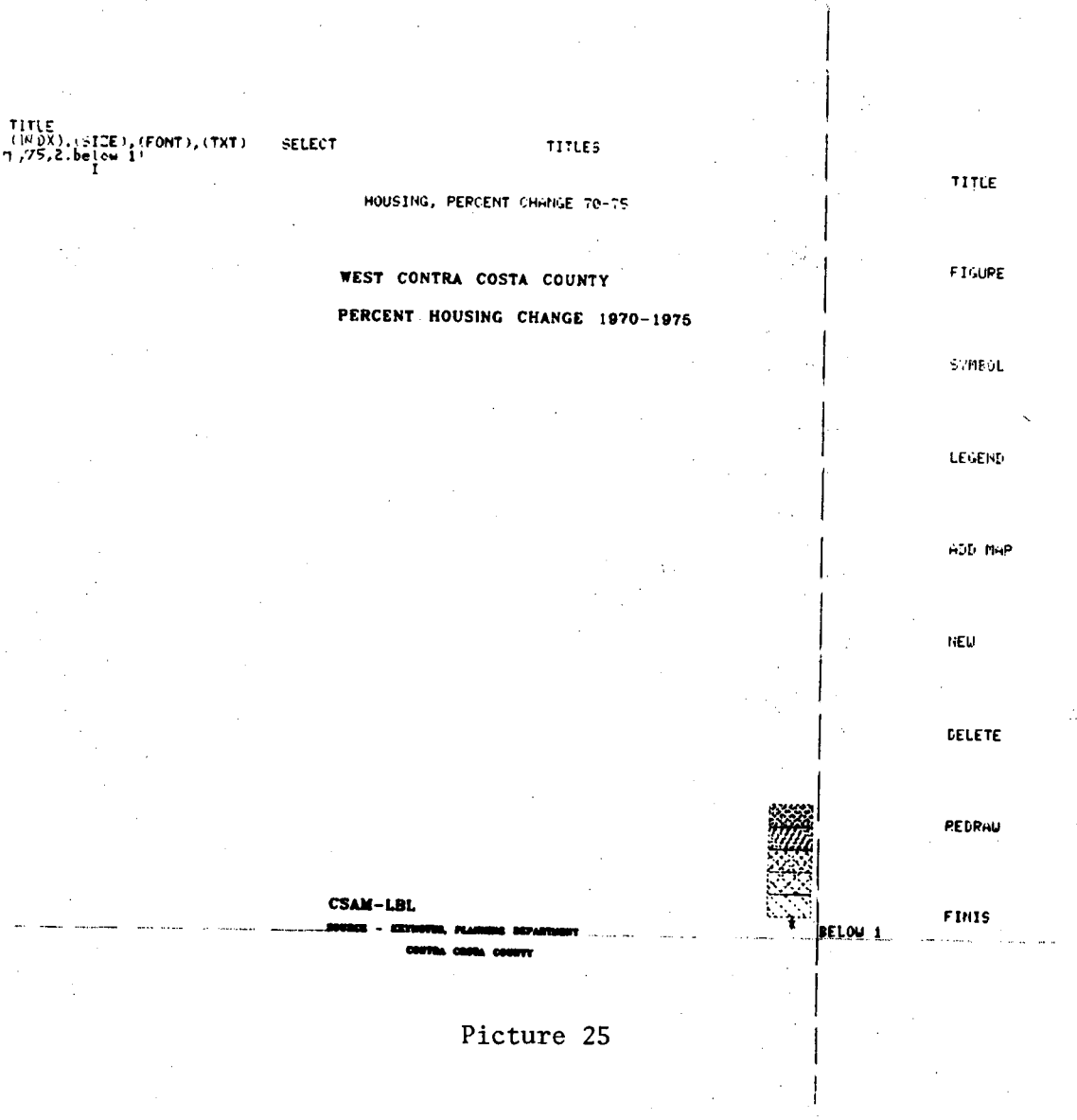
Picture 24

Titling is picked up again, with an Index (or sequence number) of seven (7).

Five (5) text strings were inputed (from Picture 19), and the Legend is counted as one (1).

The User was reminded to keep track of title index count and the Legend is counted as one (1) in the Index count sequence.

Therefore, in the TXT, "Below 1" is Index number 7 (see cross-hairs below).

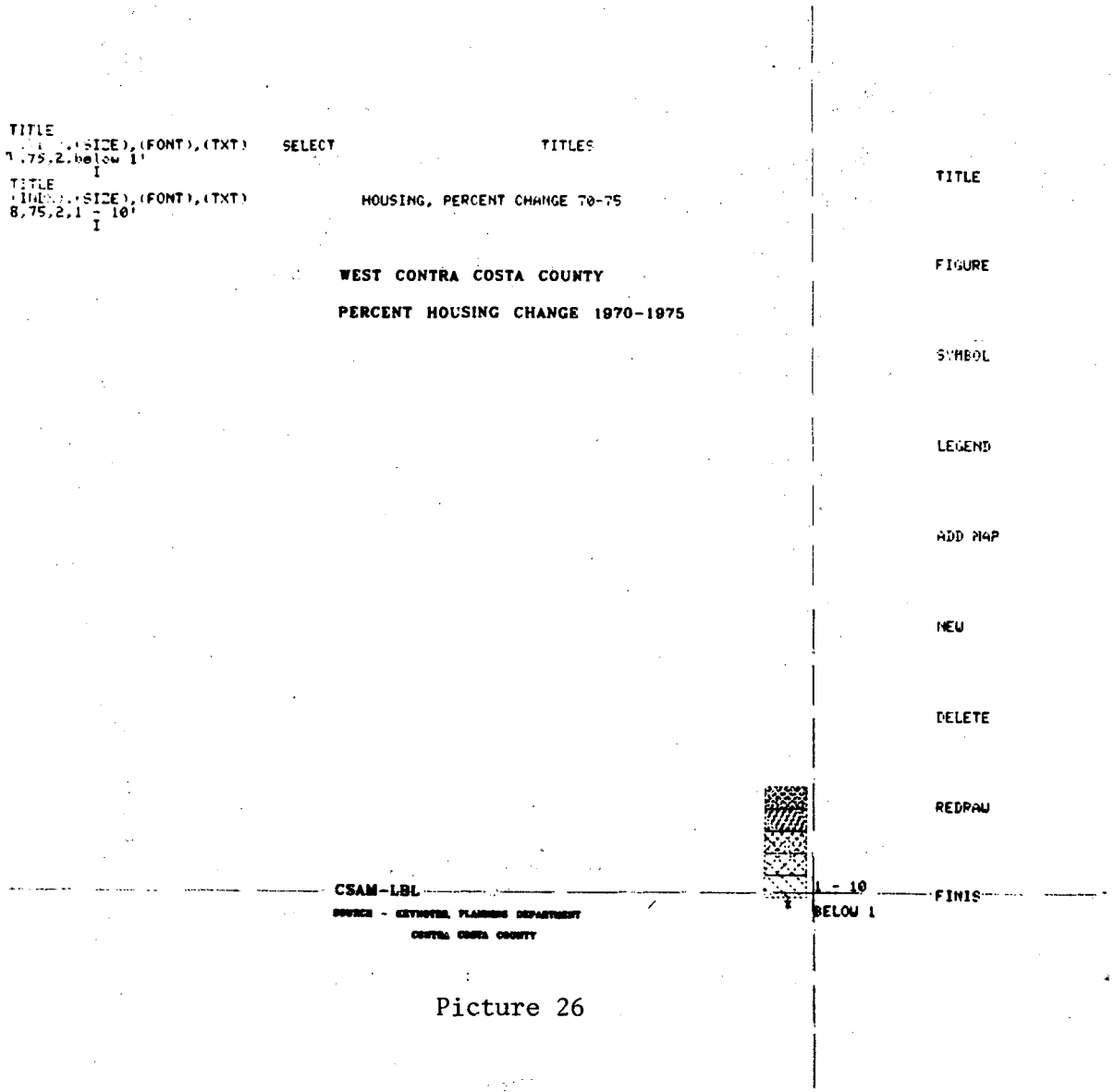


Picture 25

The text for the second lowest value range (1-10) is entered similarly to Picture 25.

Keep the (SIZE) figure constant in Legends.

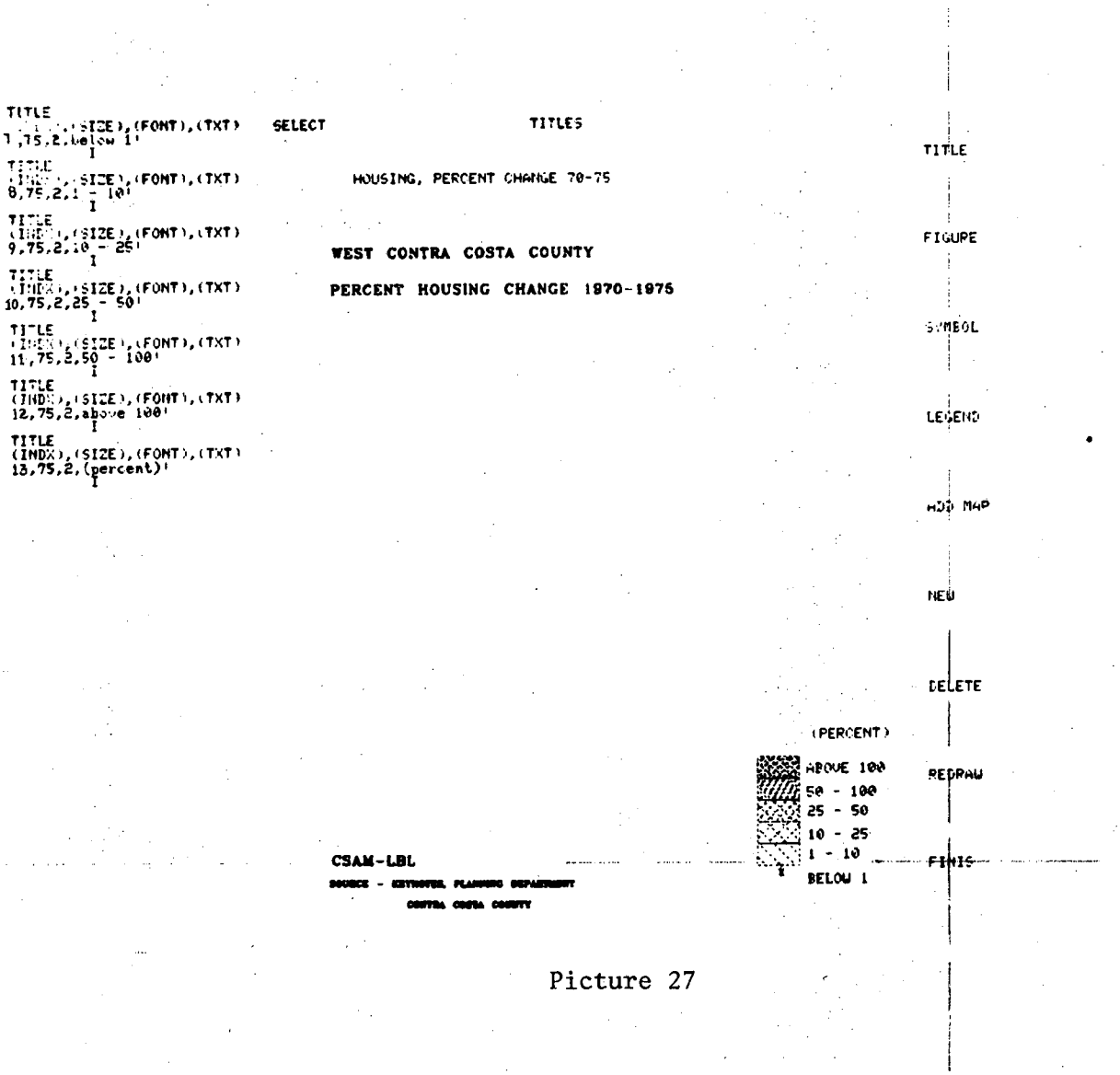
See the next Picture for the remaining Legend title input.



Picture 26

The remaining Legend values have been inserted. Any other title may be included at this time.

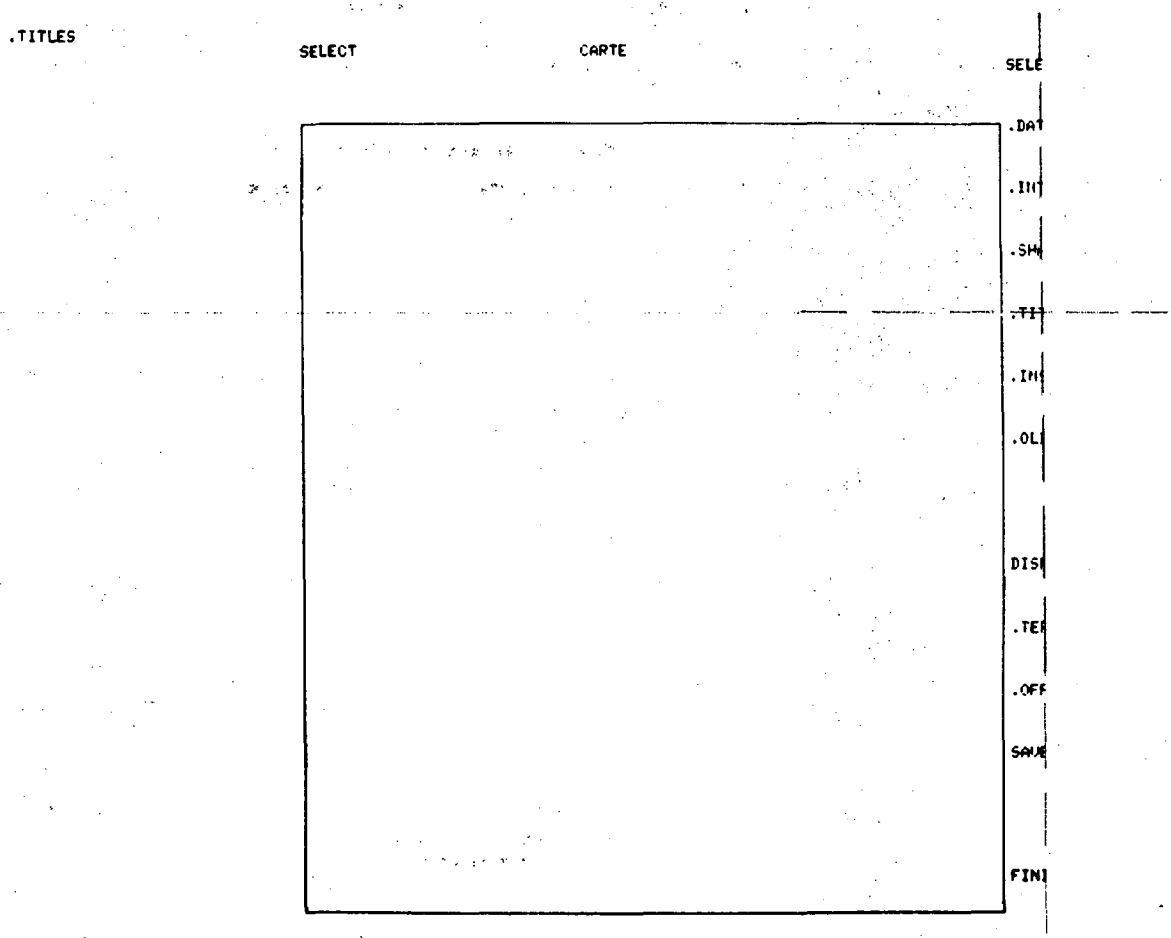
When the User has determined enough title input, execute FINIS as shown below.



Picture 27

The User may execute .TITLES at any time. In our example, say, the "Run date" should be on the map, and it was missed in the normal sequence of titling directives.

Simply, execute .TITLES again.

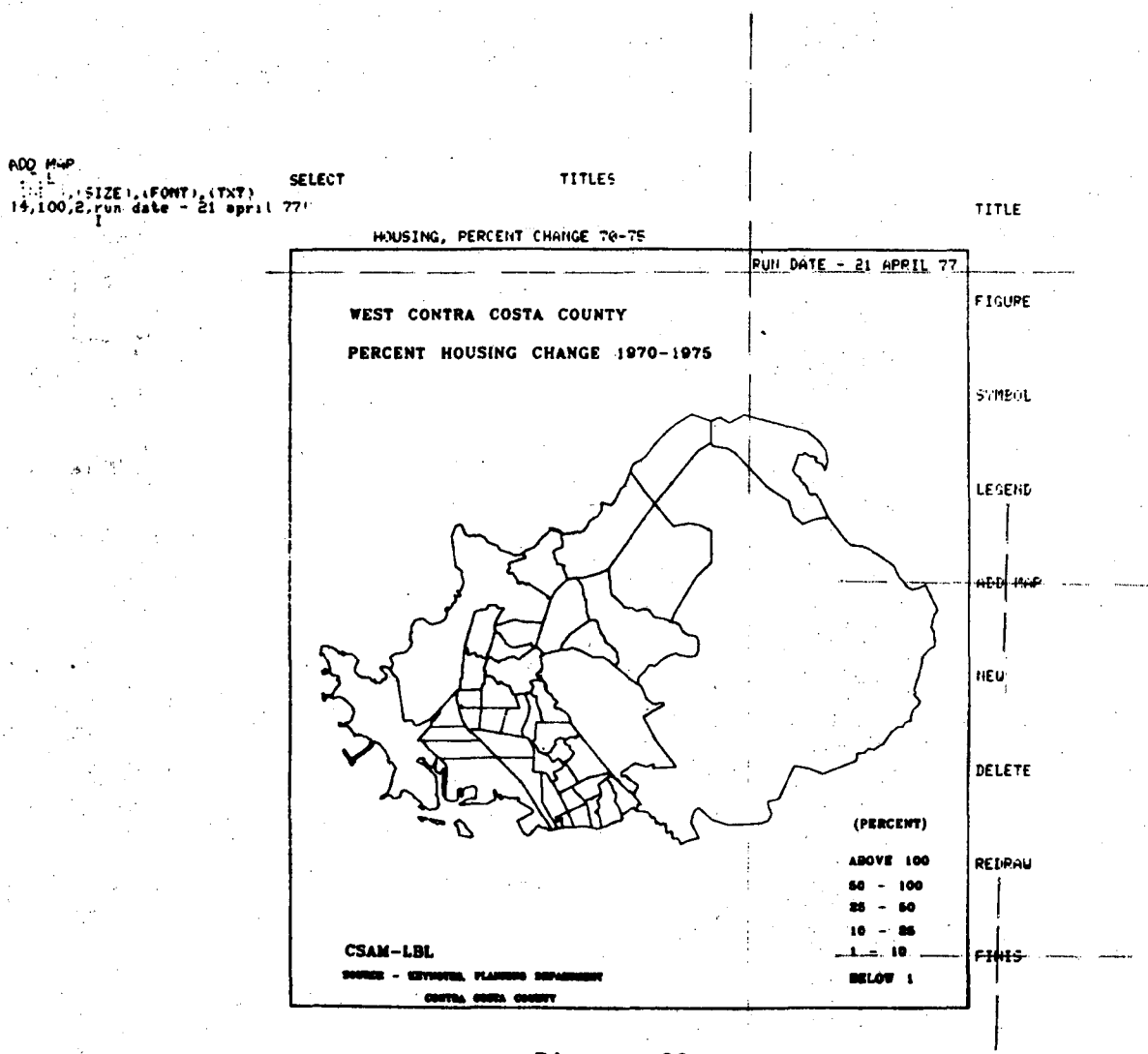


Picture 28

Enter the "Run date" text string.

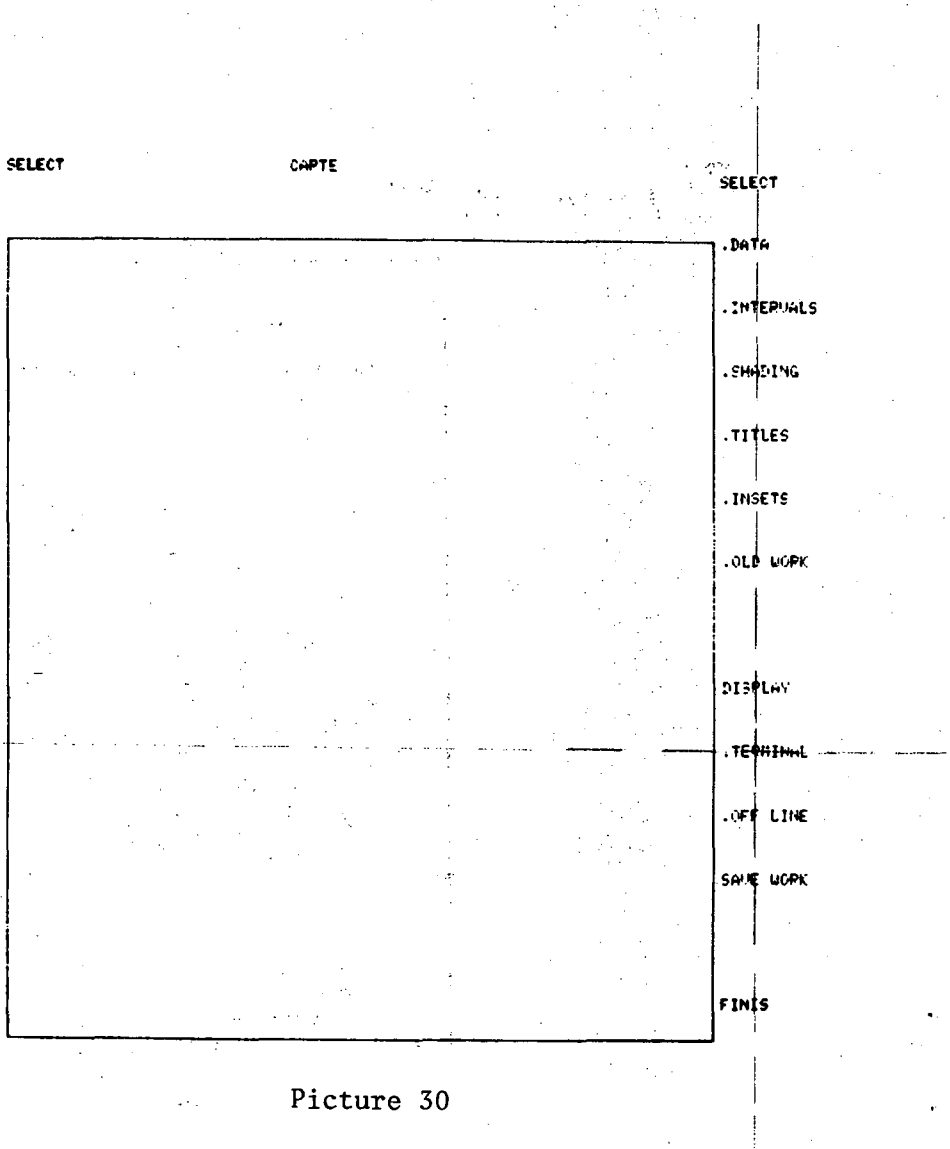
ADD MAP was also executed in Picture 29.

Execute FINIS.



Picture 29

To display the final map, execute .TERMINAL



Picture 30

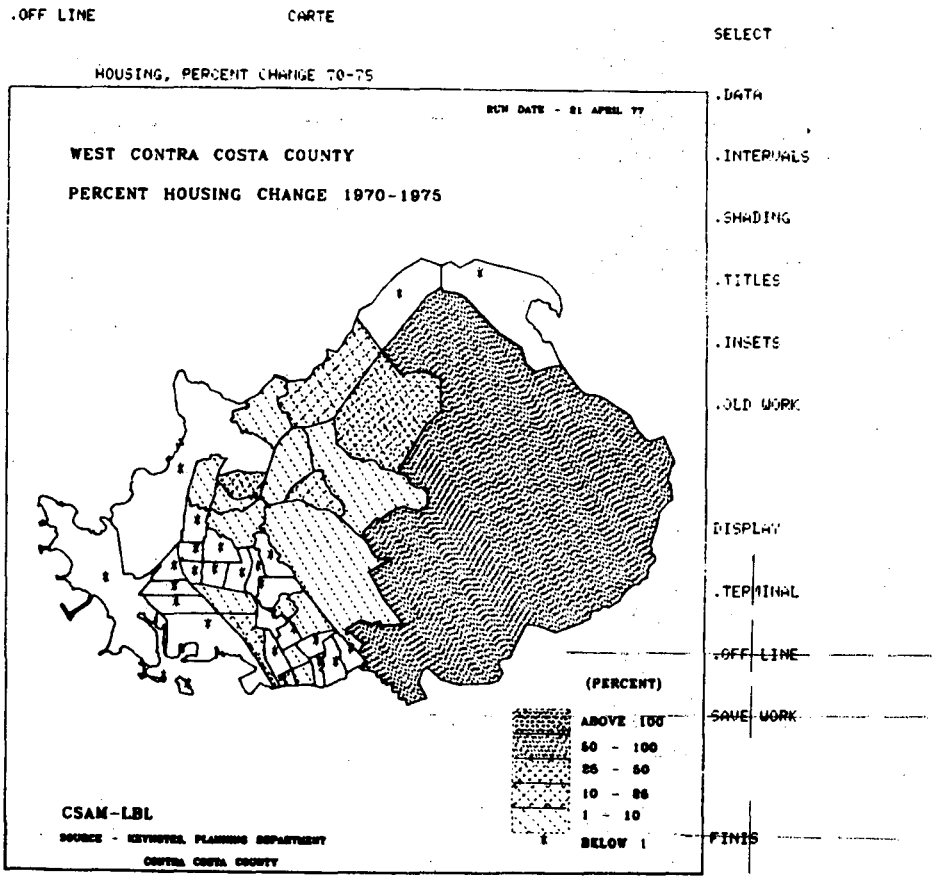
In the Picture below, all map work has been displayed. If completely satisfied with bining, shading and titles - execute SAVE WORK to store the finished map, and OFFLINE to make a microfiche film copy of the map.

The User may, at anytime, repeat any previous step in the mapping process.

If several data items were selected (Picture 3) and the User wants to map the next data characteristic, select .DATA and repeat the entire mapping process. Of course, many of the map design features are saved, and will not have to be repeated again.

If the same binning and shade patterns are used, only the titling may be changed.

Execute FINIS when completely finished.



Picture 31

When FINIS is executed, the CARTE program will query,

DO YOU WANT TO SAVE THE MAP JUST DESIGNED?

If Yes, the map is stored on PSS and will continue to query
If No, the system will query

DO YOU WANT A NEW DATA SET?

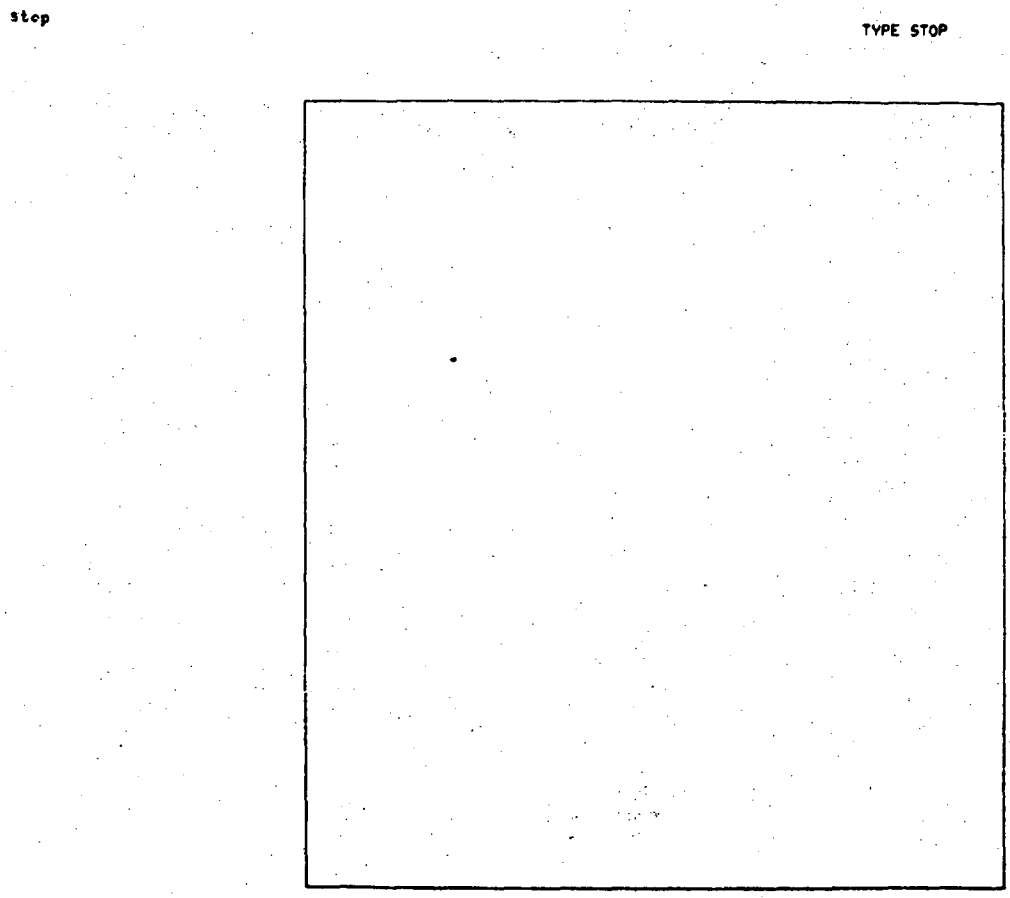
If Yes, the User is returned to the DO BE DO phase
If No, the system will query

DO YOU WANT A NEW MAP FILE?

If Yes, the User is returned to the MAPEDIT phase
If No, the system will query

ENTER STOP, TO TERMINATE RUN.

User must type in "STOP", and will be returned to the MONITOR System.



Picture 32

LOCATIONS OF AIR QUALITY MONITORING STATIONS

CALIFORNIA, ANY POLLUTANT, ANY YEAR (313 STATIONS TOTAL)

XBL 775-8638

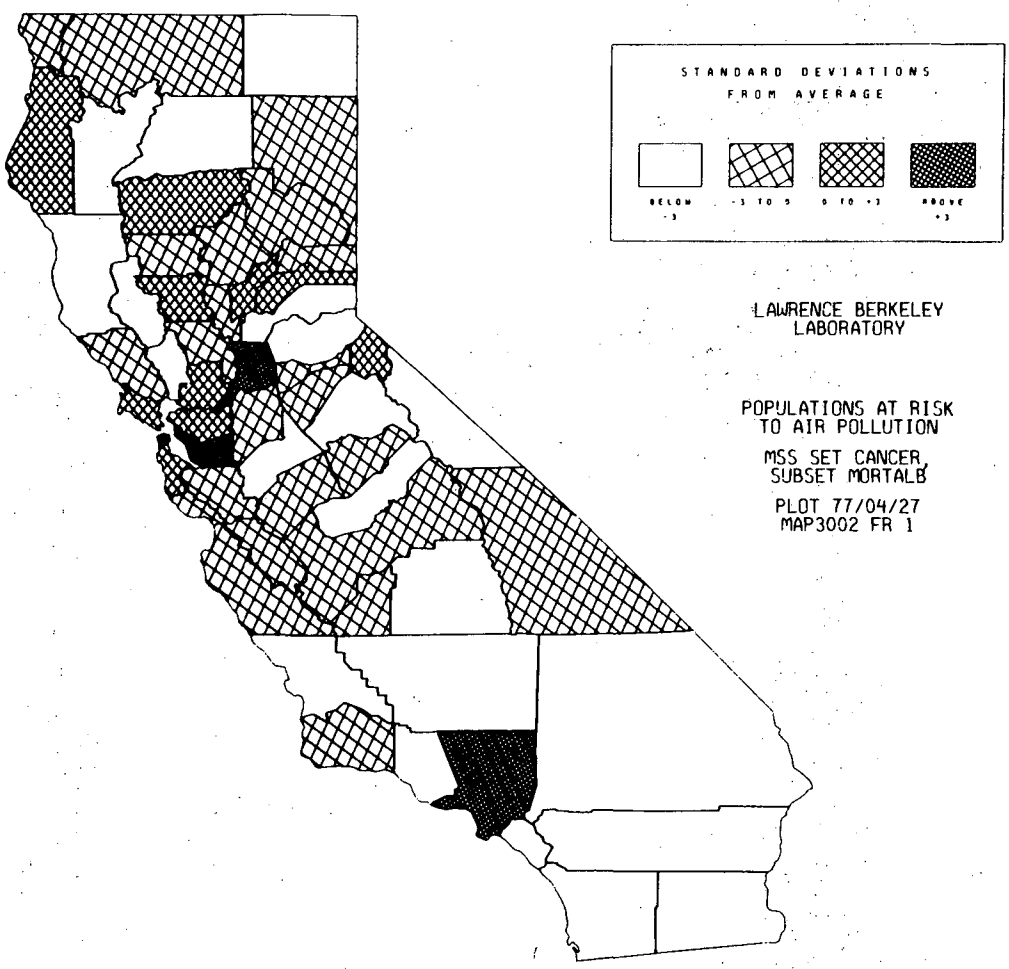
AGE-ADJUSTED CANCER MORTALITY RATES - STANDARD DEVIATIONS FROM AVERAGE

CALIFORNIA WHITE MALES, NCI DATA 1950-69

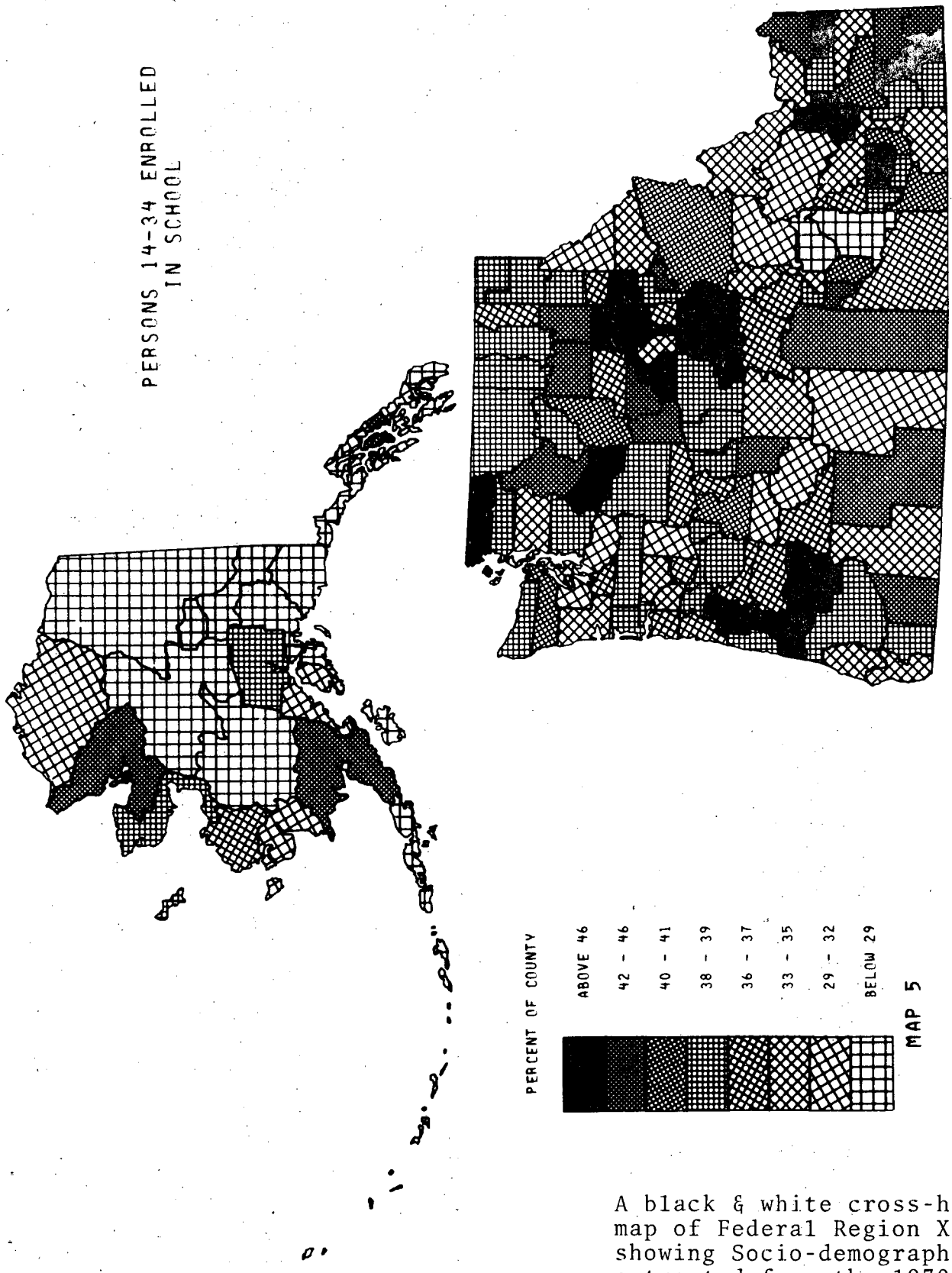
CANCER, ALL TYPES (ICD 140-205)

TOTAL NUMBER OF DEATHS (20 YEARS) = 216761

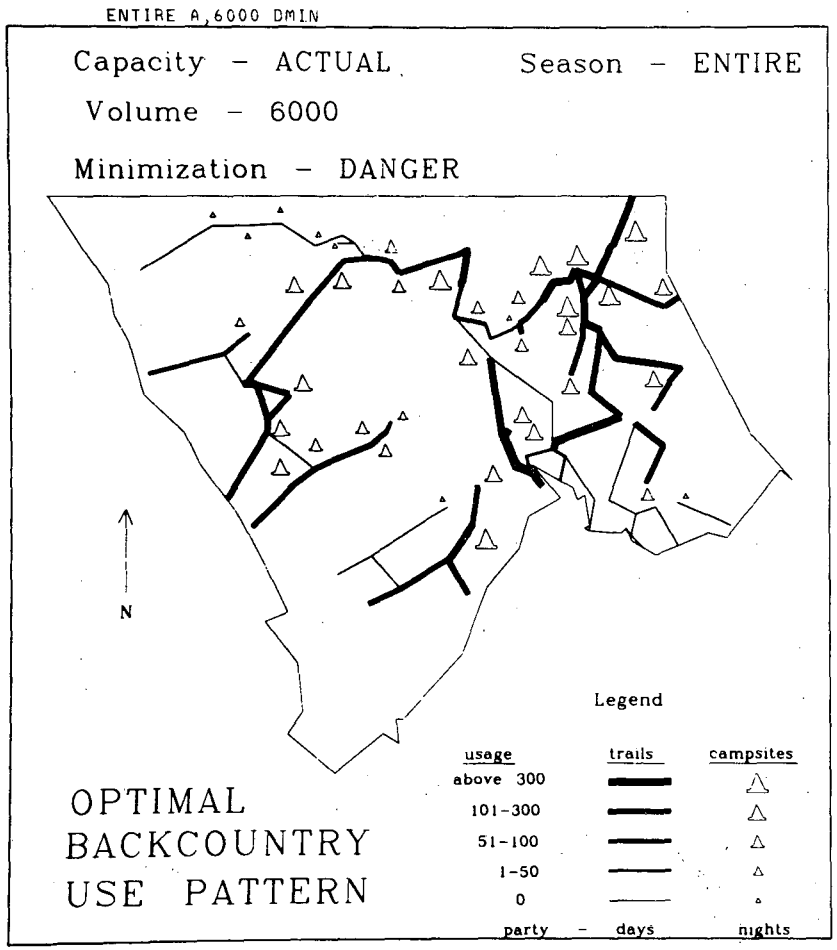
AVERAGE MORTALITY RATE = 171.72 + - 0.37 (PER 100,000)



XBL 775-8640

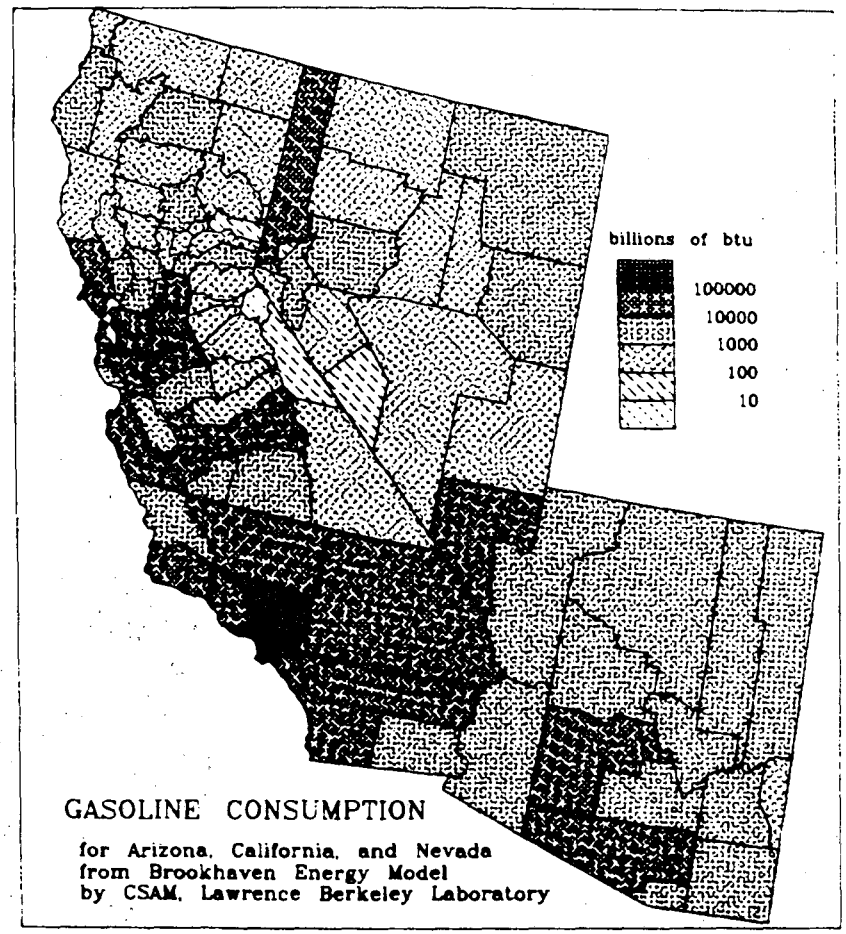


A black & white cross-hatched map of Federal Region X by county, showing Socio-demographic data extracted from the 1970 Census.



XBL 772-7596

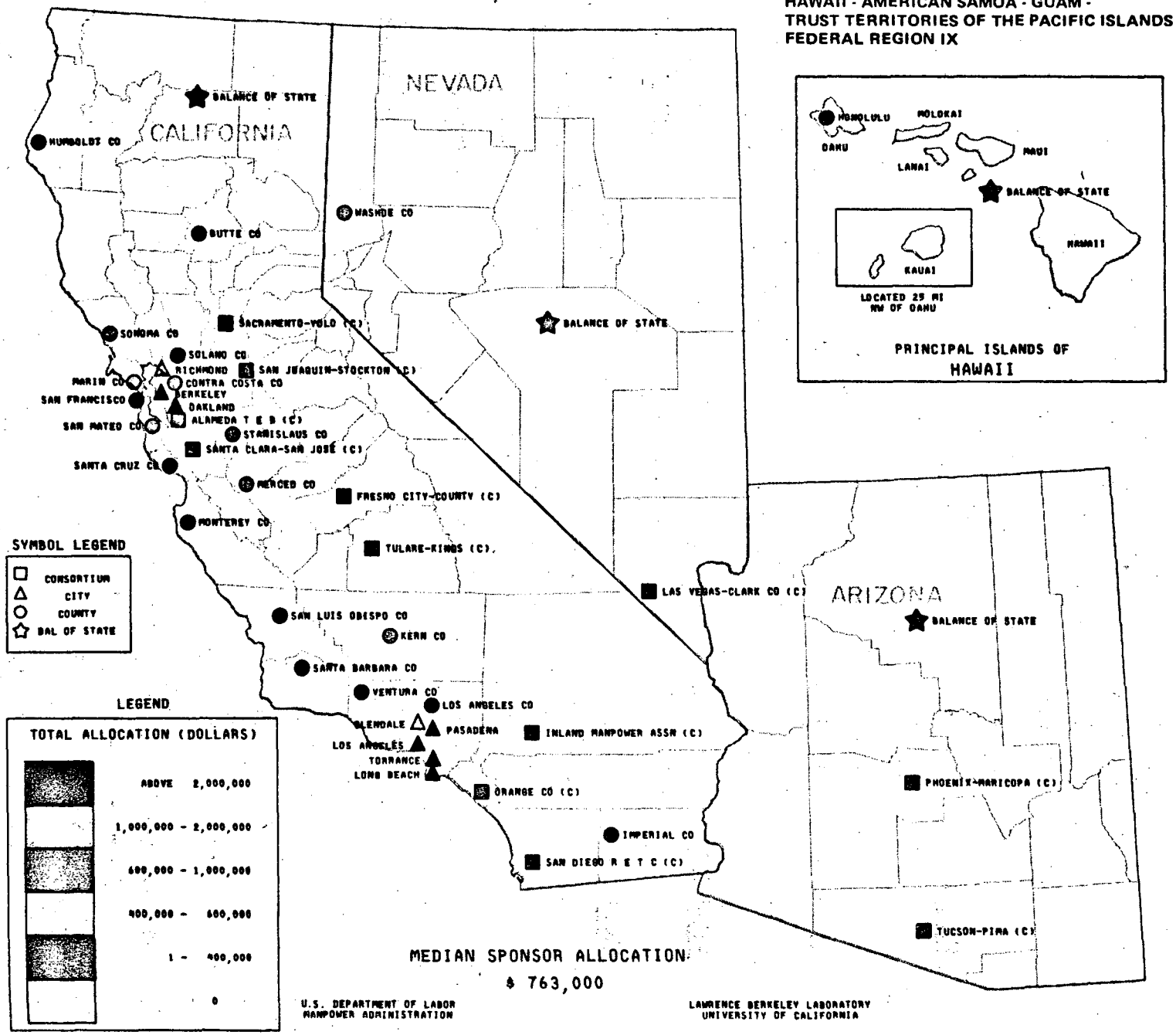
Optimal backcountry use for Northern Glacier National Park depicted as a computer-generated map, designed interactively on a Tektronix 4014 terminal. Campsite and trail symbols were user defined. Basemap consists of trail network and campsite locations. Data is from a linear programming model constrained to minimize dangerous bear contacts.



Gasoline consumption for 3 states designed interactively and displayed at a graphics terminal. Textures are cross-hatched line patterns. Base map outlines are extracted from U.S. by County map. Data is from the the Brookhaven National Laboratories Energetics Atlas.

MAP 13 - Allocation of Total CETA Title II Funds For Public Service Employment - FY 1974 Region IX by Prime Sponsor

ARIZONA - CALIFORNIA - NEVADA - HAWAII - AMERICAN SAMOA - GUAM - TRUST TERRITORIES OF THE PACIFIC ISLANDS FEDERAL REGION IX



U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA

INSETS

An inset(s) can be created in the normal and default map at most any step in the mapping process. The flow chart on page 80 gives a very useful sequence of steps for inset creation. These steps will be covered in detail in Picture 33 thru Picture 46. The mapfile has also been changed from the previous tutorial, to the California by county map.

After INSETS is executed, a new list of directives appear in the menu.

WINDOW - The window may be described as the area of the map that will be the inset. This directive is used first and initializes the program to expect a portion of the map to be selected by the User.

INPUT PTS - The second directive to be used; it calls for the cross-hairs to be placed at two points on the map - that will be a diagonal describing the area inset. It can also be used for VIEWPORT, see page 86.

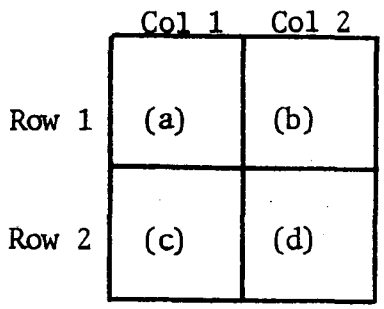
VIEWPORT - The viewport may be described as the area where the inset will be placed. Placement is determined by QUAD, BY STATE, or INPUT PTS.

QUAD - This directive initializes the program to expect a matrix input that describes how the work space will be divided for the inset(s). With the QUAD directive, the program will expect (when called for) four values that determine the matrix size and area of the work space where the inset will be placed. The rows and columns of the matrix are entered by the User similar to the following example.

Example: A 2x2 matrix, this will generate the following divided work space.

When the User is prompted to enter the rows and columns for the VIEWPORT, the inset can be placed in any of the four "areas" by entering

		Matrix Size		Viewport Location	
		Row	Col	Row	Col
Inset in area	(a)	2,	2,	1,	1
" " "	(b)	2,	2,	1,	2
" " "	(c)	2,	2,	2,	1
" " "	(d)	2,	2,	2,	2



Work Space

In Picture 38, option (b) was used. As the matrix size in increased, the viewports become smaller. The map at the top of page 91 has a matrix size of 3x3.

BY STATE - If a mapfile contains two or more states, on entire state may be selected with this directive. When executed, a prompt will ask the User to enter the Federal Information Processing Standard (FIPS) code for the state. See Picture sequence 43 thru 46.

SAVE INSET - This directive is used to store the finished inset. It is used after QUAD, BY STATE, and INPUT PTS; if omitted, the inset will fail to appear for shading. This directive must be used.

MODIFY - This directive allows the User to change or adjust an already defined inset, see page 88. The code automatically defines the first inset.

REDRAW - This directive will display the current state of inset design. The input sequence of commands are not saved with REDRAW.

RESET - Use this directive with caution, it cancels all User defined insets, and returns to the initial inset design.

FINIS - Concludes the INSET option; all insets are saved and the User is returned to the original set of CARTE directives.

An INSETS Tutorial

The following California by County mapfile shows "overcrowding" of the counties adjacent to San Francisco. The work space does allow room for an inset so we will create an inset of the crowded area and place it in an "empty" portion of the work space.

The second decision is how to place the inset - by QUAD or INPUT PTS (BY STATE cannot be used, see definations above). Since the upper right portion of the work space is empty (see Picture 33) and is equal to or larger than ¼ the area of the entire work space, we will try the QUAD option - although INPUT PTS could have been done just as easily.

Begin by executing INSETS, and start with the example on page 81, Picture 33.

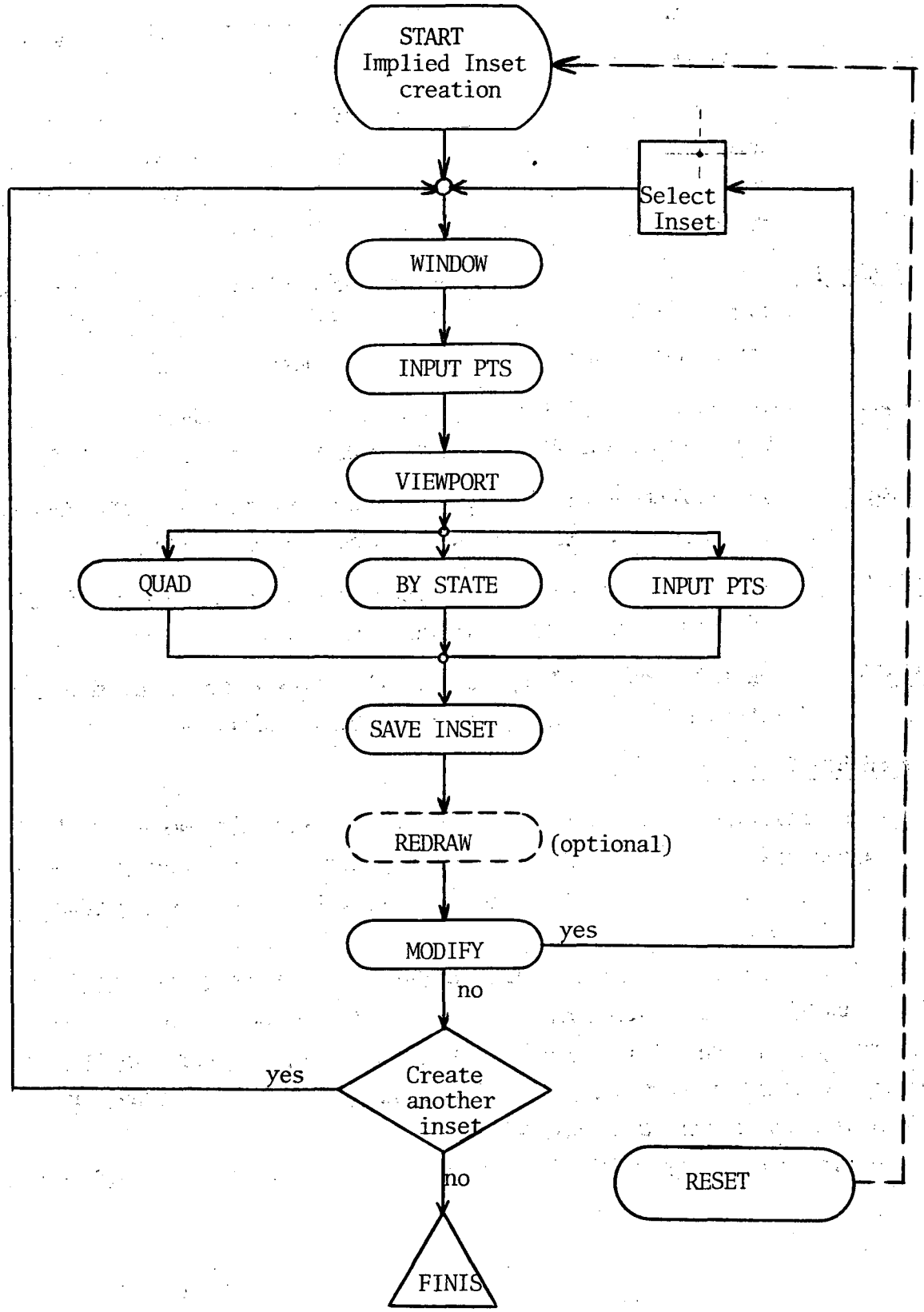
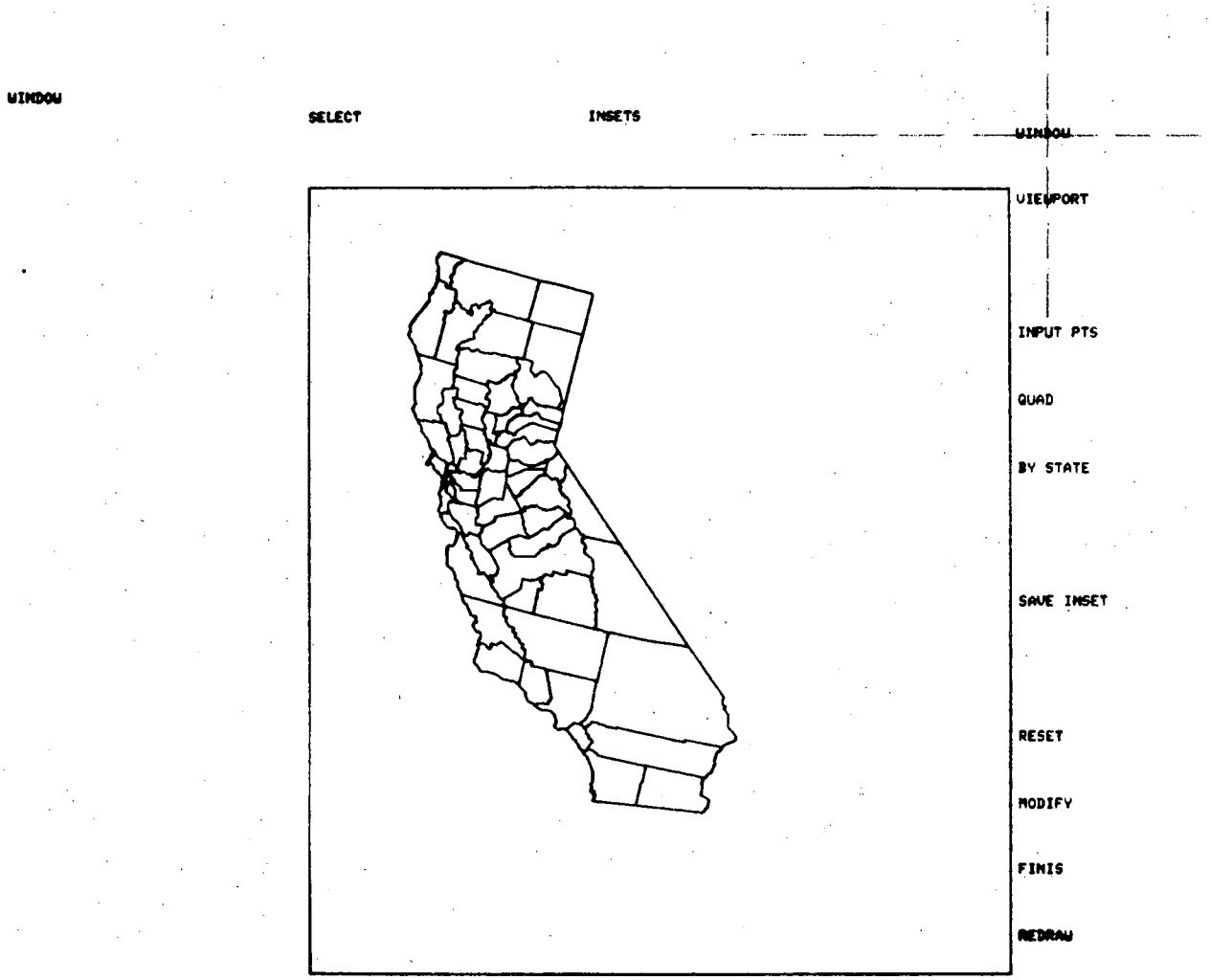


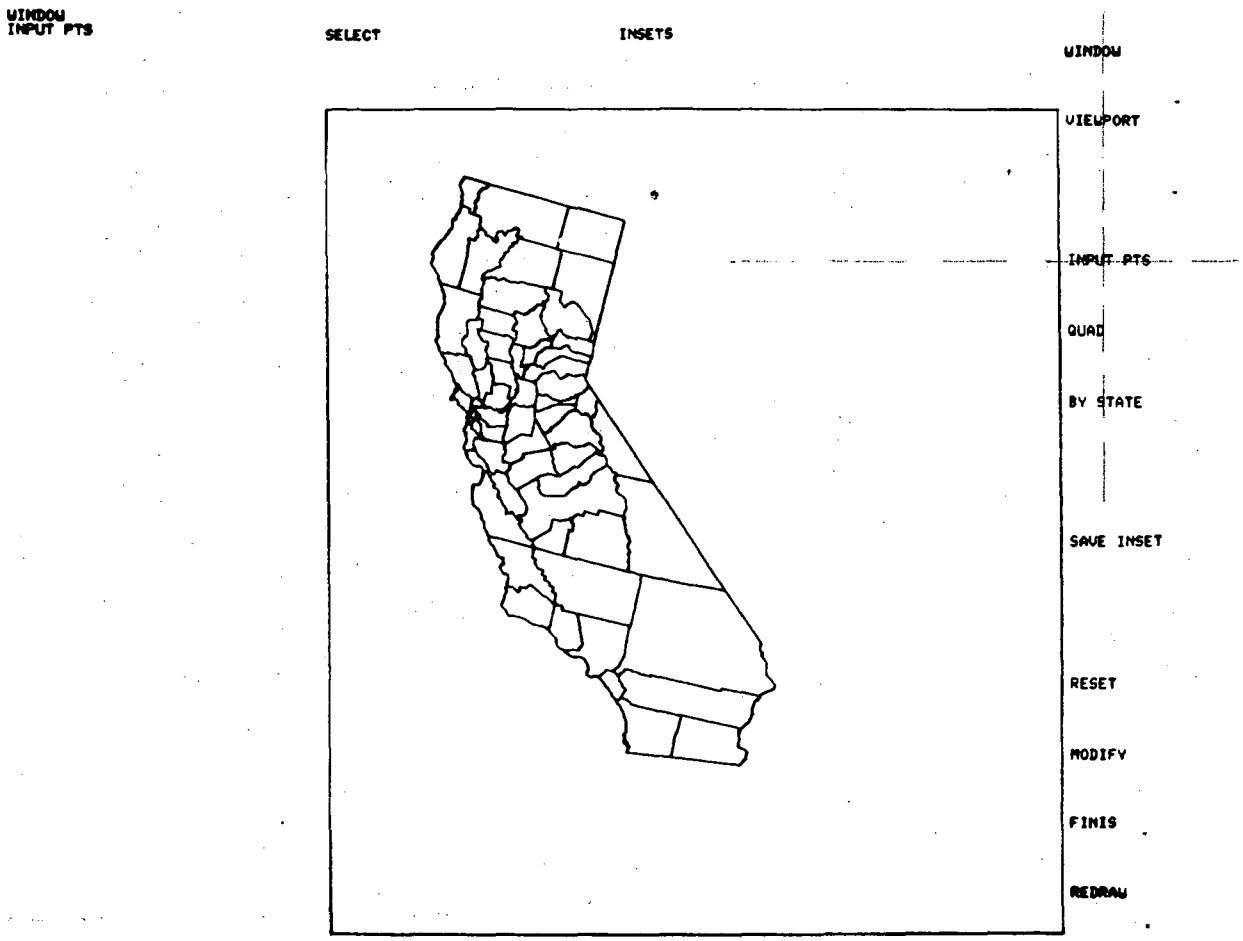
Figure 3. INSETS Flow Diagram

After INSETS is executed a new set of directives appear, center the cross-hairs on WINDOW, hit the space bar.



Picture 33

The next step is to execute, INPUT PTS.

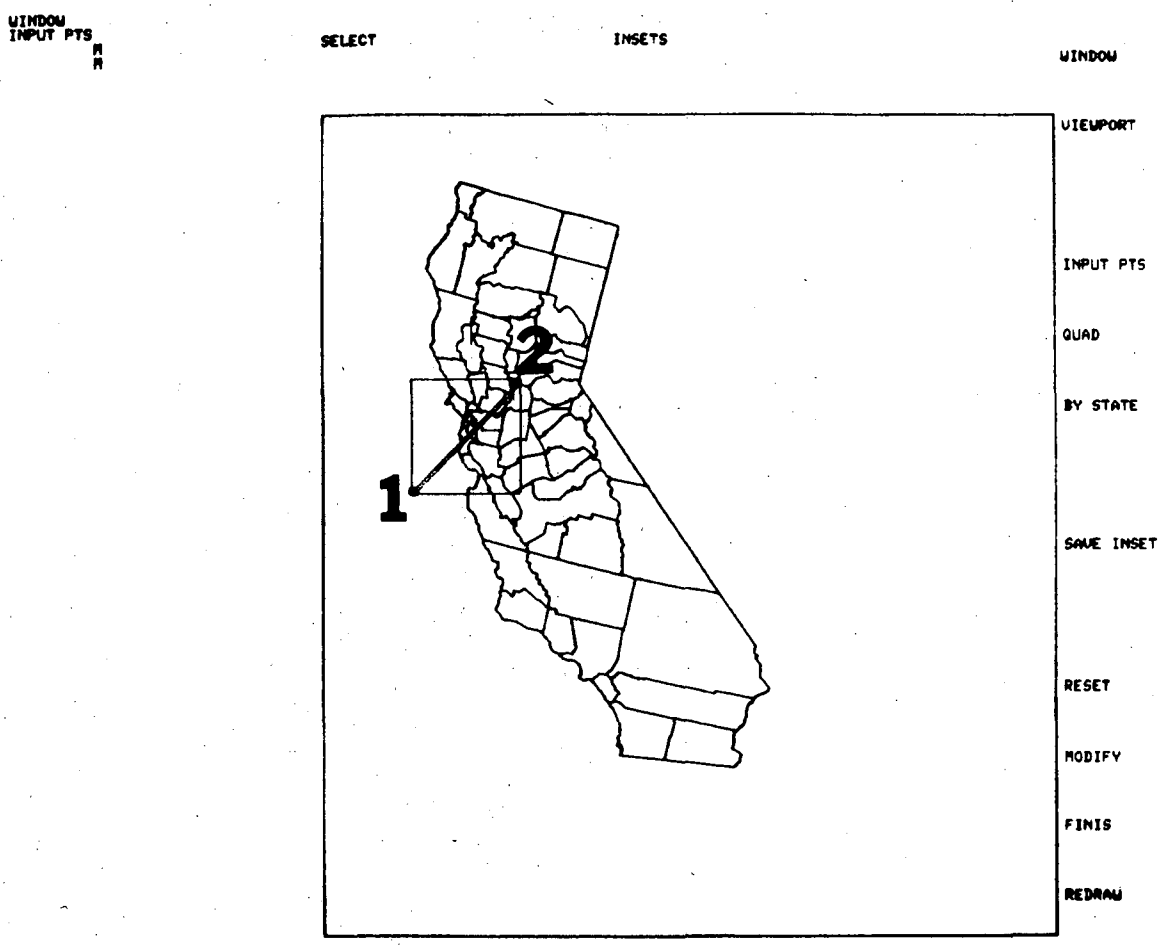


Picture 34

The INPUT PTS command displays the cross-hairs for inputing 2 points. These 2 points determine a diagonal whose area will define the inset or window.

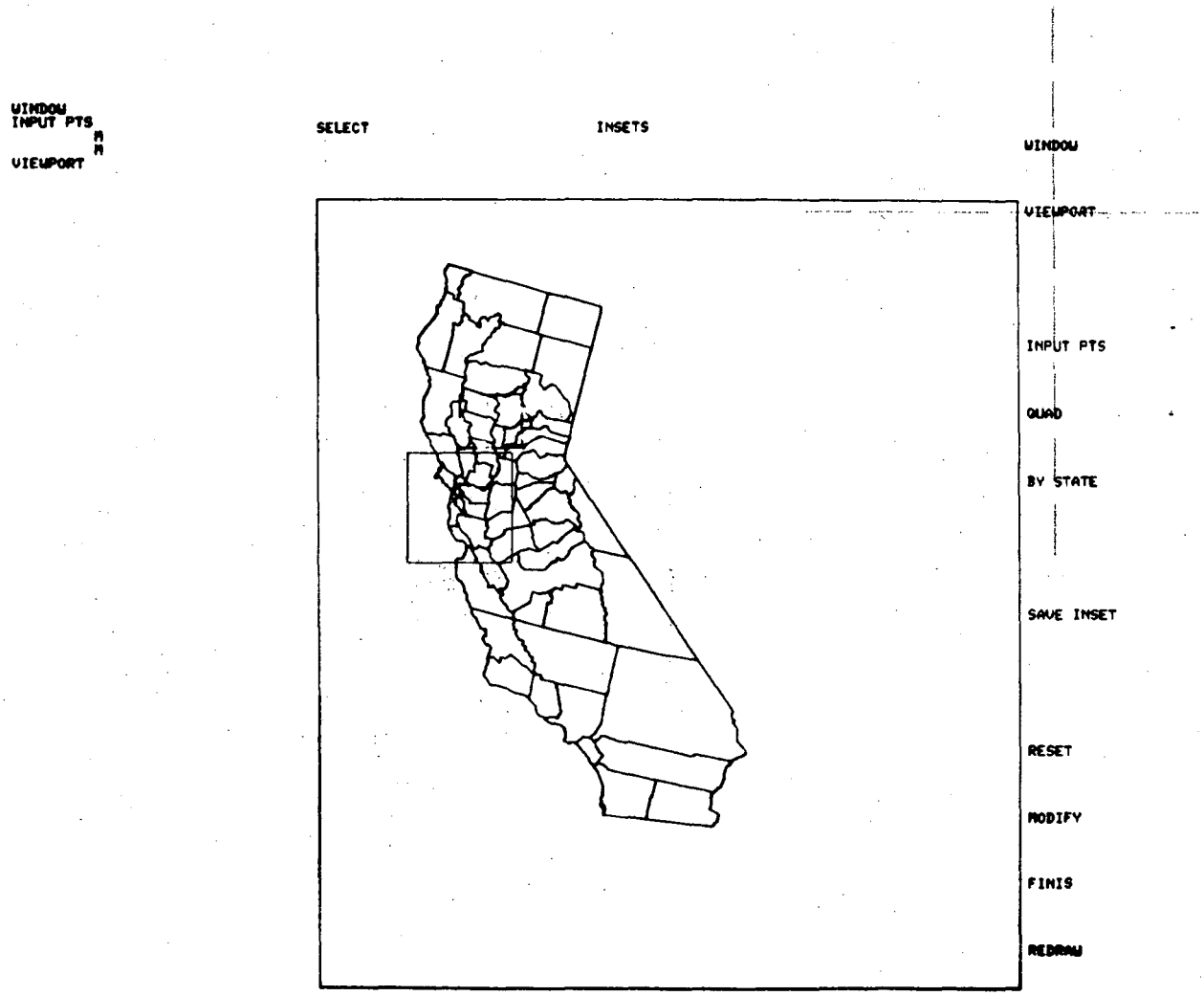
Locate point **1** south and "out to sea" from San Francisco, execute by hitting the space bar.

Locate point **2** Northeast of San Francisco, and execute.



Picture 35

A rectangle will appear, drawn about the diagonal just described by points 1 and 2. The rectangle will be the future inset and must be located - by VIEWPORT. Center the cross-hairs on VIEWPORT and execute.

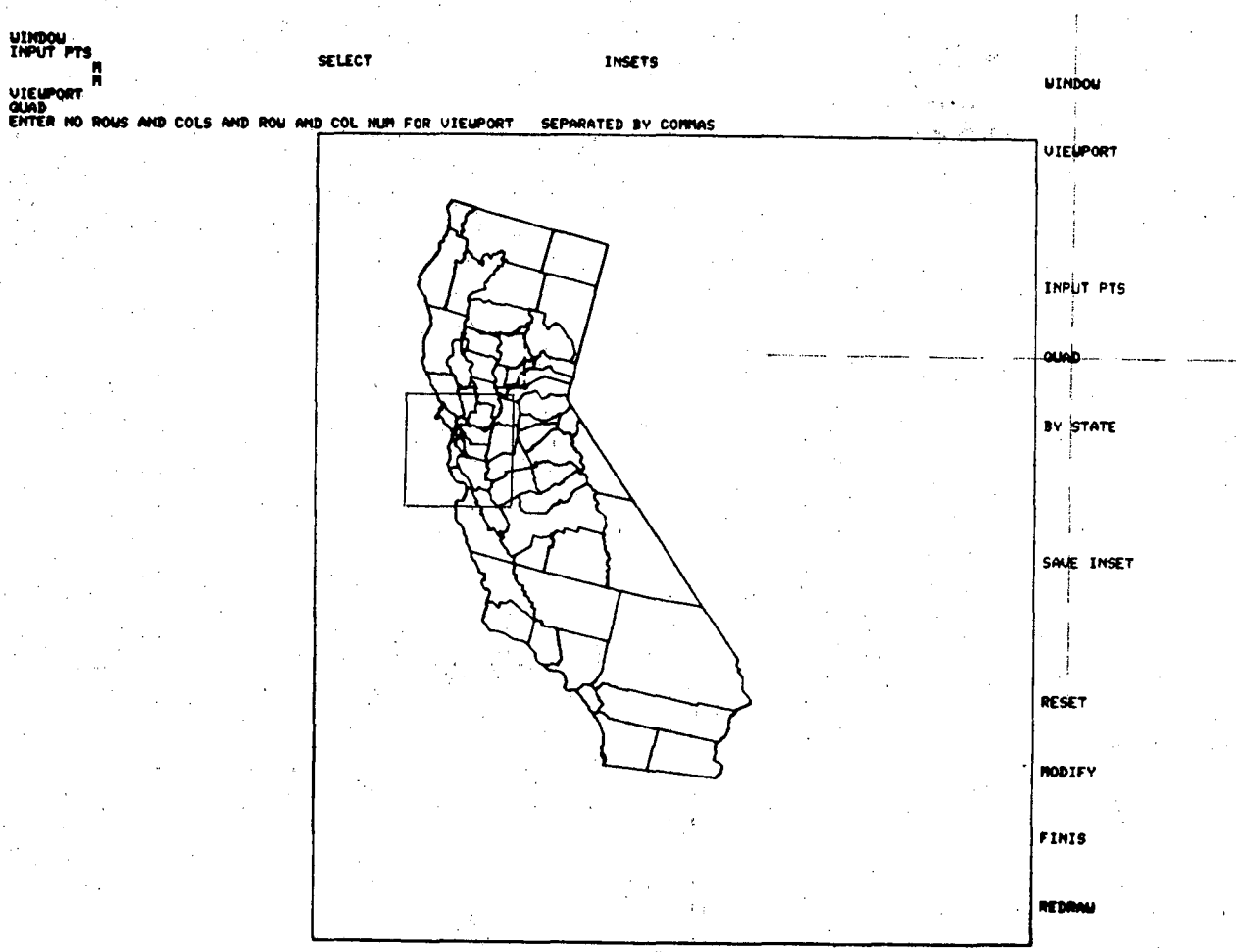


Picture 36

We previously mentioned in the INSETS introduction that the QUAD option would be used; after executing VIEWPORT - execute QUAD.

The User is now called to
ENTER THE NUMBER OF ROWS AND COLUMNS AND ROW AND COLUMN NUMBER FOR VIEWPORT, SEPARATED BY COMMAS.
A complete explanation of the entry is shown in the example under QUAD on the defination pages 78 and 79.

Continue to Picture 38 for inputing the QUAD numbers.

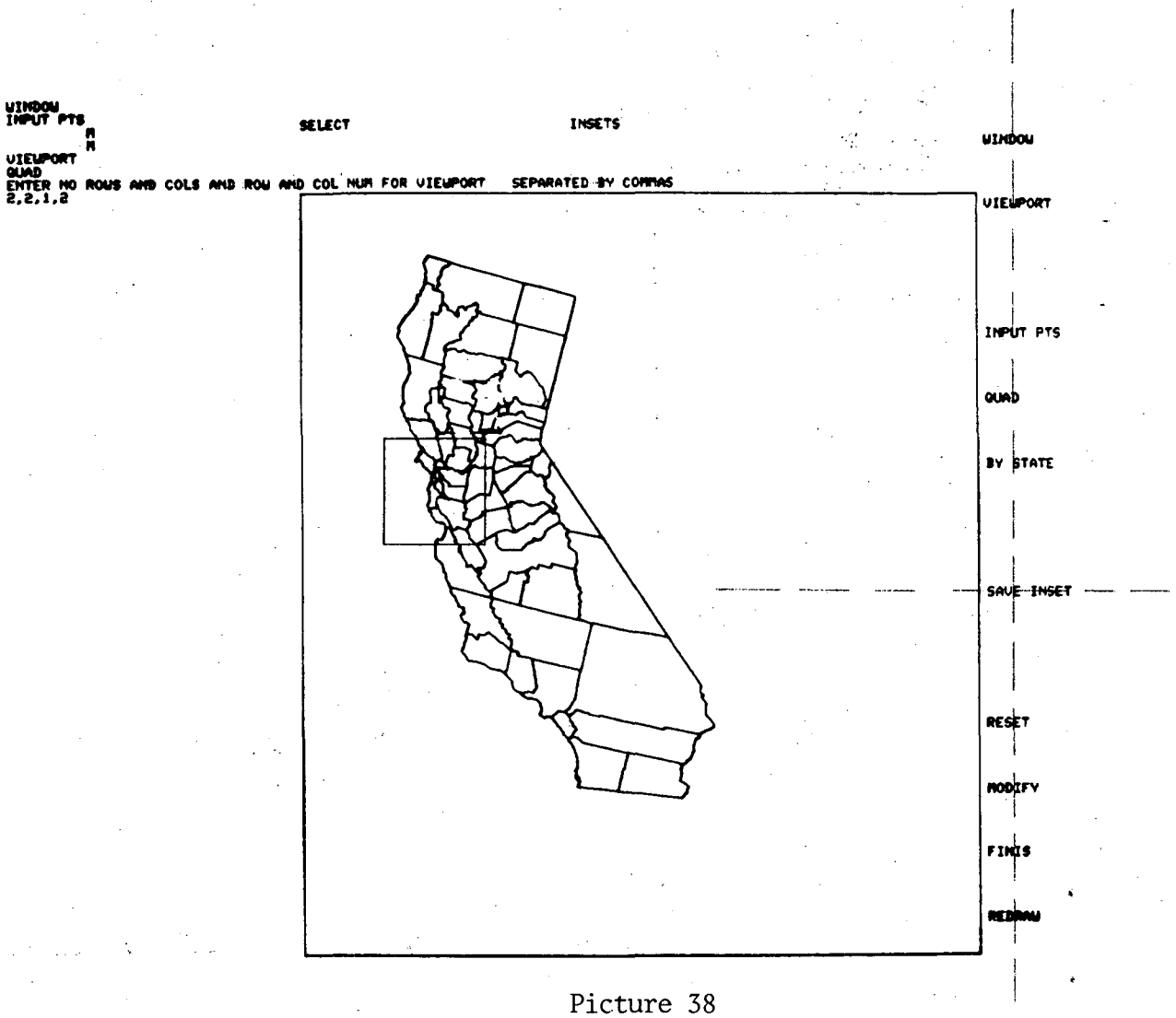


Picture 37

The QUAD input is entered as 2,2,1,2 Return. Proceed to Picture 39.

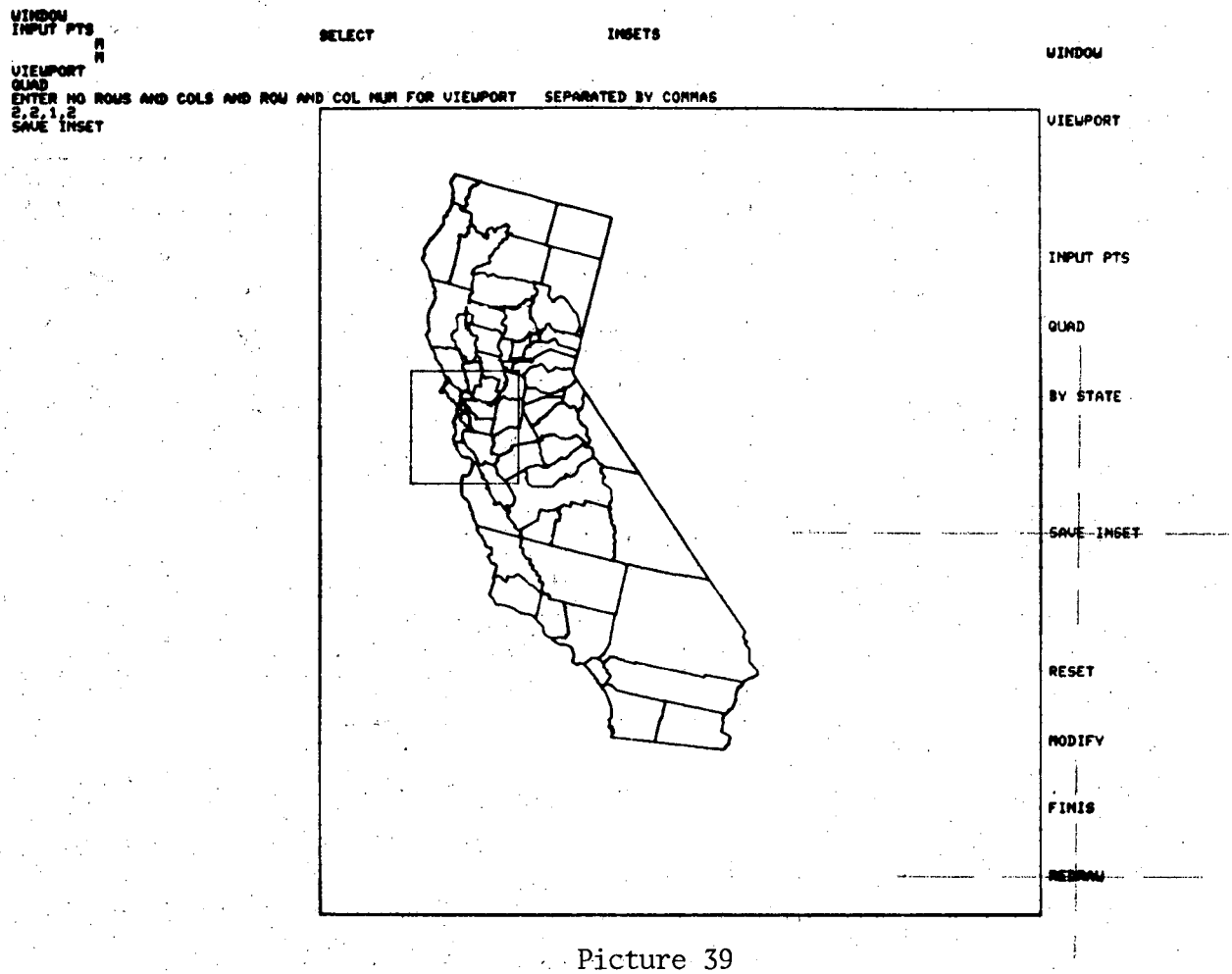
Defining the Viewport by INPUT PTS

Execute INPUT PTS after VIEWPORT. The cross-hairs will appear and await User input. The viewport is defined exactly as the procedure in Picture 34 and 35. Place the inset in an "empty" portion of the work space. A rectangle will appear and will be the inset for the map. The inset in the map on the lower half of page 91 was inputed by INPUT PTS.



Picture 38

We want to save the inset just made, execute SAVE INSET.

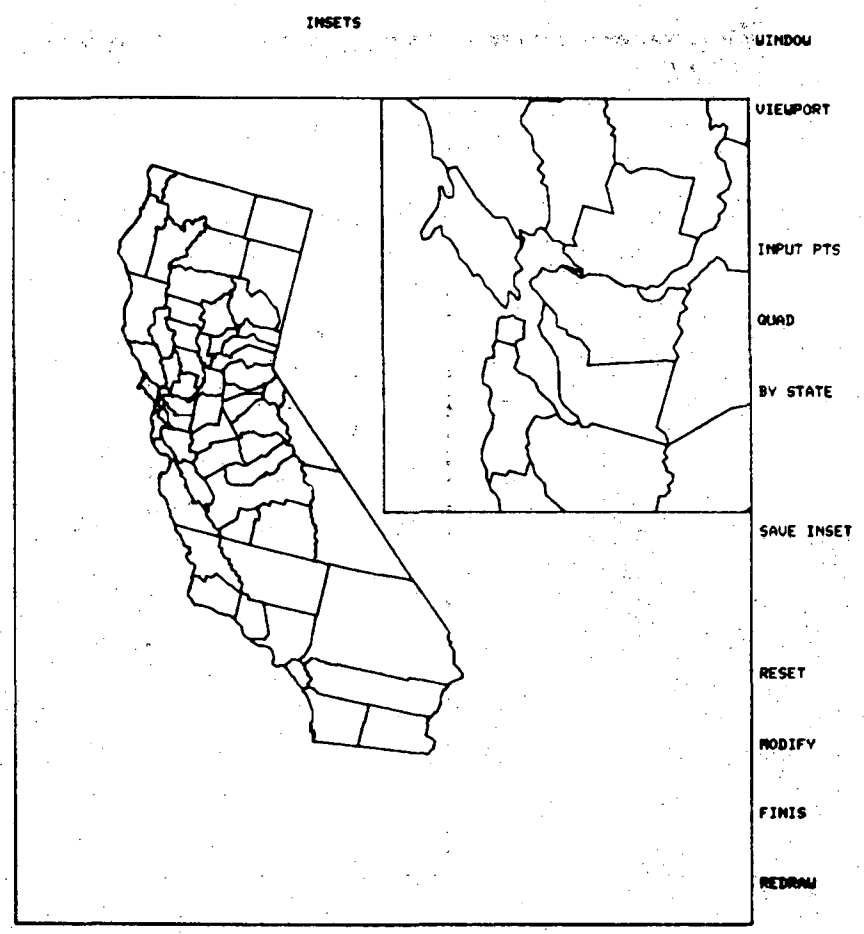


Picture 39

By executing REDRAW, the inset will be displayed. If data had been previously selected, binned, and patterened; the display would include the patterns in the county outlines, both "base" and inset maps.

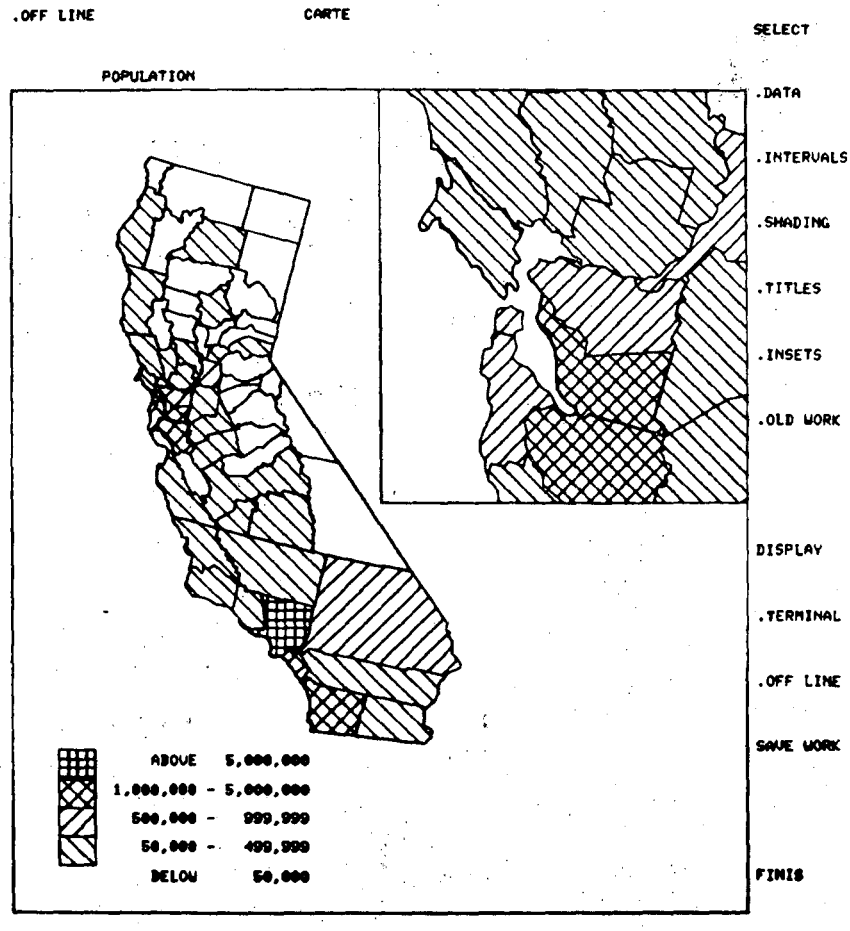
MODIFY

If the User is not satisified with the inset as it is now displayed, it may be changed with MODIFY. When MODIFY is executed, cross-hairs will appear on the screen and the User selects the inset(s) to be changed by centering the cross-hairs on that inset, hitting the space bar and return. The User then proceeds to WINDOW and repeats the inset steps, Picture 33 thru 40.



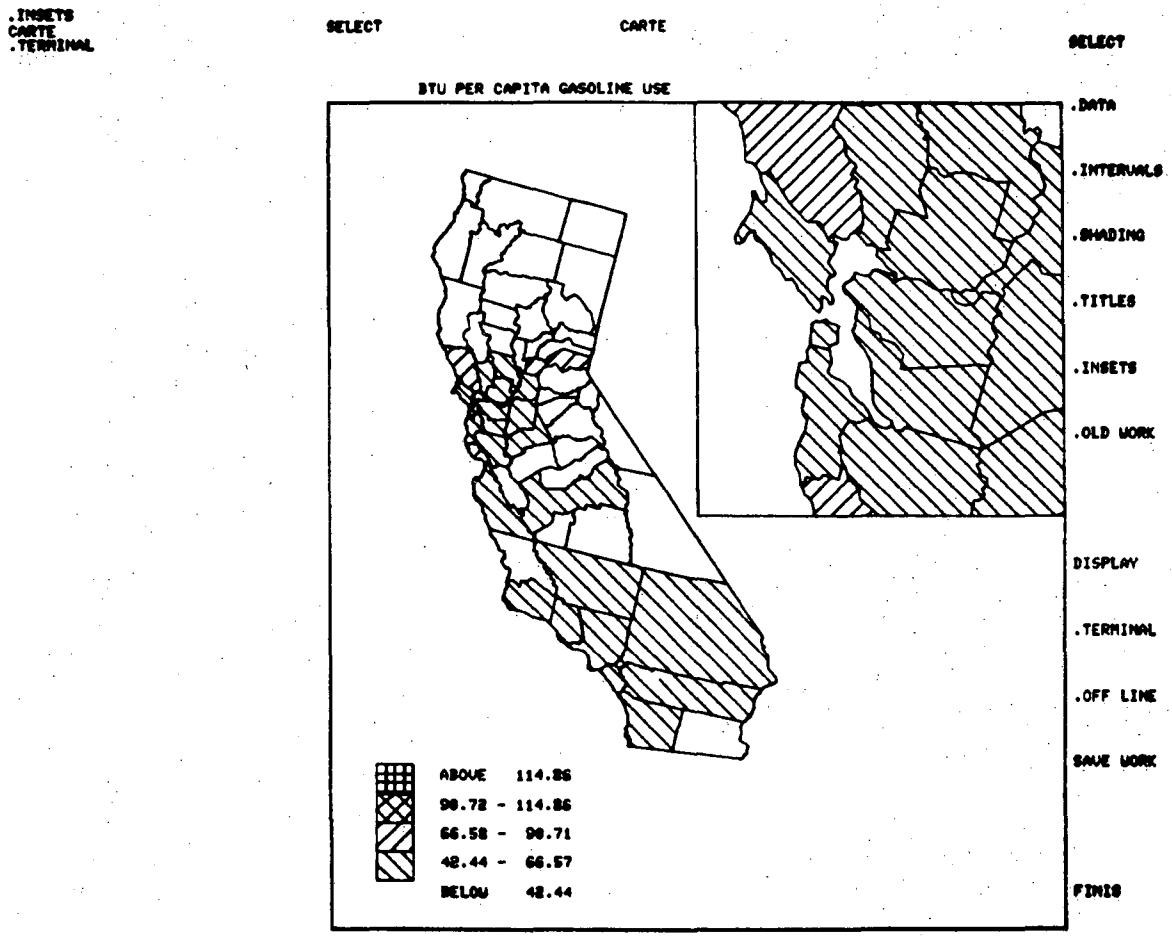
Picture 40

Picture 41 shows how cross-hatching patterns would be displayed on the "base" and inset maps. Also, a legend, data, and patterns were previously defined in the mapping process.



Picture 41

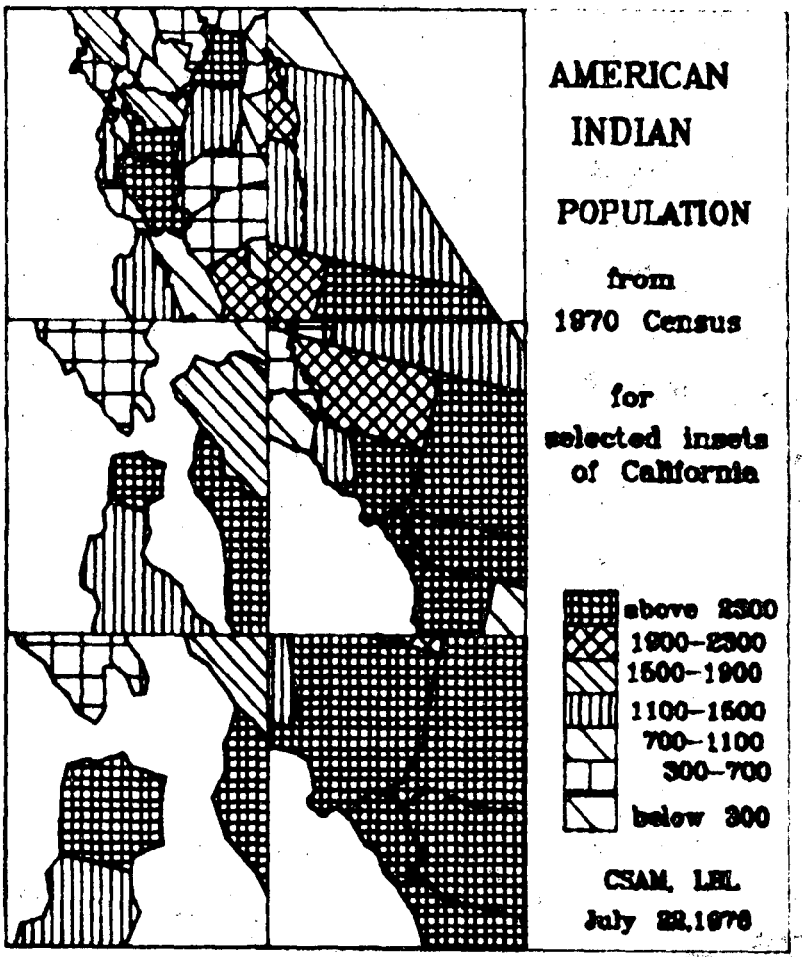
The Picture below is another example, with different data, of the inset process. Again, previous steps put in the legend, etc.



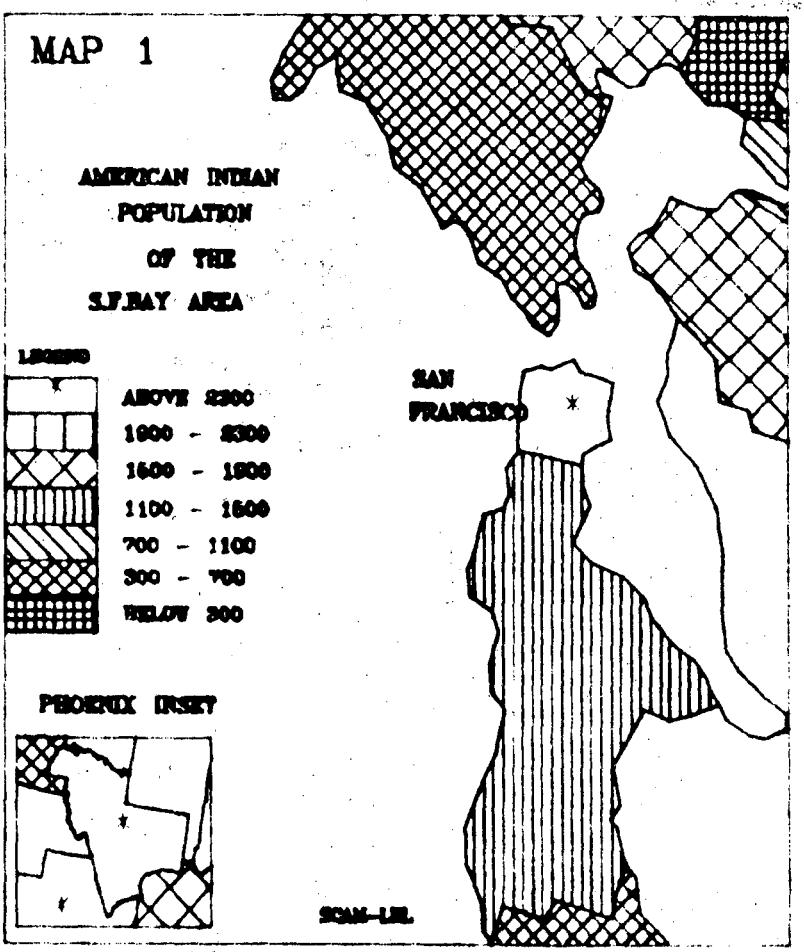
Picture 42

This map was made with a 3x3 matrix for the QUAD option.

Three of the insets were left blank, so that titles could be included.



In this map, an inset was included in the map by using the INPUT PTS option.



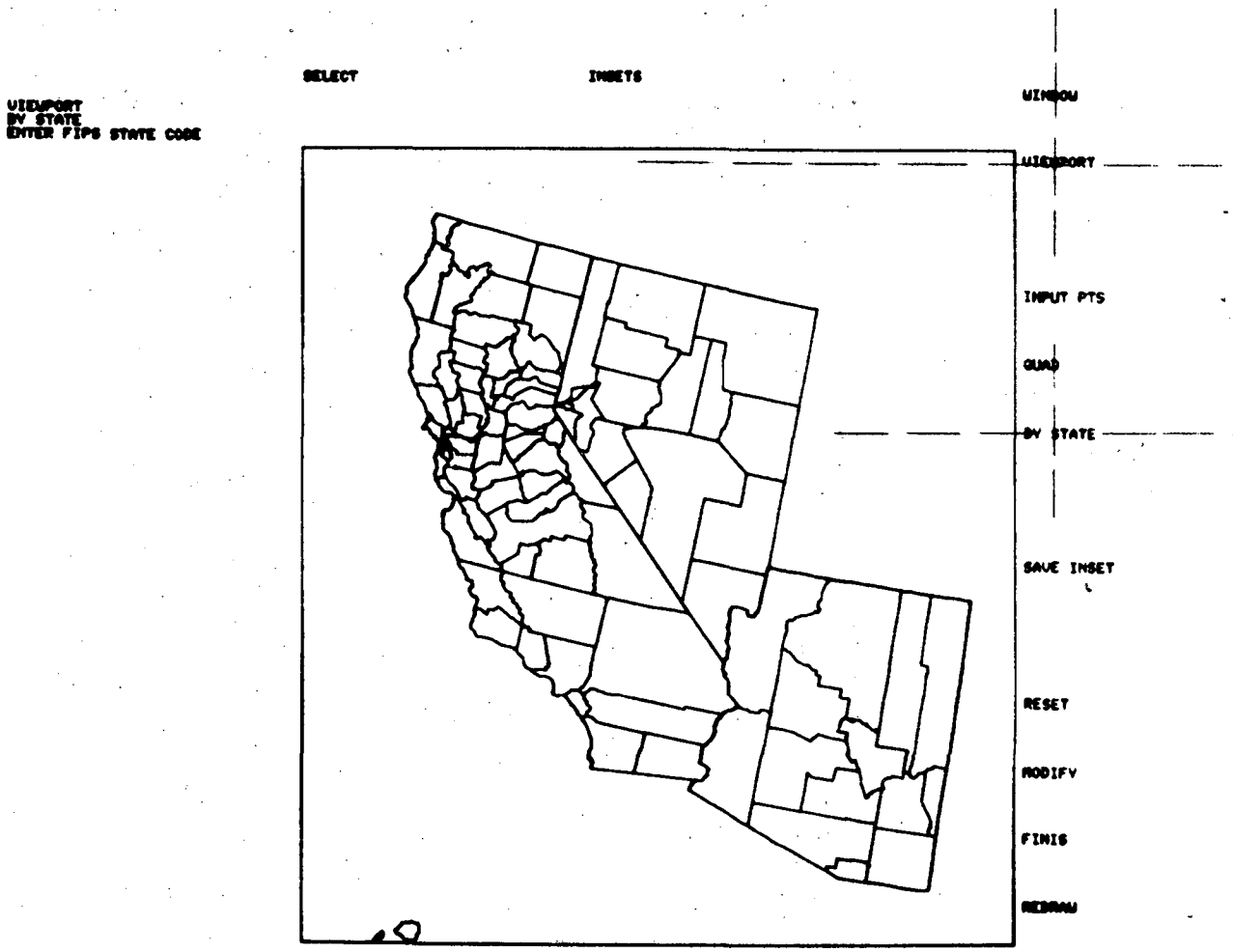
INSET Selection by State FIPS Code

As defined on page 79, when the User map file contains two or more states, one state may be selected as an "inset" by using the FIPS code option.

In the example below, we have skipped the directives down to VIEWPORT. After VIEWPORT, execute BY STATE and the system will query

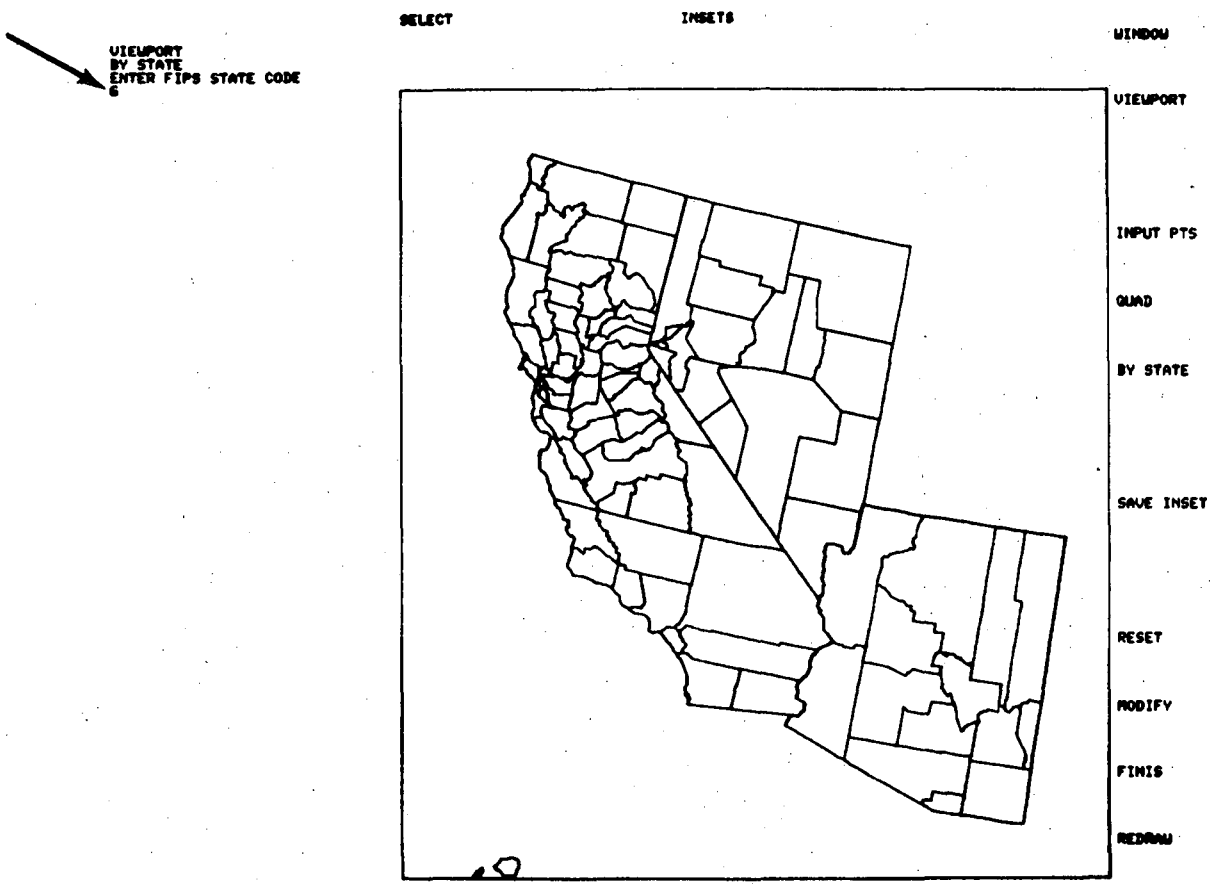
"ENTER FIPS STATE CODE"

continue to Picture 44.



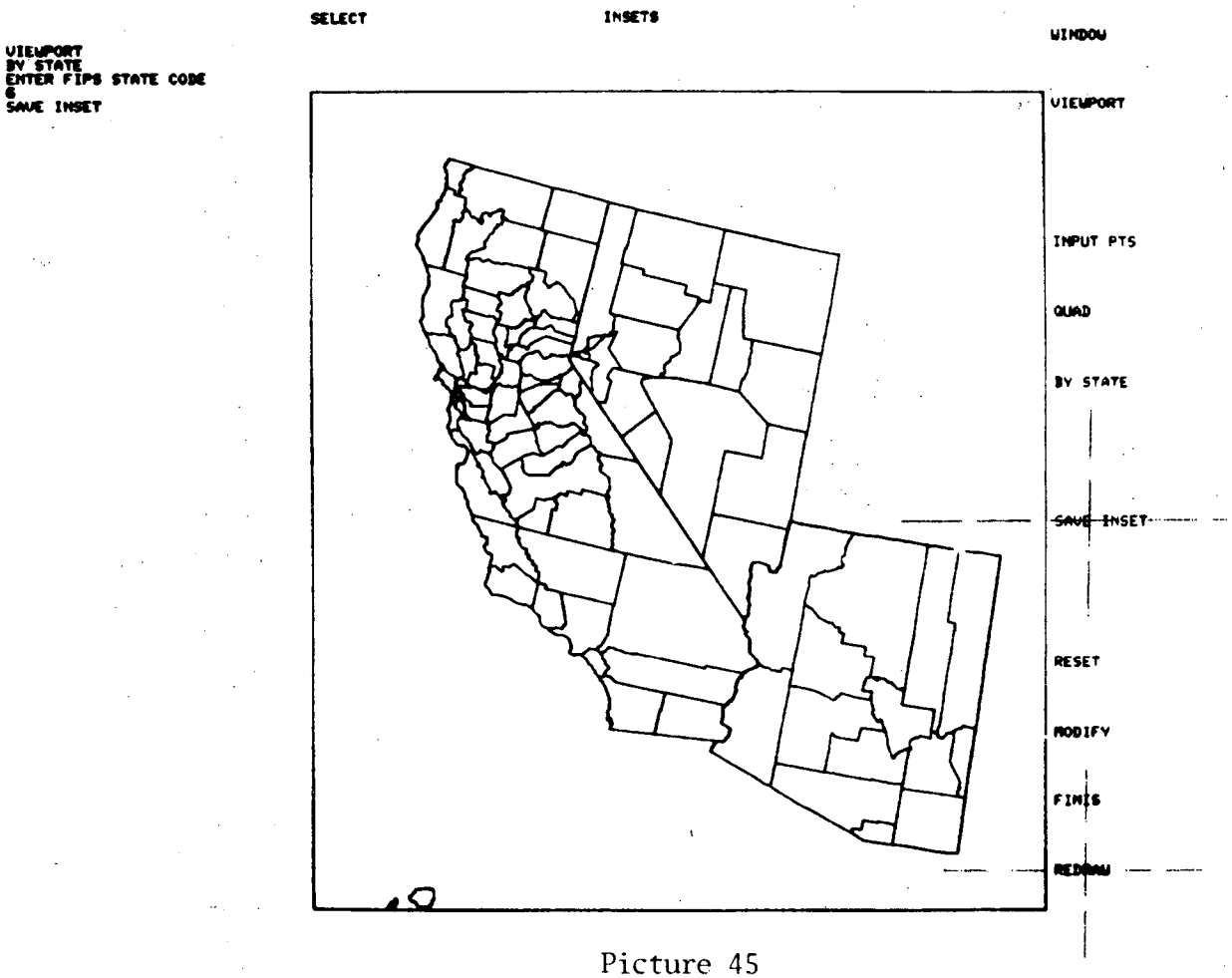
Picture 43

Since California has been selected, enter 6 (the FIPS code) and Return.



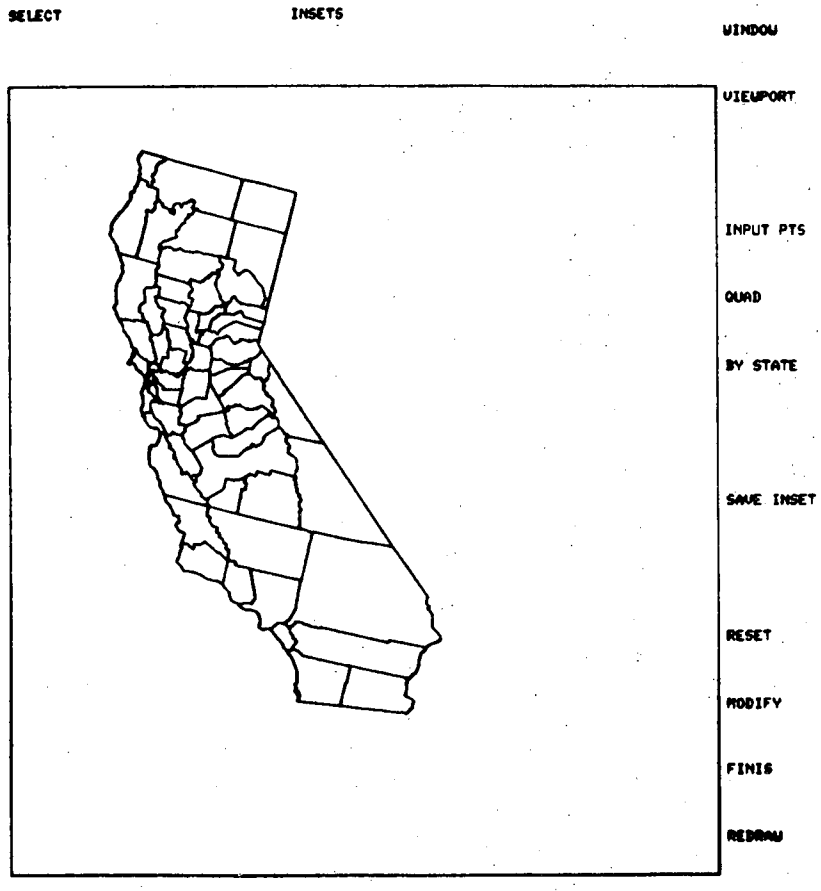
Picture 44

Execute SAVE INSET.



Picture 45

REDRAW will display California subtracted from the original 4 state map.



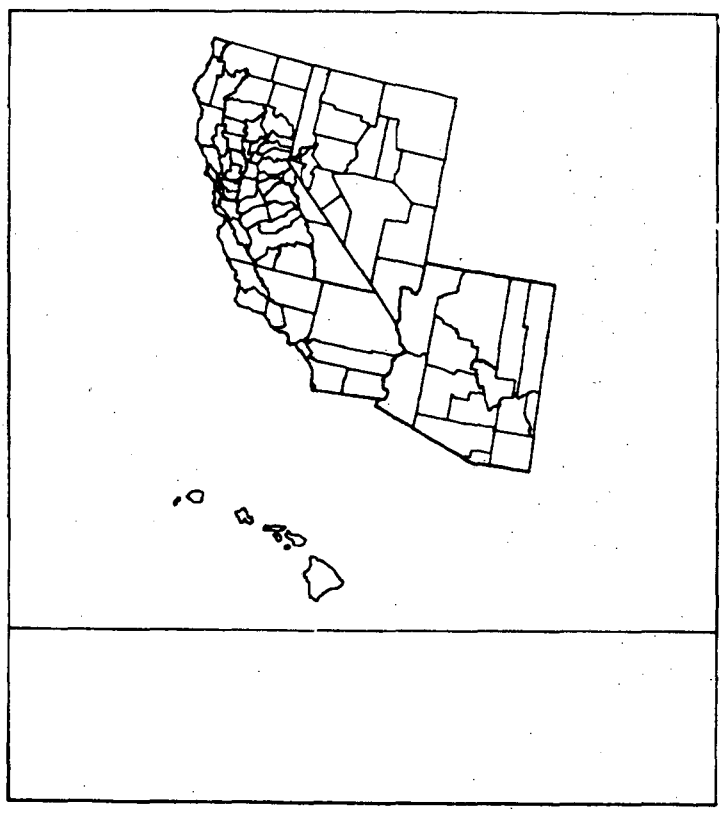
Picture 46

THE DEFAULT DESIGN

The option for a default map has been selected and several pre-programmed modules will replace User input. Binning for five data ranges, cross-hatch patterns, and a legend will be produced in this mode. The title that appears in the data list will appear as the only title - above the work space. Only one data characteristic can be chosen at a time. The Data Base Arithmetic option and Insets may be used, however, they will defeat the purpose of this quick mapping procedure. The default map was designed to finish a map quickly, with minimal User input.

In the six Pictures that follow, a portion of the Brookhaven Energetics Data Base[7] will be used.

Picture 47 shows the default map format. The lower portion of the work space (divided by a line) is reserved for the automatic legend printout. The map file will fill the upper portion.



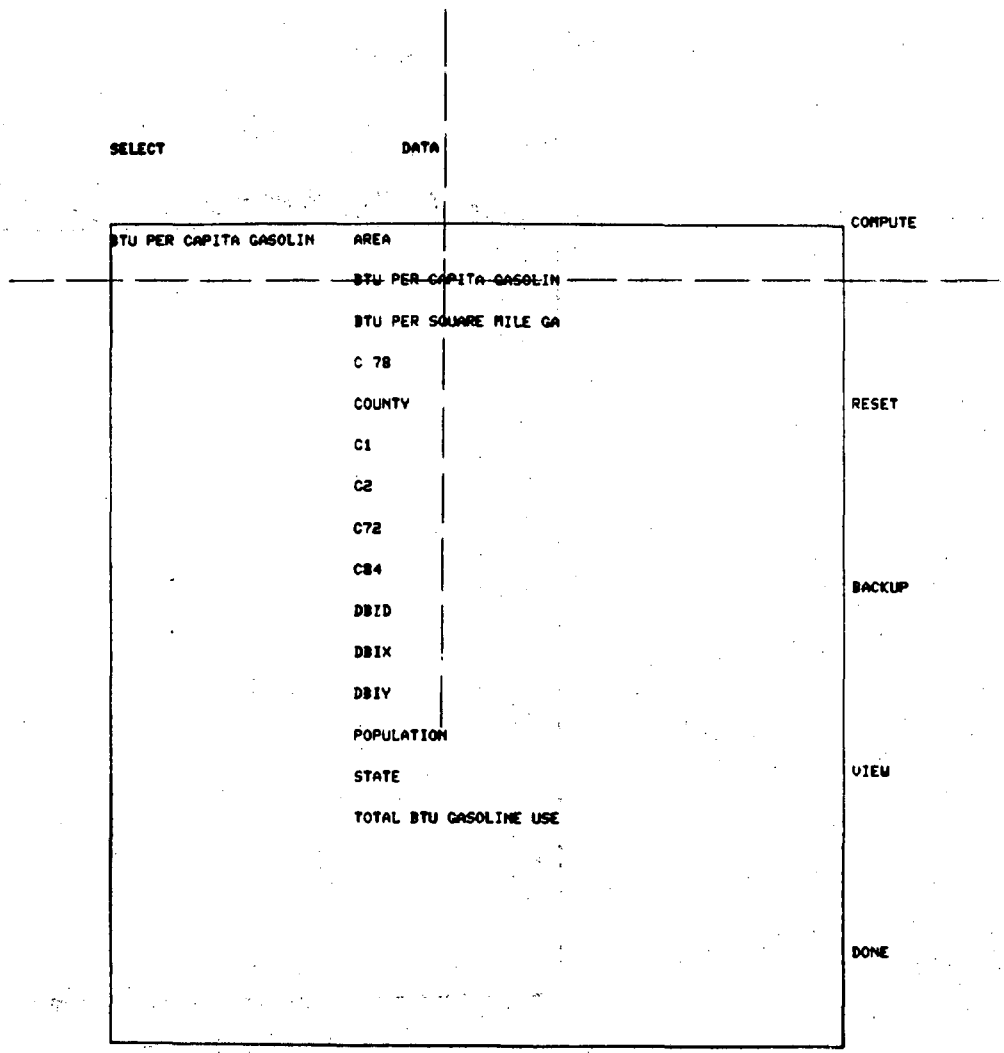
Picture 47

Begin this shortened map making procedure with the DATA directive. Select a data characteristic by centering the cross-hairs on the name, hit the space bar and Return.

The characteristic just selected will appear in the upper portion of the work-space (see below).

See Picture 1-4 for additional details on the DATA directive.

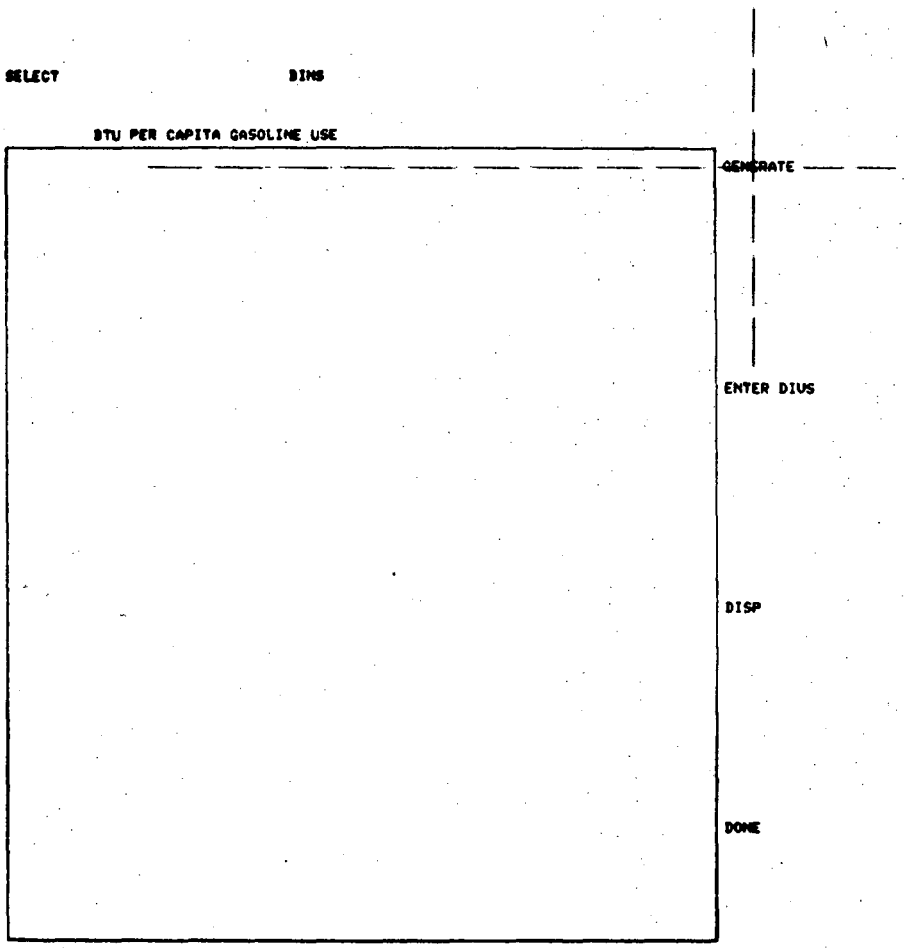
NOTE: Only 1 data characteristic per DATA run can be chosen in this mode.



Picture 48

The screen will clear and a new set of directives will appear, along with the name of the data characteristic at the top of the work space.

Continue the default process by centering the cross-hairs on GENERATE, hit the space bar and Return.



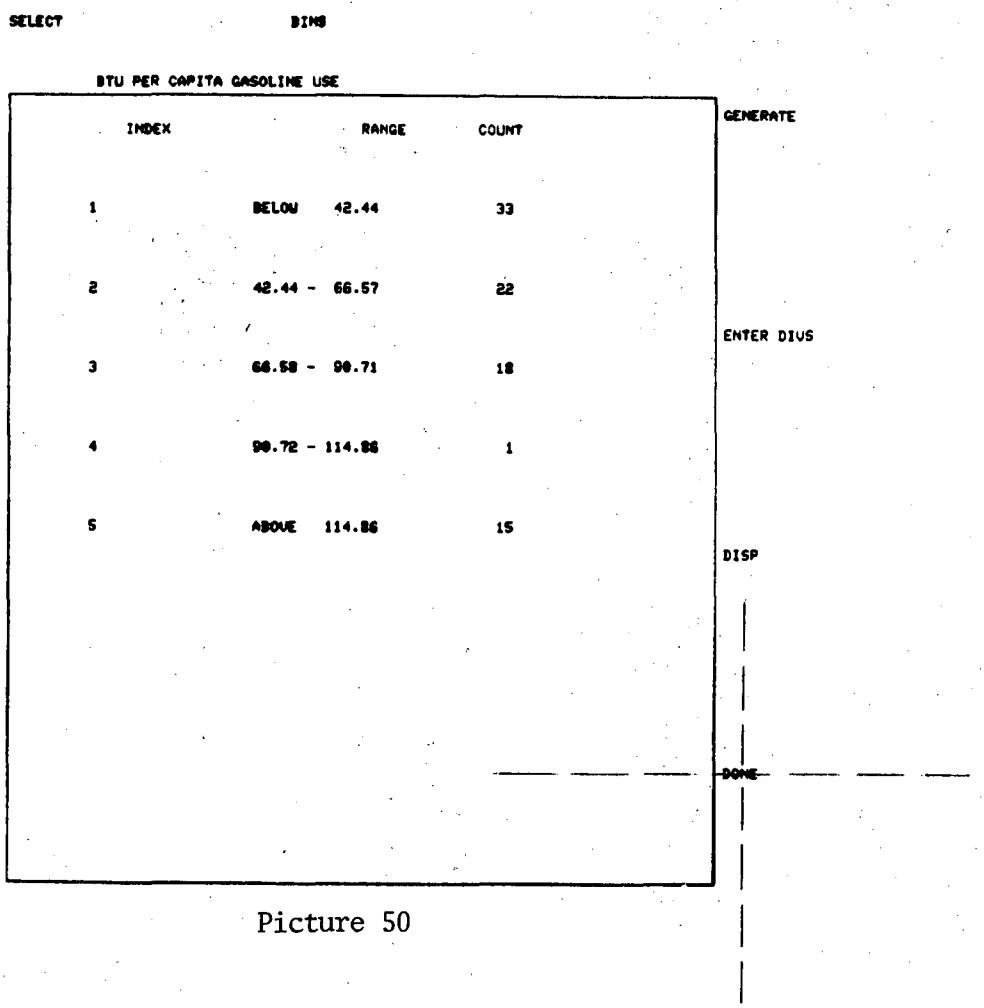
Picture 49

The range of data values are calculated and then printed in the workspace. If disatified with the automatic binning process, new values can be entered with ENTER DIVS (see Picture 5-8 for complete details). Note, only 1 to 5 bins may be used with the default mode.

Again, the User is cautioned that these additional steps defeat the quick mapping process.

If the binning is acceptable, execute DONE.

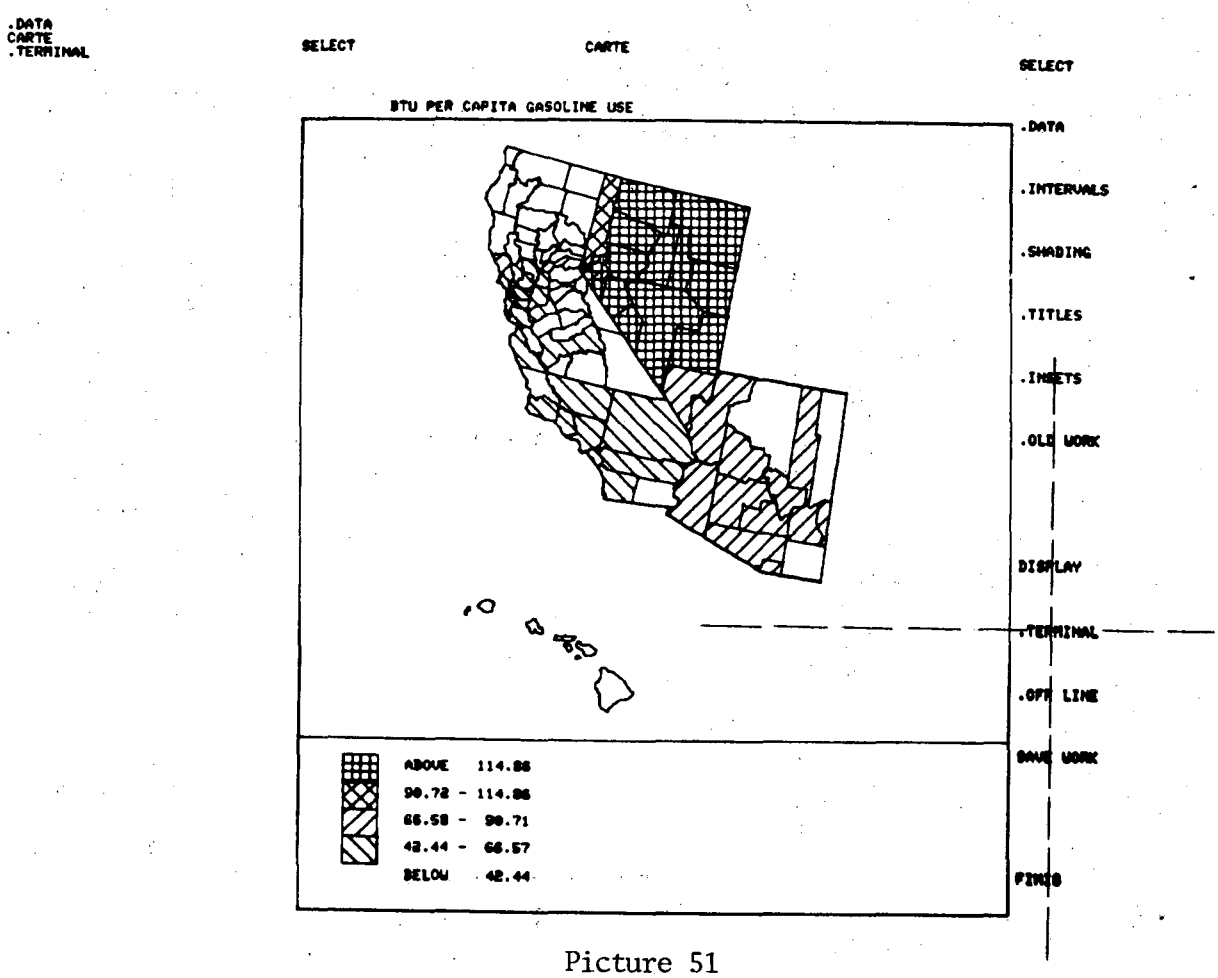
Continue to Picture 51.



Picture 50

The default map is printed in full with the TERMINAL command.

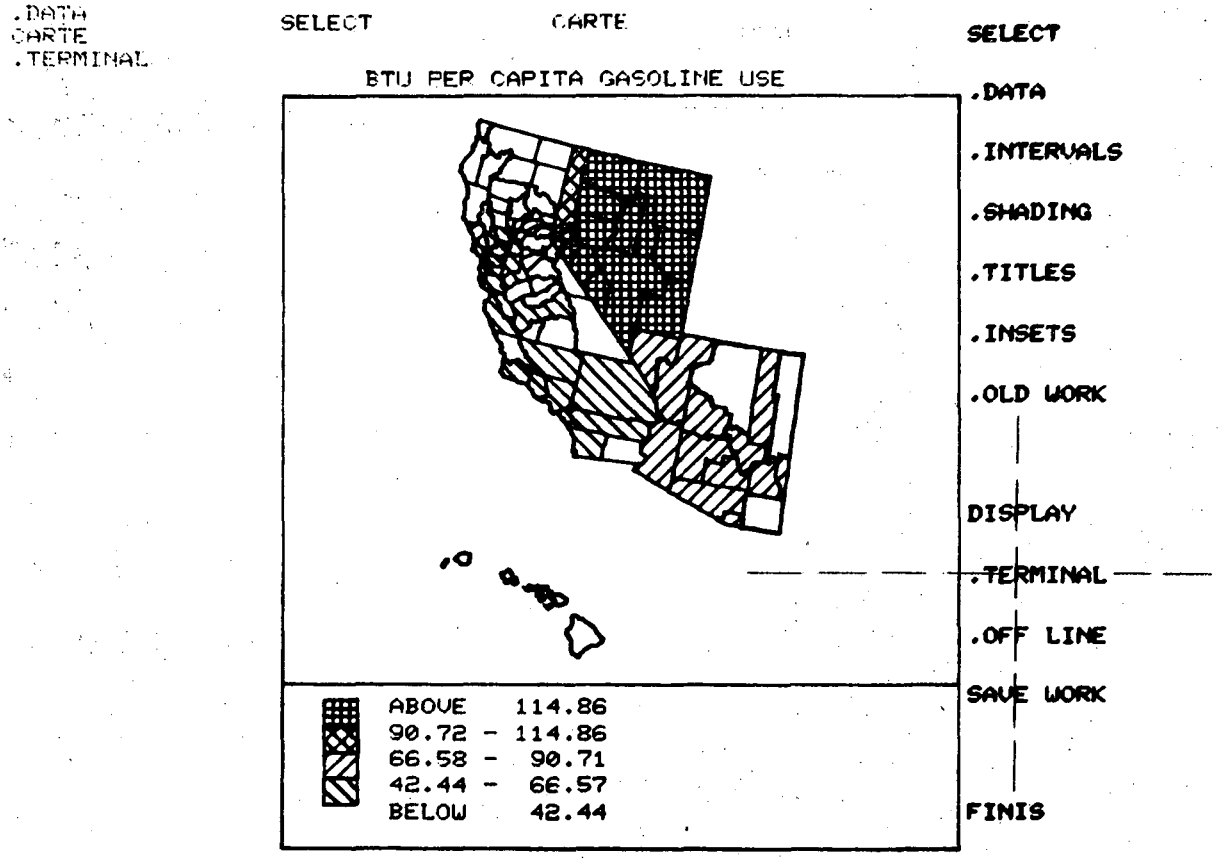
The program has called precalculated cross-hatch patterns to display the five data range values. The Legend prints these values and their patterns. The data characteristic name remains at the top of the work space. The map may now be printed off line on film, but not saved on PSS. The User may return to the data directive and map another characteristic.



Picture 51

This is a duplicate map of Picture 51, however it has been reproduced from the screen of a Tektronix 4012. All Pictures up to this point have been taken from a Tektronix 4014 model.

In a general comparison of the Tekronix display models, the 4014 has a much larger screen, or about four times the resolution of the 4012 model. The 4014 also has four character sizes and dashed line capability, while the 4012 has only one character size and generates only solid lines.

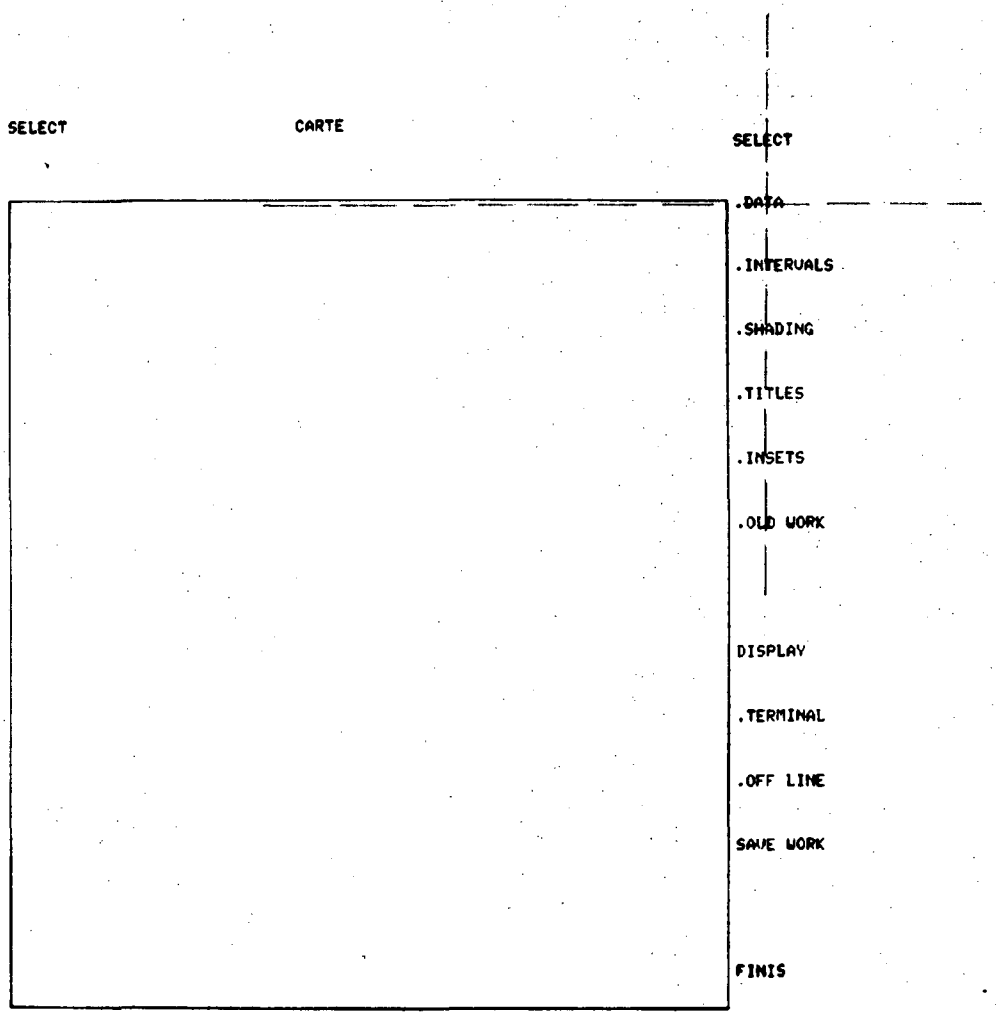


Picture 52

DATA BASE ARITHMETIC

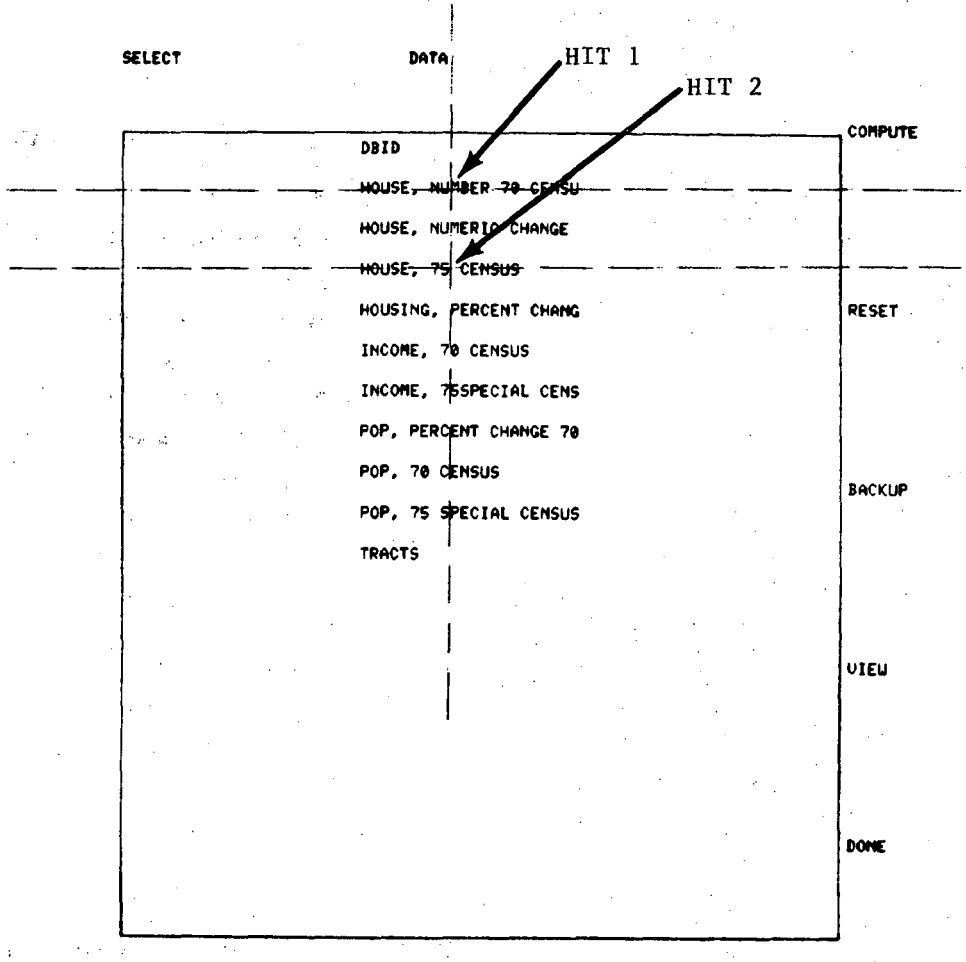
It is possible to perform arithmetic on area characteristics and to map the result, (there is no facility for storing the result in the data base). Two examples of calculations will be given on the following Pictures, 53-63.

To perform a calculation it is first necessary to enter the data select module. Position the cross-hairs on DATA and hit the space bar.



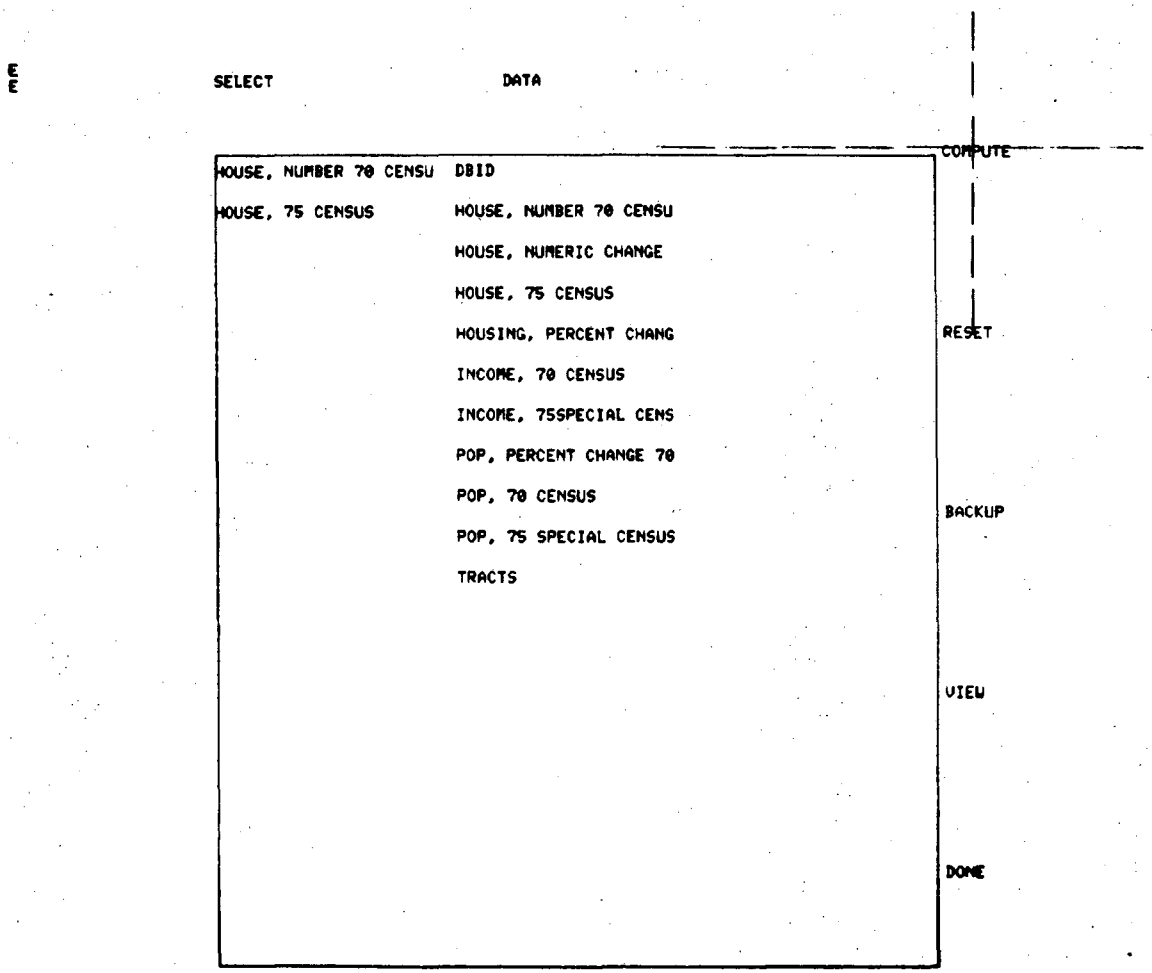
Picture 53

The characteristics to be operated upon should be selected using the cross-hairs; they will appear in the left-hand column of the work space.



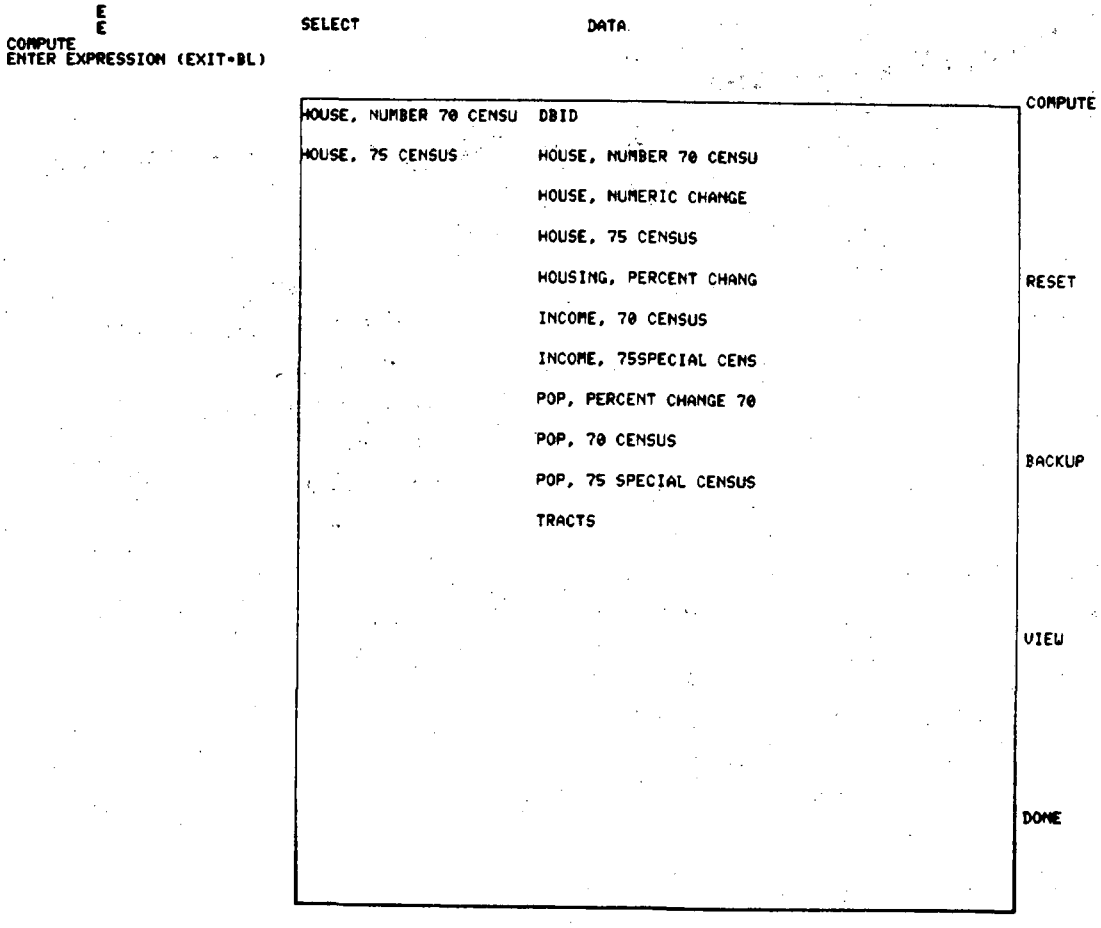
Picture 54

To begin the computation, position the cross-hairs on COMPUTE, and hit the space-bar.



Picture 55

The User will now be prompted to enter an expression from the keyboard. This mode can be left by typing a "blank" followed by a Carriage Return. A valid expression can include values, characteristic numbers, and the operators +, -, *, /.

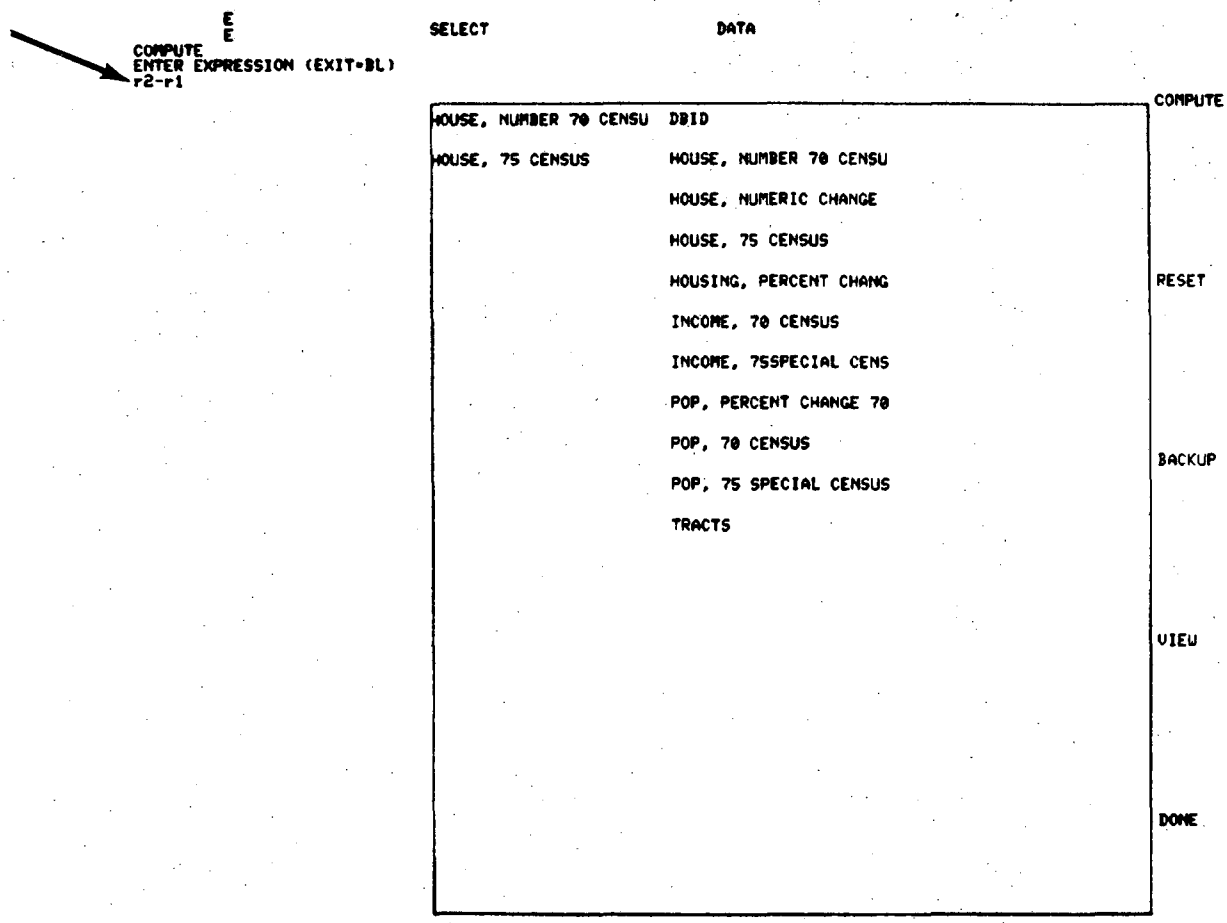


Picture 56

EXAMPLE 1: In this case, the numeric change between 1970 and 1975 censuses[8] is desired. The expression is simply the first characteristic selected (Housing in 1970) subtracted from the second characteristic (Housing in 1975).

To differentiate characteristics (records) from numbers in an expression, its position in the list is preceded by an "R". Thus, in this case, "House, number 70 Census" is "R1" and "House, 75 Census" is "R2". The numeric change in housing is simply "R2-R1".

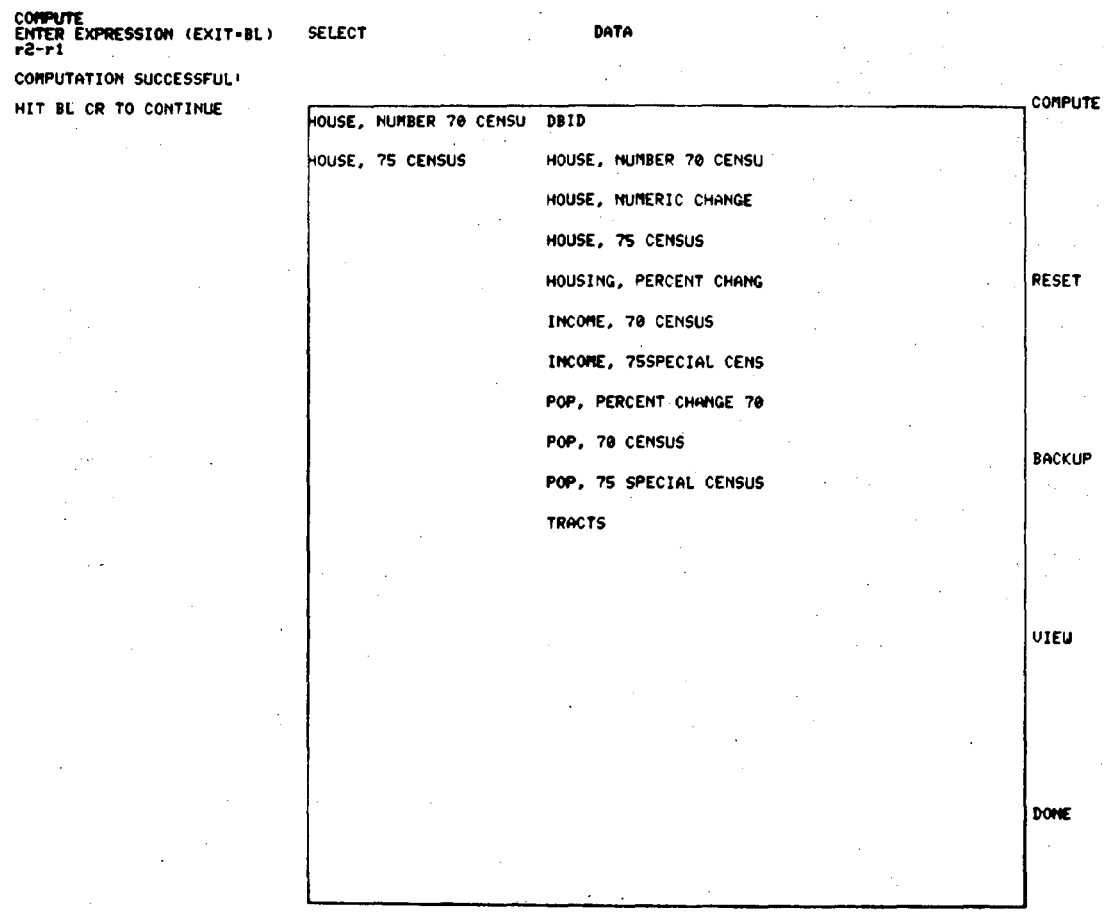
In the Picture below, enter r2-r1 followed by a carriage return.



Picture 57

The COMPUTATION WAS SUCCESSFUL! will be displayed when the expression is converted and computed by the program.

Enter a blank followed by a carriage return (a blank line) to view the result.



Picture 58

The result of the calculation is displayed. Enter a blank line to enter the enterval selection module, as when any data characteristic has been selected.

HIT BL CR TO CONTINUE

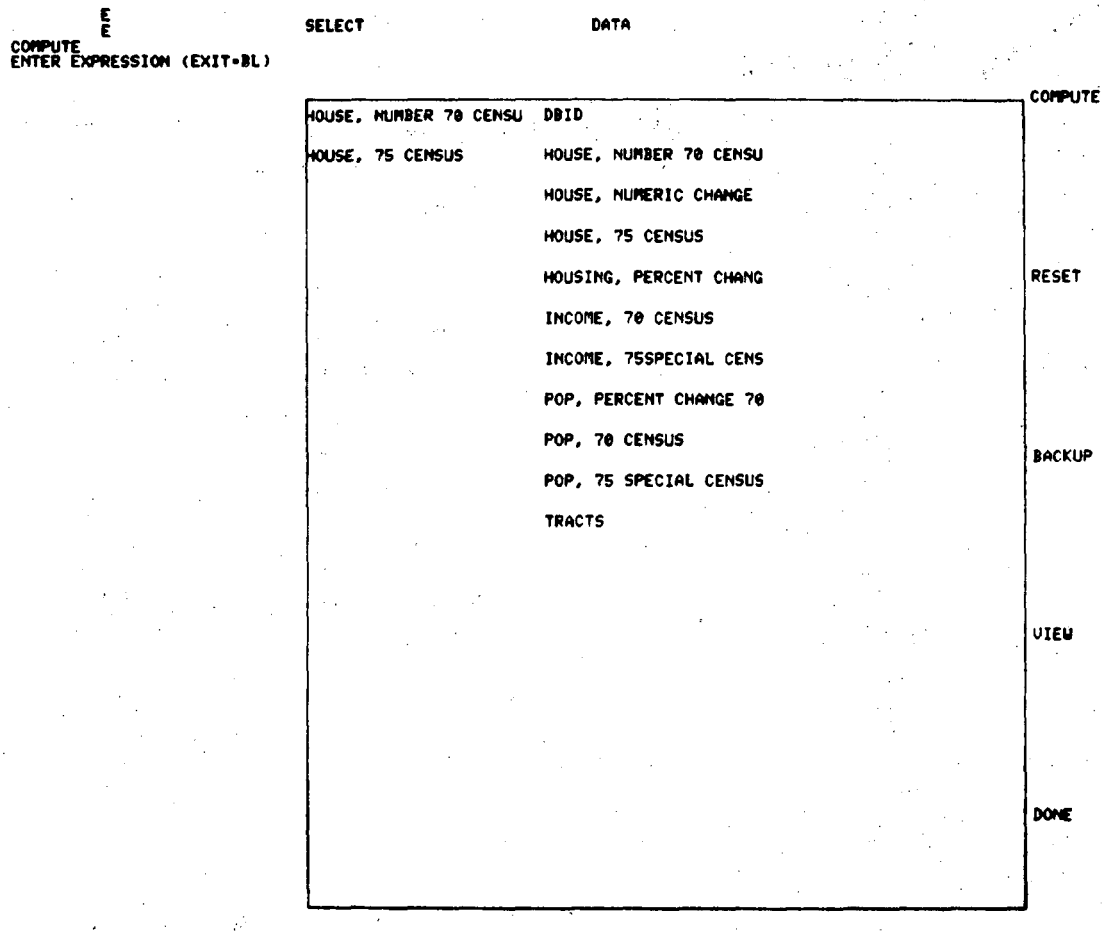
R2-R1

31	17	-18
3.23E+02	-18	1.36E+03
3.62E+02	75	4.29E+02
2.50E+02	1.02E+02	0.
1.02E+02	1.30E+03	9.96E+02
1.80E+02	7.58E+02	1.52E+02
2.30E+02	1.50E+02	7.05E+02
3.15E+02	1.10E+02	2.22E+03
1.58E+03	4.18E+02	5.16E+02
2.72E+02	29	1.51E+03
-3.15E+02	2.36E+02	7.11E+02
-69	1.52E+03	2.32E+02
8.0	66	59
-6.0	1.05E+02	9.66E+02
1.42E+03	-46	-30
5.56E+02	1.50E+02	3.10E+03
4.36E+02	2.43E+02	1.24E+03
2.58E+02	5.04E+02	4.55E+02
50	66	7.57E+02
0.	1.18E+03	2.49E+02

Picture 59

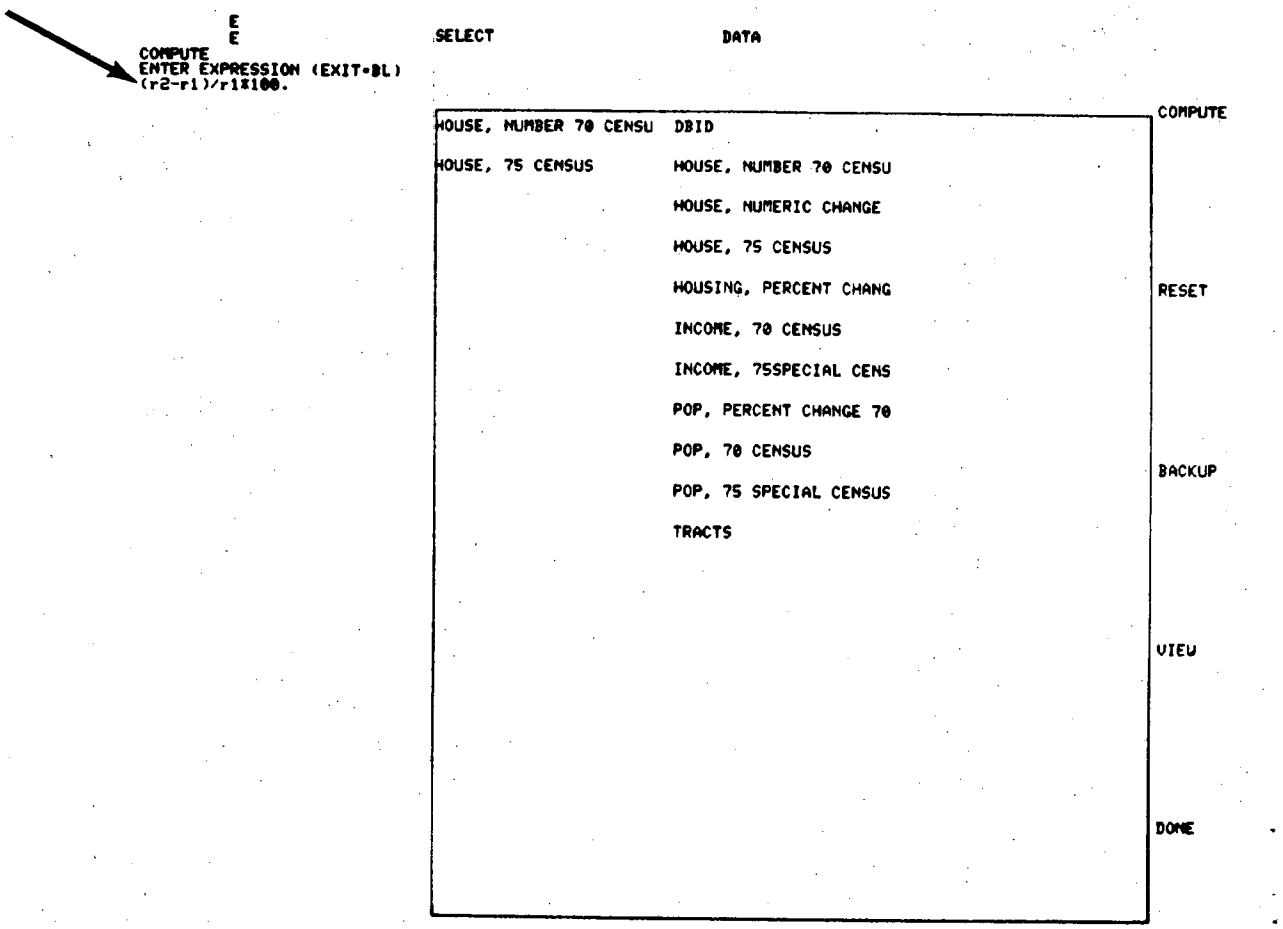
EXAMPLE 2: Once again the compute mode has been entered, with the number of houses in 1970 (R1) and in 1975 (R2) preselected.

This time, it is desired to calculate the percentage change in housing.



Picture 60

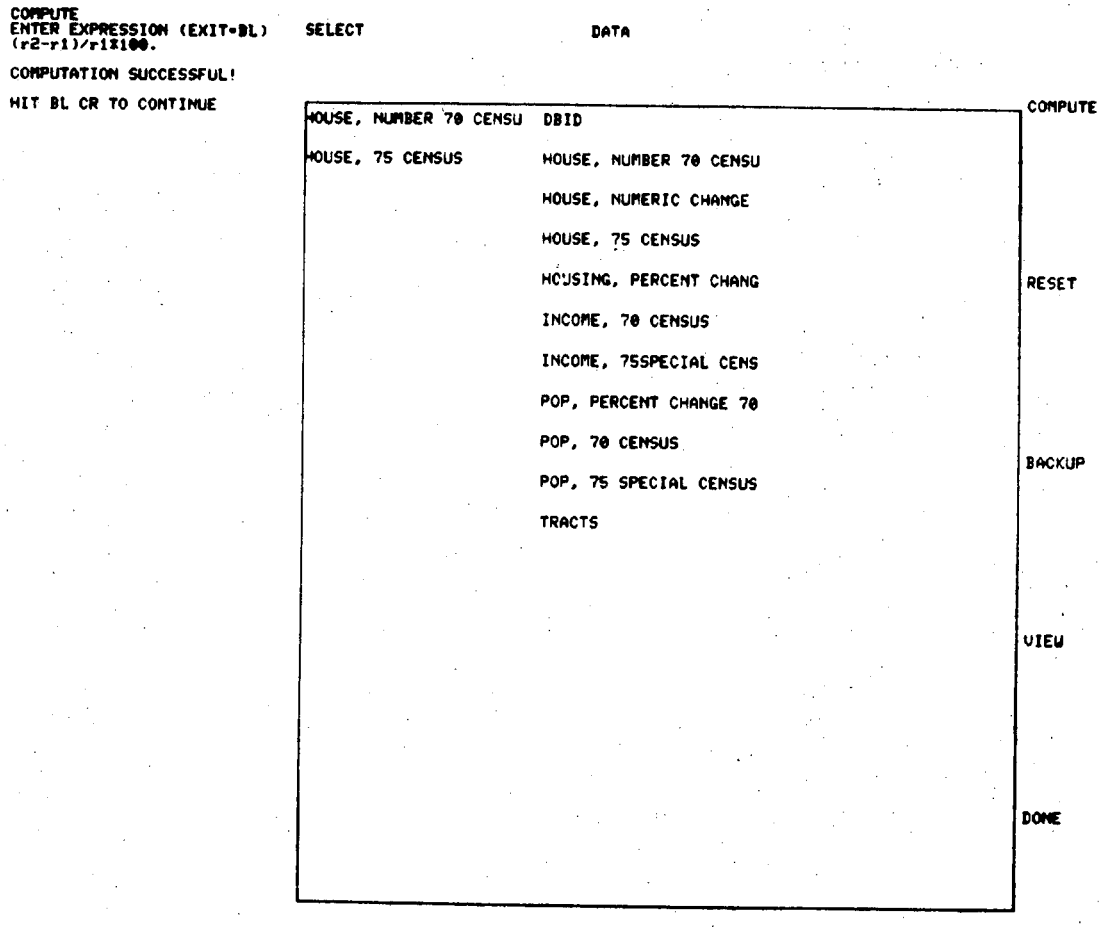
The expression is entered (see below). Remember that R1 is the first pre-selected record (House number 70 Census) and R2 is the second (House, 75 Census). It is also the order (from top to bottom) in which they appear in the left-most column of the workspace. This is the column that lists characteristics selected (by using the cross-hairs) for mapping or to be used in a calculation.



Picture 61

The COMPUTATION WAS SUCCESSFUL! Enter a blank followed by a carriage return (a blank line) to view the result.

If the computation was unsuccessful, the message "COMPUTE ERROR" would appear. Probably an error was made in typing the expression. Enter a blank line to return to data select mode, and try again.



Picture 62

This is the display of the calculation. There are five tracts that increased more than 100 percent, and seven which lost housing. These can be identified on the map by choosing appropriate division points in the next step in the mapping process - interval selection. The interval selection module will be entered by entering another blank line.

. END COMPUTE

HIT BL CR TO CONTINUE

(R2-R1)/R1X100.

2.6	1.7	-1.4
22	-1.5	55
33	3.5	19
38	7.0	0.
23	58	61
8.3	1.39E+02	8.9
9.1	9.4	36
16	8.3	1.35E+02
86	19	21
30	1.5	60
-21	29	21
-4.6	1.24E+02	16
.76	20	4.5
-1.2	5.0	28
1.46E+02	-2.2	-3.2
35	7.3	1.58E+02
20	10	61
22	35	51
21	3.5	43
0.	69	25

Picture 63

PART C

GRID BASED MAPPING SYSTEM

PART C

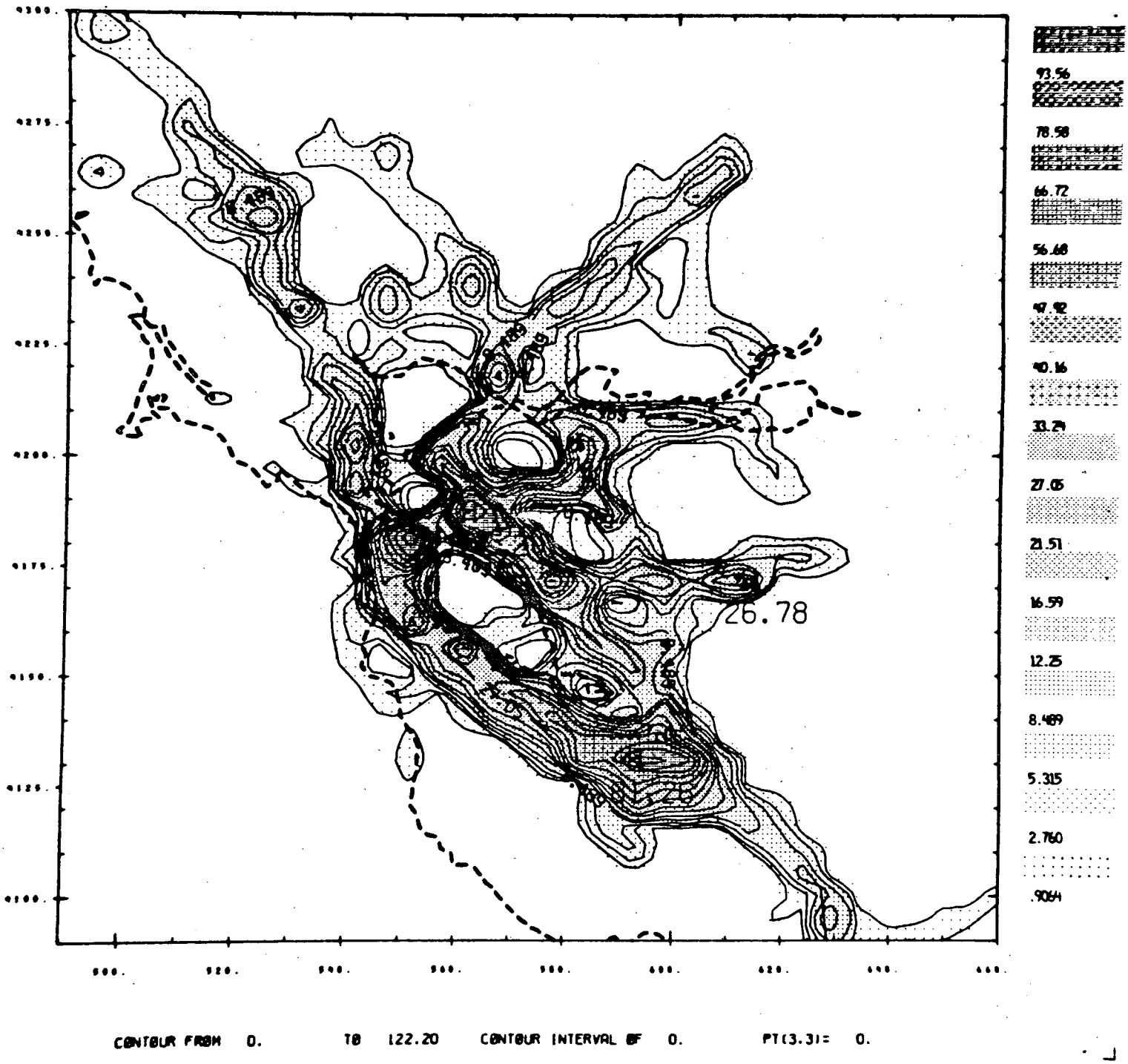
GRID BASED MAPPING SYSTEM

10. Introduction

Information systems at LBL are growing and rapidly evolving. Although current data bases are comparatively small, future large integrated data bases and gridded maps will be an integral part of SEEDIS.

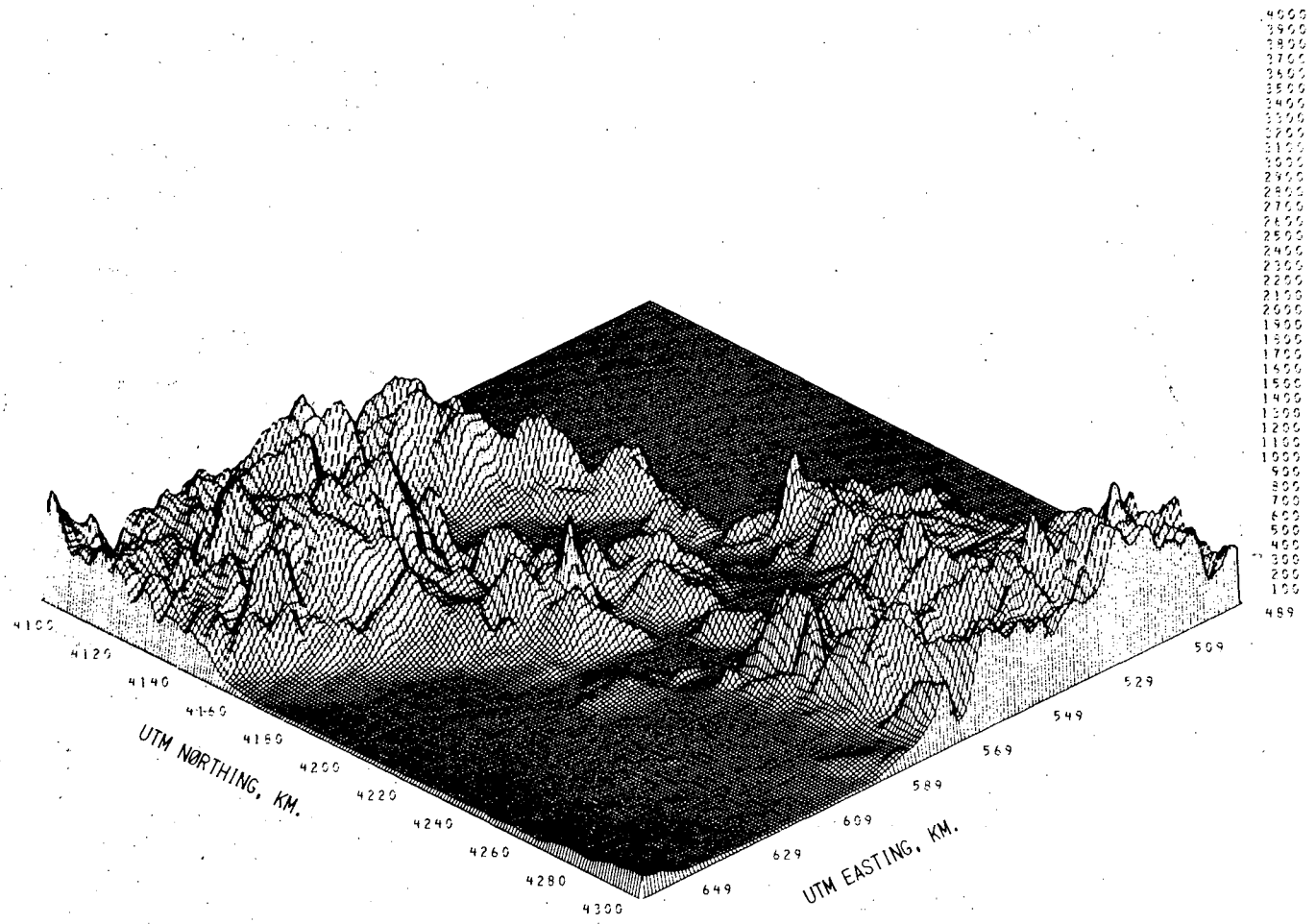
The major display system for gridded data is IDDS , the Integrated Data Display System. Thematic maps generated at LBL from gridded data primarily use subroutines from IDDS. This is a set of general purpose high-level Fortran subroutines for graphics analysis and display. Use of the package requires some programming knowledge.

Sample output is included to give an overview of thematic mapping capabilities at Lawrence Berkeley Laboratory.

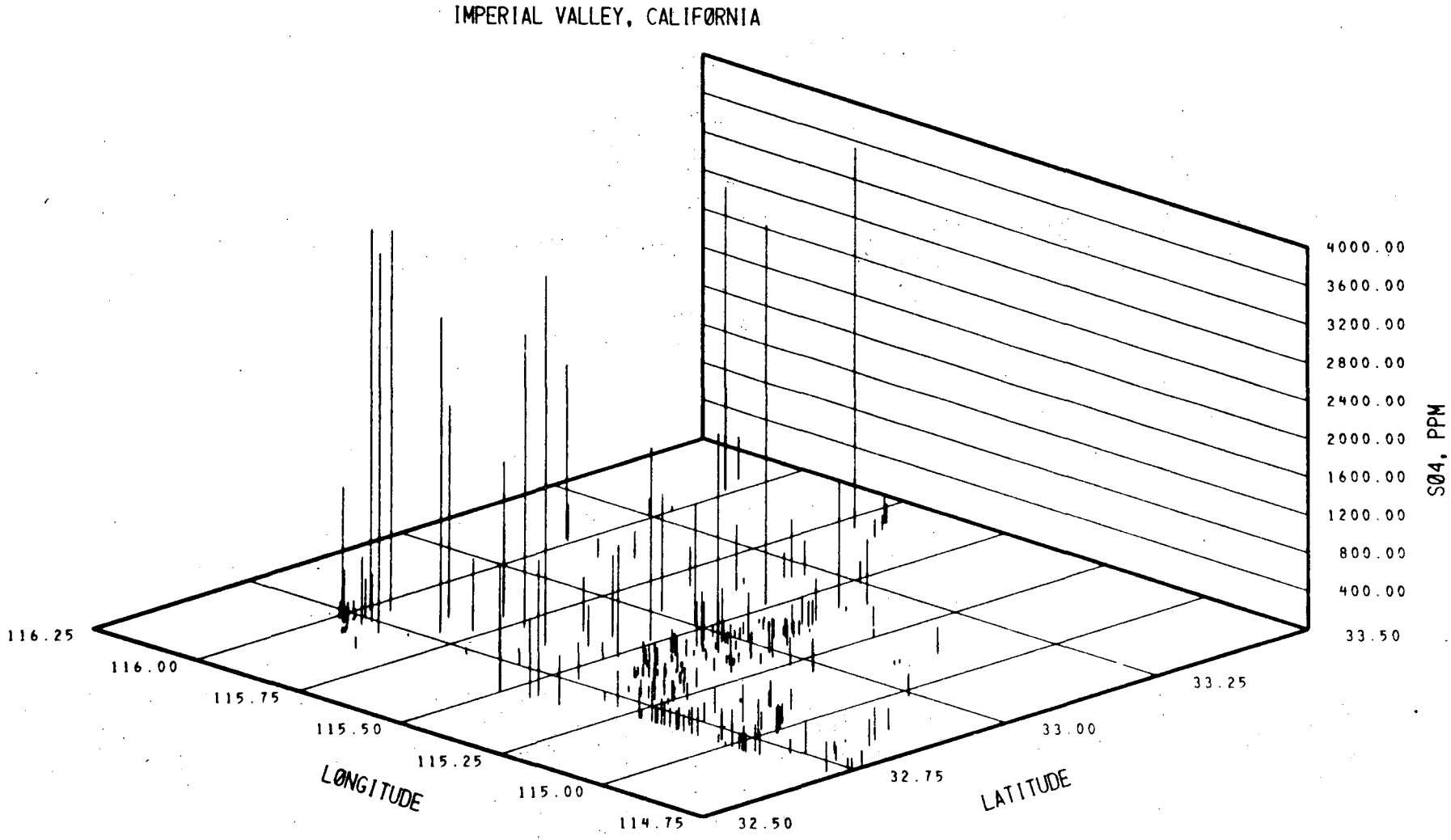


Projected 1985 rates for automobile particulate emissions by the Bay Area Pollution Control District. Emissions are measured in grams per second/per square kilometer. Geography is measured in UTM local coordinates. Map has both polygonal and gridded data.

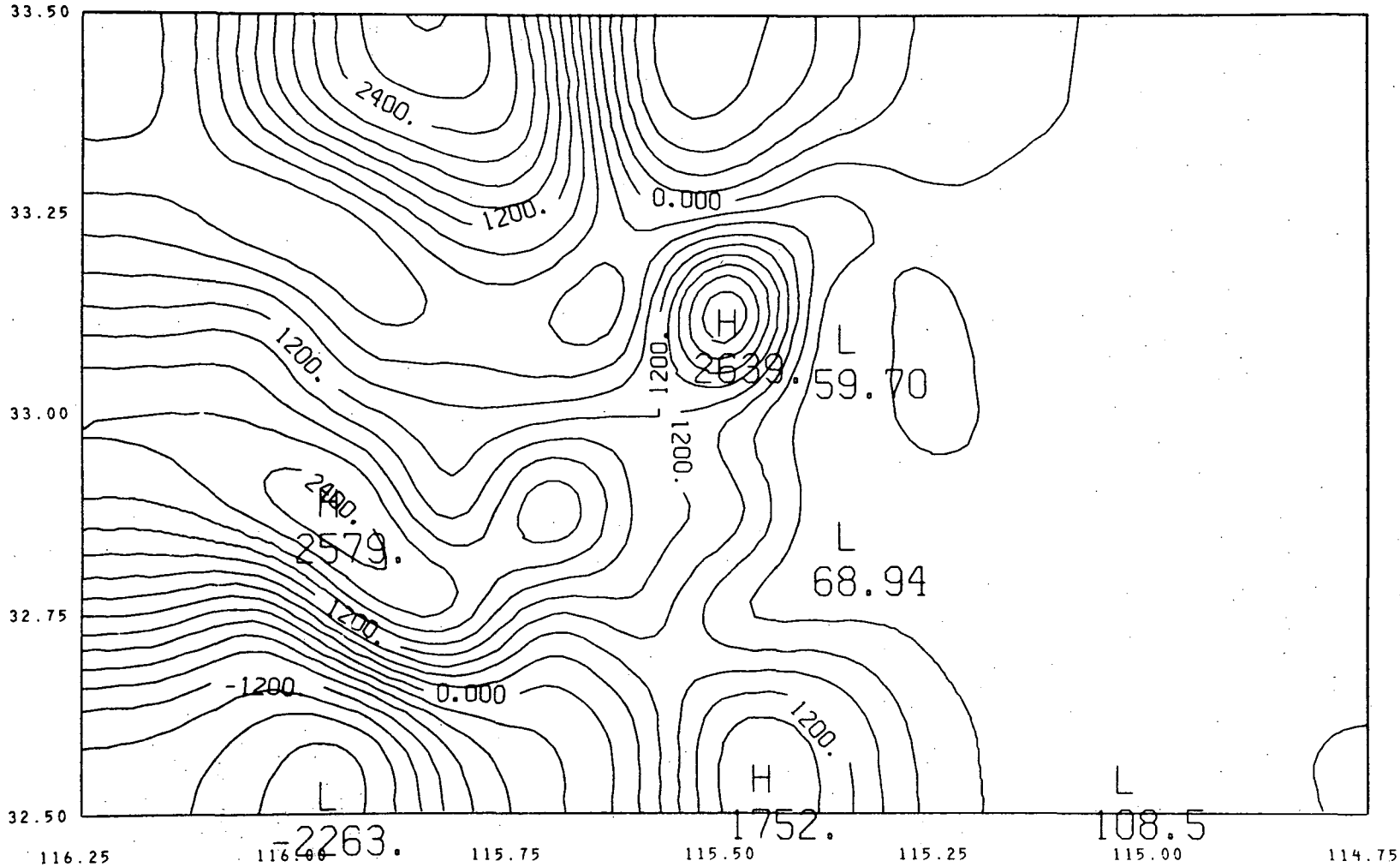
SAN FRANCISCØ BAY AREA TØPØGRAPHY



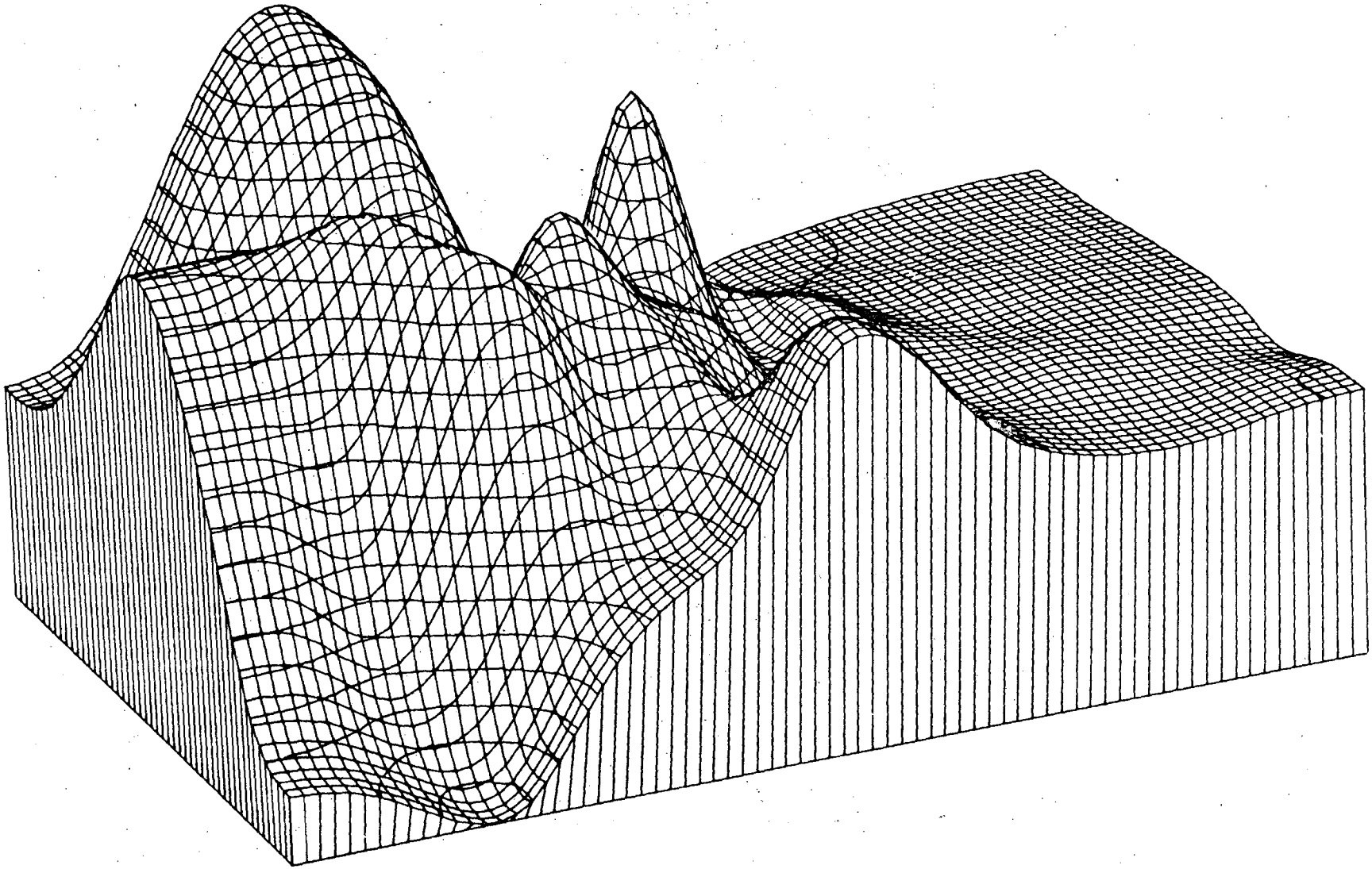
A perspective view of San Francisco and nine surrounding bay area counties. The topography model is viewed from the East; the two larger peaks in the center of the grid are Mt. Diablo and Mt. Tamalpias.



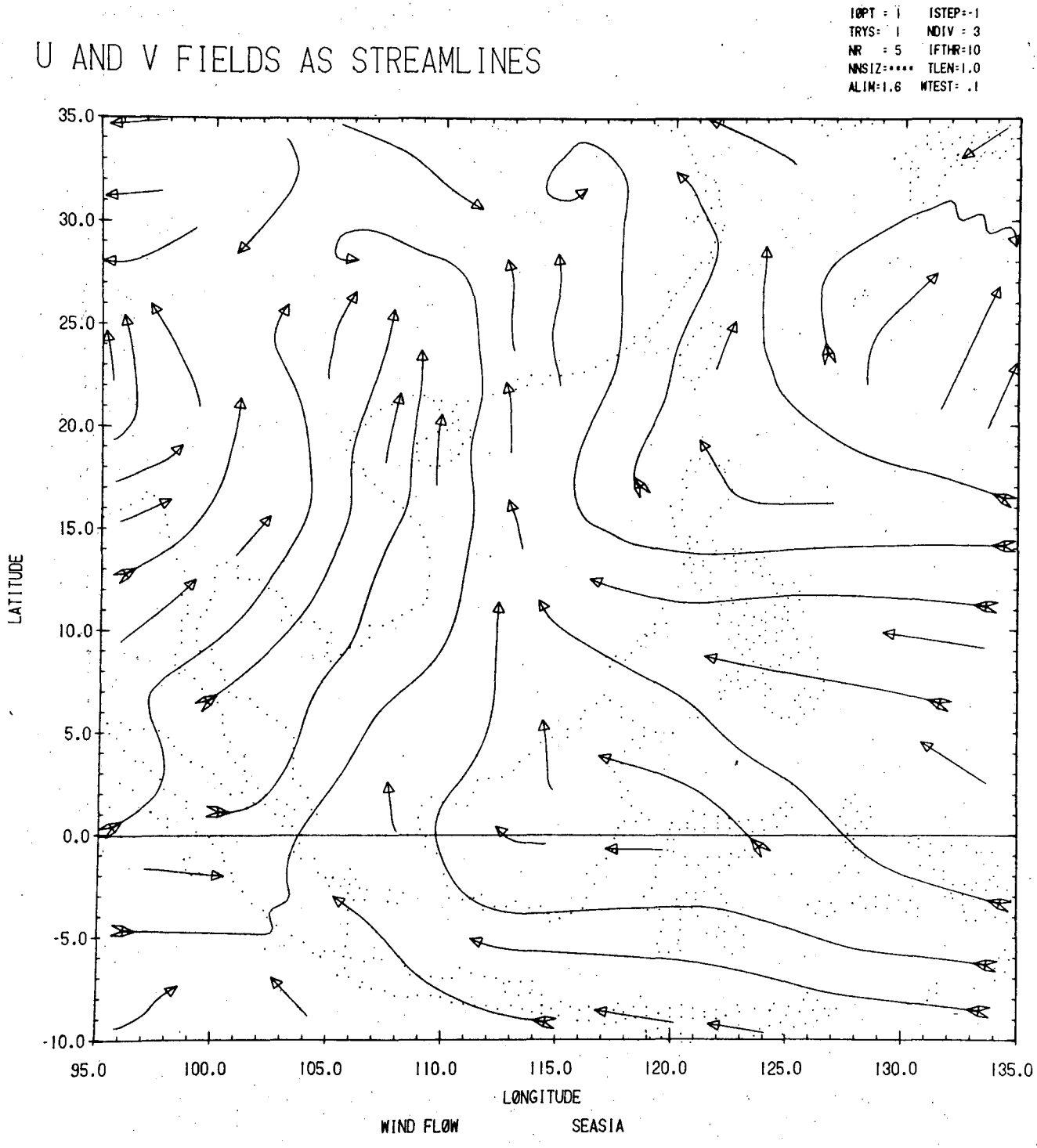
A representation of the pollutant SO_4 content in the groundwater of the Imperial Valley, California. The various vertical heights are porportional to the pollutant concentration for the waterwell measurement at that point in the valley.



A contour representation of the previous map after the data has been interpolated and integrated to the entire valley area.

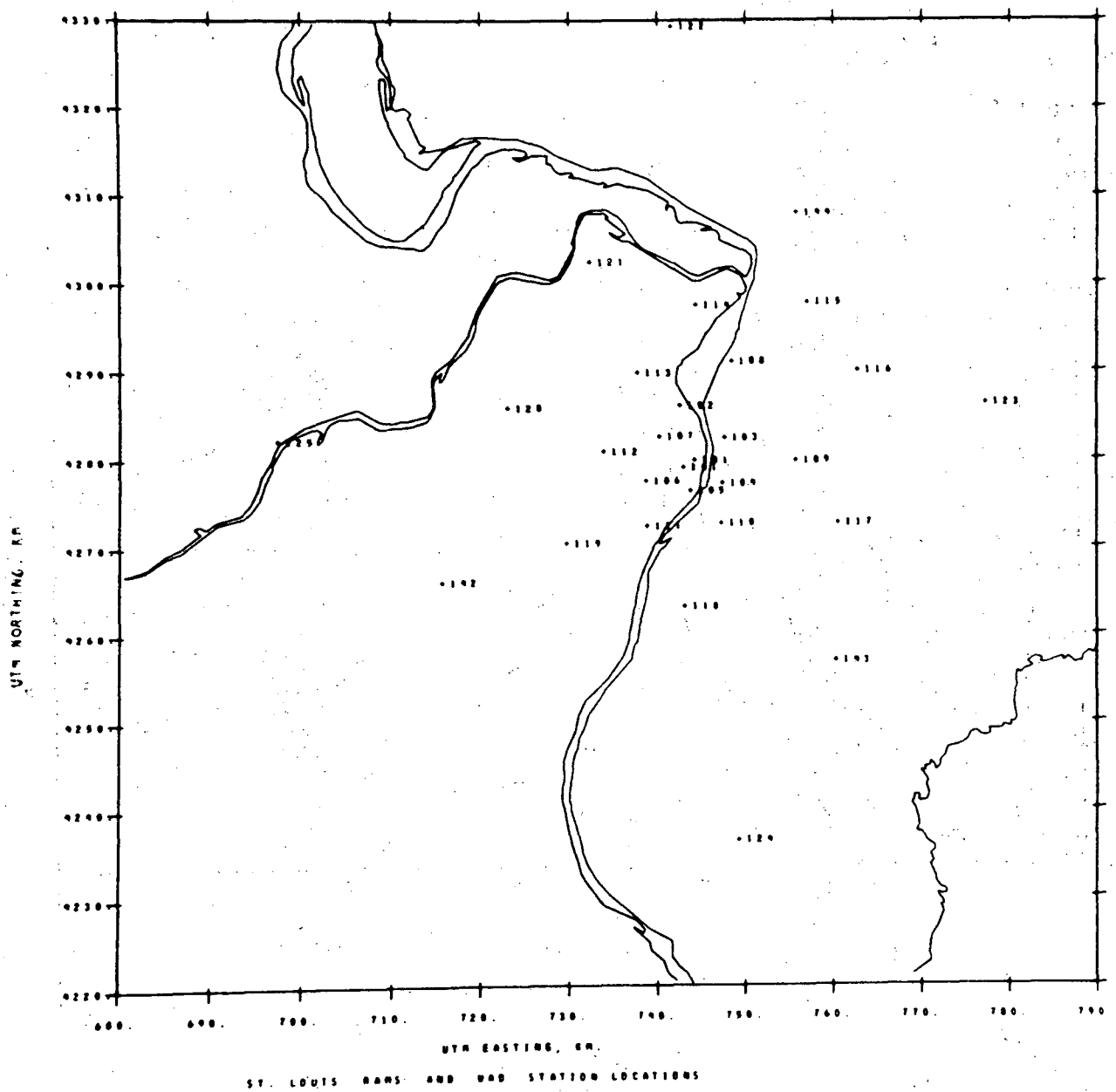


A surface view representing the data from the previous two maps.



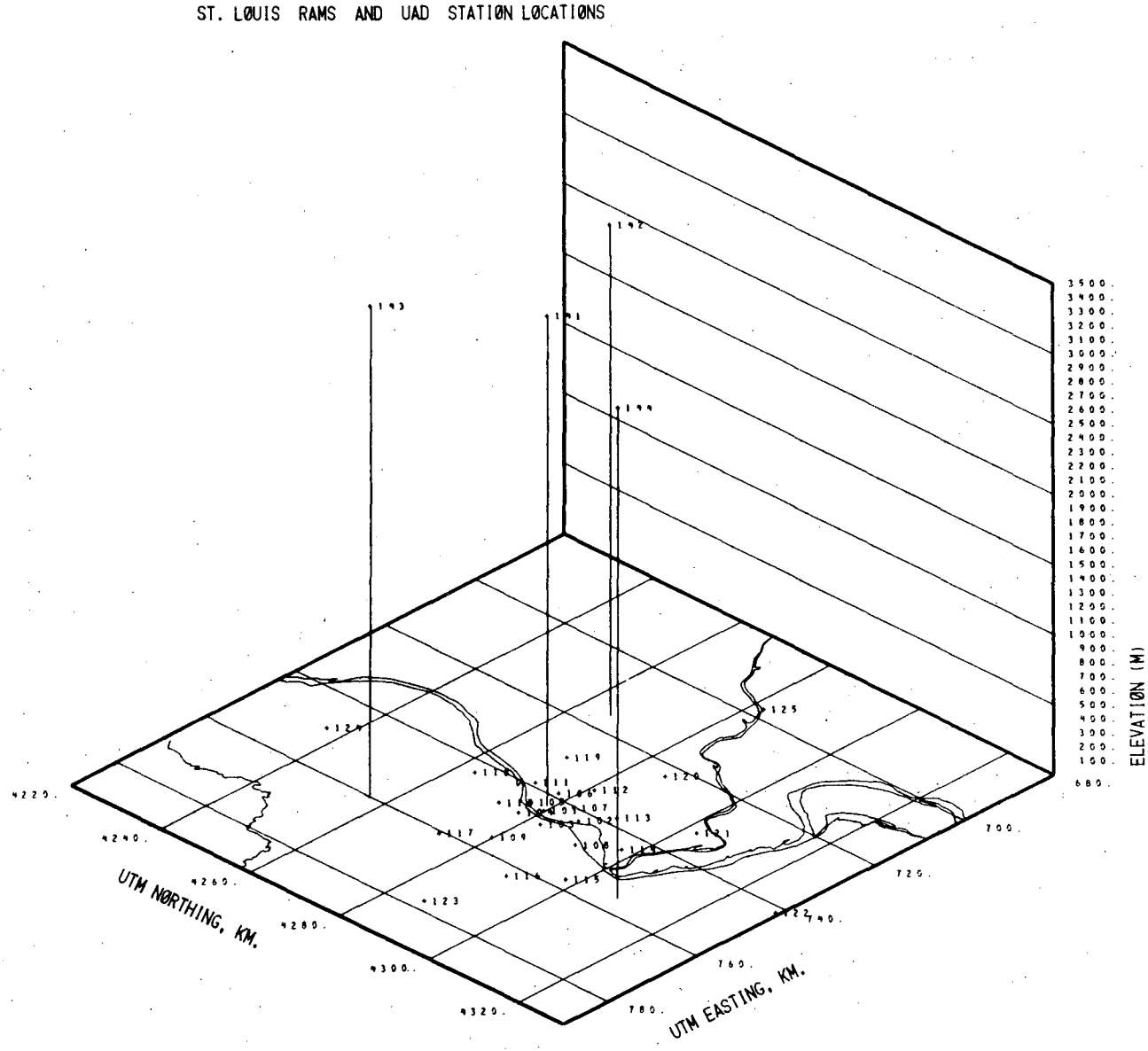
Gridded wind data displayed as streamlines overlaid on outlines of Southeast Asia.

FRAME NO. 3



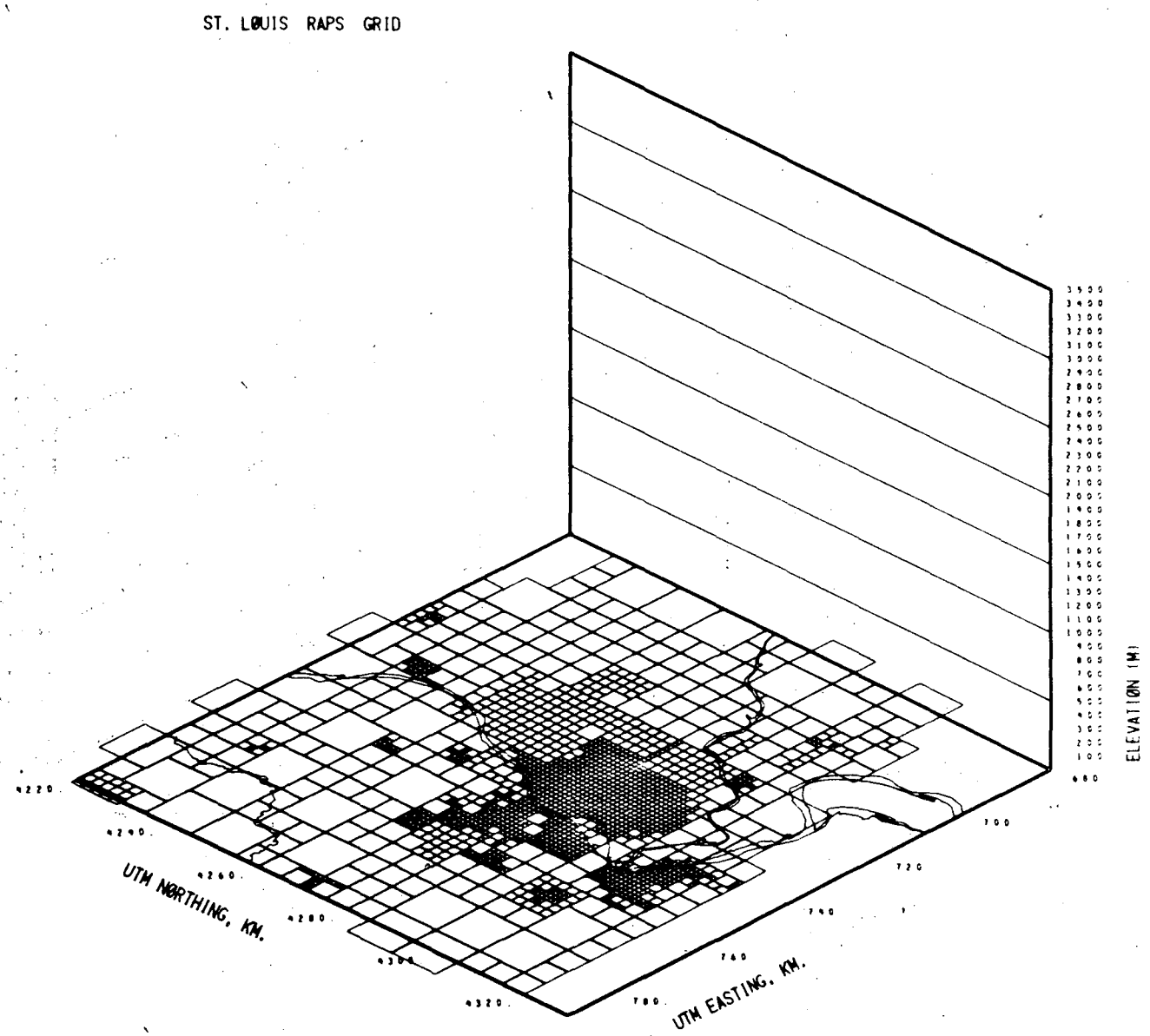
Locations of Regional Air Monitoring Stations in St. Louis Regional Air Pollution Study Area.

FRAME NO. 1



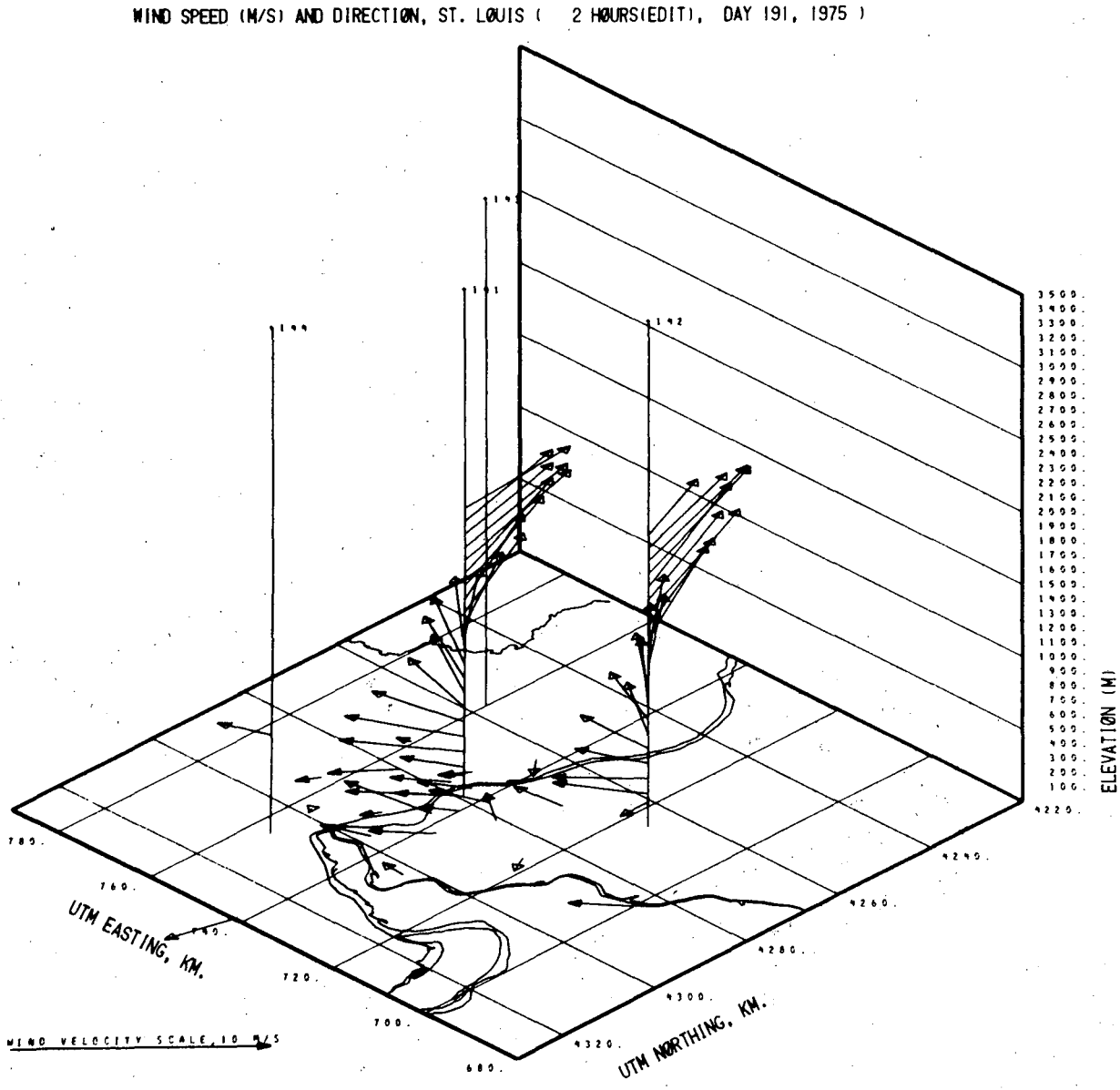
A three dimensional view of previous map, distinguishing ground-bases and vertical profile monitoring stations.

FRAME NO. 2



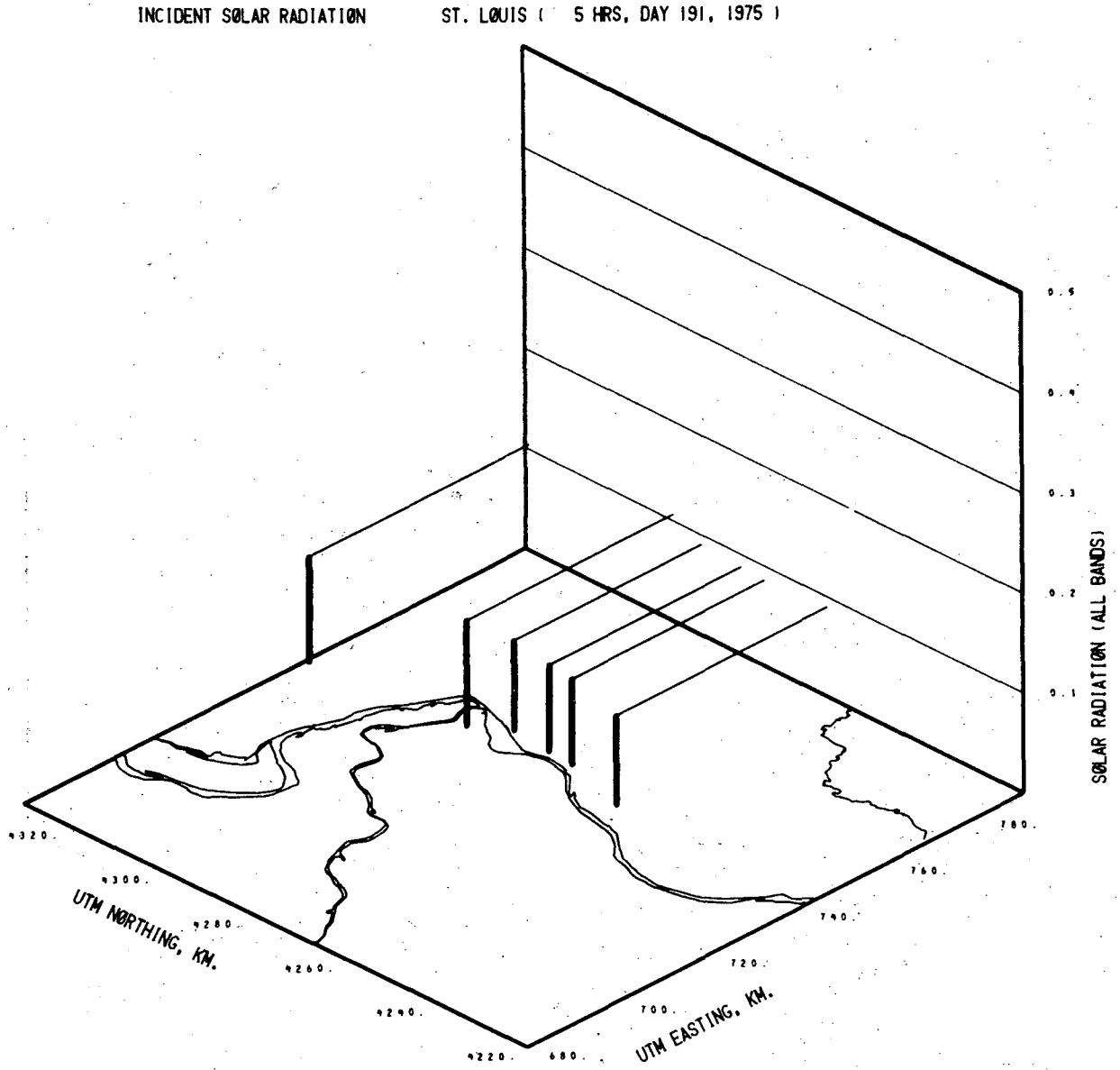
Three dimensional projection of pollution monitoring grids for St. Louis Area combined with region rivers. Each cell represents one monitoring area.

FRAME NO. 17



A three dimensional plot of wind speed and direction for the same St. Louis area.

FRAME NO. 37



Three dimensional view of incident solar radiation (in langleys) at selected locations in the St. Louis area. The height of the bars is proportional to the measured radiation.

APPENDIX A

MAPEDIT Users Guide

Harvard Holmes and Bill Benson

November 1974

MAPEDIT USERS GUIDE

HARVARD HOLMES AND BILL BENSON

NOVEMBER 1974

TO GET A COPY, DO
LIBCOPY(MAPEDIT,TEMP/RR,MAPBARB)
BARB(TEMP)

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WHAT IS MAPEDIT:

MAPEDIT IS A FORTRAN PROGRAM DESIGNED TO SUPPORT A VARIETY OF MAPPING OPERATIONS. IT ALLOWS THE COMBINATION OF MAPS AND SELECTION OF SUBSETS OF A MAP ACCORDING TO SEVERAL ATTRIBUTES. IN THIS REGARD, IT PERFORMS AN INTELLIGENT COPYING FUNCTION, ALLOWING THE SELECTION OF RECORDS TO BE COPIED IN A CONVENIENT, MAP ORIENTED MANNER. SECOND, IT PROVIDES CHANGES IN PROJECTION (EQUIRECTANGULAR ,CONIC, ETC.) AND CHANGES IN FORMAT, (THE STANDARD **NICKEL DUMP** ,DIME-LIKE **TENCENTS** , OR A SPECIALIZED FORMAT CALLED **ZIP**). THIRD , IT PROVIDES SPECIALIZED DATA PROCESSING STEPS WHICH ARE USED PRIMARILY WITH RAW DIGITIZER INPUT. THESE STEPS INCLUDE DATA COMPRESSION (STRAIGHT LINE RECOGNITION ALGORITHM), CORNER DECTECTION, FIDUCIAL ANALYSIS, ERROR CHECKS, FITTING ROUTINES AND COMMON BOUNDARY MATCHING.

PROGRAM OPERATION

MAPEDIT EXPECTS TWO FILES AS INPUT--A DATA FILE, (USUALLY CALLED **MAPIN**)CONTAINING THE MAP OR MAPS TO BE WORKED ON, AND A FILE OF COMMANDS DESCRIBING THE OPERATIONS TO BE PERFORMED (USUALLY CALLED **INPUT**). MAPEDIT PRODUCES A LISTING OF THE OPERATIONS (USUALLY ON **OUTPUT**), A DATA FILE AS OUTPUT (USUALLY ON **MAPOUT**), AND A PLOT FILE (**FILM**). TWO INTERNAL FILES ARE USED, **OLDMAP** AND **NEWMAP**). ON OCCASION, THESE ARE INPUT AND OUTPUT FILES AS WELL. THE ORDER OF THESE FILES ON THE PROGRAM IS **INPUT,OUTPUT,MAPIN,MAPOUT,OLDMAP,NEWMAP, FILM.**

MAPEDIT RUNS ON THE CDC 6000 OR 7000 SERIES MACHINES, MAKING USE OF UP TO 250,000 WORDS OF LARGE CORE MEMORY ON THE 7000 SERIES MACHINES AND USING THE DISK FOR RANDOM ACCESS MEMORY ON THE 6000 SERIES.

THE SOURCE AND BINARY VERSIONS OF THE PROGRAM ARE AVAILABLE FROM THE **PROGRAM STORAGE SYSTEM** , AS LIBRARY **MAPEDIT** AND SUBSET **OLDPL** FOR THE SOURCE IN UPDATE FORMAT AND SUBSET **MAPEDIT** FOR THE BINARY. AN EXAMPLE OF MAPEDIT FOR THE CDC 7000 FOLLOWS.

```
JOBCARD
STAGE(MAPIN,27493)
FETCHPS(MAPEDIT,LGO,MAPEDIT)
FETCHPS(GRAPHIC,SCLGO,SCLGO)
LIBGEN(F=SCLGO,P=ULIB)
LINK(F=LGO,P=ULIB,P=BKYIO,EO=X)
MAPEDIT.
DISPOSE(FILM=MF)
7-8-9 EOR CARD
*APPEND MAP
/ST=6
*PLOT
6-7-8-9 END OF JOB CARD
```

THIS JOB RETRIEVES MAPEDIT FROM THE CACHE/PROGRAM STORAGE SYSTEM, CREATES A TAPE FILE, EXECUTES MAPEDIT, AND DISPOSES THE **FILM** OUTPUT FROM MAPEDIT. IN THIS CASE, MAPEDIT READS IN STATE 6 (CALIFORNIA) FROM A COUNTY MAP OF THE UNITED STATES AND PLOTS IT.

A DETAILED EXPLANATION OF THE COMMANDS FOLLOWS.

THE INPUT TO THE PROGRAM CONSISTS OF CARDS OF THREE TYPES--

(1) COMMANDS AND OPTIONS OR PARAMETERS (IDENTIFIED BY AN ASTERISK IN COLUMN 1),
(2) A STRING OF GEOCODES AND COORDINATES LIMITS (IDENTIFIED BY A SLASH IN COLUMN 1), AND
(3) INPUTS PARTICULAR TO SPECIFIC COMMANDS (IDENTIFIED BY THE LACK OF AN ASTERISK OR SLASH).

EACH COMMAND IS FOLLOWED BY A LIST OF 0 TO 20 GEOCODE STRINGS, FOLLOWED BY COMMAND SPECIFIC INPUTS. AS MANY COMMANDS AS DESIRED MAY BE USED. COMMANDS BEGIN IN COLUMN 2 AND MAY BE ABBREVIATED TO ONE LETTER. OPTIONS OR PARAMETERS ARE SEPARATED FROM THE CONMMAND WORD BY ONE OR MORE BLANKS. OPTIONS ARE ALPHABETIC, WHILE PARAMETERS ARE NUMERIC. OPTIONS MAY ALSO BE ABBREVIATED TO ONE LETTER. PARAMETERS MAY BE IN IN ANY FORMAT, INTEGER, FIXED OR EXPONENTIAL, NO EMBEDDED BLANKS SHOULD BE USED, HOWEVER. EACH GEODCODE STRING IS COMPOSED OF DESCRIPTORS SEPARATED BY COMMAS, EACH DESCRIPTOR IS A TWO LETTER GEOCODE SELECTOR, AN EQUALS SIGN AND A NUMERIC VALUE. EXAMPLES OF THE INDIVIDUAL COMMANDS WILL MAKE THIS NOTATION CLEAR. THE GEOCODE SELECTORS CURRENTLY IN USE ARE GIVEN BELOW. WHERE POSSIBLE, THE NUMERIC VALUES ADHERE TO THE FEDERAL INFORMATION PROCESSING STANDARDS FIPS.

ORDER	ABBREVIATION	EXPLANATION
1	ST	STATE OF THE UNITED STATES
2	SM	STANDARD METROPOLITAN STATISTICAL AREA
3	UA	URBAN AREA
4	CO	COUNTY
5	PL	PLACE
6	SC	STANDARD CENSUS AREA
7	MC	MINOR CIVIL DIVISION
8	TR	CENSUS TRACT
9	ED	ENUMERATION DISTRICT
10	IN	INSET NUMBER
11	PA	PART OF SOMETHING (USUALLY TRACT)
12	IP	ISLAND POINTS (ISLANDS ARE AREAS WHICH DO NOT BELONG TO THE ENTITY BOUNDED)
13	MS	MAP SCALE (APPROXIMATELY THE LEAST COUNT OF THE DIGITIZING EQUIPMENT CONVERTED TO LONGITUDE OR LATITUDE

A GEOCODE STRING MAY USE AS MANY SELECTORS AS DESIRED. THEY MAY BE IN ANY ORDER. A MAP ITEM WILL BE SELECTED IF ALL OF ITS AVAILABLE GEOCODES MATCH THOSE IN THE STRING. GEOCODES NOT SUPPLIED FOR THE MAP ITEM OR NOT SPECIFIED IN THE STRING ARE IGNORED. ASSUME FOR EXAMPLE, THAT OUR MAP IS A COUNTY MAP OF THE U.S. , THEN

```
/ST=44,CO=1
```

REFERS TO THE FIRST COUNTY OF STATE 44.

```
/CO=1
```

REFERS TO THE FIRST COUNTIES OF ALL THE STATES.

/ST=44,CO=1
/ST=44,CO=2
REFERS TO THE STATE 44, THE FIRST AND SECOND COUNTIES. IF NO GEOCODE STRINGS ARE GIVEN, THEN THE ENTIRE MAP IS USED.

GEOCODE STRINGS MAY INCLUDE COORDINATE LIMITS BY USING ANY OF THE 4 LETTER SELECTOR ABBREVIATIONS **XMIN,XMAX,YMIN,YMAX.** FOR EXAMPLE,

/YMIN=35,YMAX=40

REFERS TO ALL COUNTIES, LYING BETWEEN 35 AND 40 DEGREES LATITUDE. STRINGS OF COORDINATE LIMITS MAY BE USED IN ADDITION TO THE MAXIMUM OF 20 GEOCODE STRINGS. IT DOES NOT MAKE SENSE TO MIX COORDINATE LIMITS AND OTHER GEOCODE SELECTORS IN A **SINGLE** GEOCODE STRING.

AN ALTERNATIVE WAY TO INDICATE COORDINATE LIMITS IS AVAILABLE WHEN RUNNING INTERACTIVELY ON THE 6600. THE GEOCODE STRING

/HIT

ACCEPTS COORDINATE PAIRS (XMIN,YMIN) AND (XMAX,YMAX) FROM THE GRAPHIC INPUT DEVICE. THESE ARE USED JUST AS IF THE FOUR VALUES HAD BEEN TYPED IN ON ONE LINE.

WITHIN A GEOCODE STRING, MATCHES WITH SELECTORS ARE AND-ED WHILE FROM STRING TO STRING, THEY ARE OR-ED. THUS AN OPERATION FOLLOWED BY A LIST OF GEOCODE STRINGS WILL AFFECT ALL MAP ITEMS MATCHING AT LEAST ONE OF THE GEOCODE STRINGS, WHERE TO MATCH A STRING AN ITEM MUST MATCH ALL THE SELECTORS IN THAT STRING.

*APPEND IOMETRICS
*APPEND JOMETRICS
*APPEND MAP
*APPEND PICASSO
*APPEND DUMP
*APPEND TENCENTS

THE APPEND COMMAND READS ONE OR MORE FILES FROM **MAPIN** AND ADDS THEM TO THE END OF THE CURRENT MAP. THE **IOMETRICS** OPTION READS TAPES IN DIGITIZER FORMAT. EACH INSET IS DELIMITED BY A FILE MARK AND APPEND STOPS UPON ENCOUNTERING A DOUBLE END OF FILE. THE **JOMETRICS** OPTION READS TAPES IN A LATER DIGITIZER FORMAT (NOT USED). THE **MAP** OPTION READS THE STANDARD STORAGE FORMAT, CALLED **NICKEL** FILES. THE **PICASSO** OPTION READS A BCD FORMAT CALLED **ZIP** FROM A NOW OBSOLETE ONLINE EDITING PROGRAM. THE **DUMP** OPTION READS THE BCD LISTING OF THE MAP PUT OUT BY *EXTRACT DUMP. THE **TENCENTS** OPTION APPENDS A DIME-LIKE FILE. THE CURRENT MAP MUST ALSO BE IN **TENCENTS** FORMAT, OR BE EMPTY.

*BACKUP

THIS IS PRIMARILY AN ONLINE COMMAND. IT REMOVES THE EFFECT OF THE LAST MAP CHANGING OPERATION. ONLY ONE BACKUP MAKES SENSE.

*CENTROID

CHECKS THAT ALPHANUMERIC LABELS (FOR COSMETIC FEATURES--SEE THE SECTION ON FILE FORMATS) ARE WITHIN A RECTANGLE AROUND THE MAP ITEM. IF NOT, IT GIVES A MESSAGE AND MOVES THE LABEL TO THE CENTER OF THE ENCLOSING RECTANGLE.

*DELETE

REMOVES THE SPECIFIED ITEMS FROM THE MAP.

*EXTRACT DUMP
*EXTRACT MAP
*EXTRACT PICASSO
*EXTRACT TENCENTS

EXTRACT PRODUCES AN OUTPUT FILE (ON **MAPOUT**) IN THE SPECIFIED FORMAT. **DUMP** IS A BCD LISTING OF THE ENTIRE MAP. **MAP** IS THE STANDARD **NICKEL** FORMAT. **PICASSO** IS A SPECIALIZED BCD FORMAT FOR INPUT TO AN ONLINE EDITING PROGRAM (NOW OBSOLETE). **TENCENTS** IS A DIME-LIKE FILE.

*FIXUP NUMBER

FIXUP IS A BOUNDARY MATCHING ROUTINE. BOUNDARIES WHICH ARE COMMON WITHIN THE LIMITS SUPPLIED BY NUMBER ARE MADE EXACTLY EQUAL BY SUBSTITUTING A COMMON SET OF POINTS WITHIN BOTH BOUNDARIES. NUMBER MUST BE ADJUSTED EMPIRICALLY. 100 IS A GOOD STARTING VALUE. LARGER

VALUES ARE MORE POWERFUL. THEY MAY SQUEEZE RIVERS TOGETHER WHERE NOT DESIRED. SMALL VALUES, FOR EXAMPLE 10 , MAY NOT AFFECT BOUNDARIES WHICH ARE OBVIOUSLY COMMON.

*GRID

PUTS A LONGITUDE, LATITUDE GRID ON THE PRECEEDING PLOT.

*HBOMB

OBLITERATES ALL ISLAND POINTS IN ALL MAP ITEMS ON THE GEOCODE LIST.

*ISLAND

ADDS AN ISLAND(S) TO THE FIRST ITEM ON THE GEOCODE LIST. THE ISLAND POINTS ARE TAKEN FROM THE SECOND AND SUBSEQUENT ITEMS ON THE GEOCODE LIST. FOR EXAMPLE--

```
*ISLAND
/TR=101
/TR=102
```

WILL DELETE THE AREA OF TRACT 102 FROM TRACT 101 BY ADDING THE POINTS FROM 102 TO 101 IN A CLOCKWISE MANNER. SHADING AND OTHER ROUTINES WILL BE ABLE TO AVOID THIS AREA.

*JIGSAW NUMBER
*JIGSAW SORT

JIGSAW CONVERTS A MAP IN STANDARD **NICKEL** FORMAT TO **TENCENTS** FORMAT. COMMON BOUNDARIES ARE MATCHED AND DIRECTED LINE SEGMENTS ARE IDENTIFIED BY THE POLYGONS ON EITHER SIDE. BOUNDARIES ARE CONSIDERED COMMON IF THEY ARE WITHIN NUMBER. THE DEFAULT VALUE IS .0003 . A RECORD OF THE MATCHING PROCESS IS PLOTTED WHEN A POLYGON MATCHES THE DESCRIPTOR LIST. THIS IS USUALLY DESIRABLE SINCE THE ROUTINE IS VERY FRAGILE.

THE **SORT** OPTION SORTS A MAP IN STANDARD **NICKEL** FORMAT SO THAT THE MINIMUM X FOR THE POLYGONS IS IN INCREASING ORDER. THE SORT IS VERY HELPFUL TO THE BOUNDARY MATCHING ROUTINE. FOR EXAMPLE,

```
*A M
*JIGSAW SORT
*JIGSAW
*EXTRACT TENCENTS
```

CONVERTS A MAP IN **NICKEL** FORMAT **MAPIN** TO **TENCENTS** FORMAT ON **MAPOUT.**

*KEEP

IS THE OPPOSITE OF DELETE. ITEMS ON THE GEOCODE LIST ARE KEPT, ALL OTHERS DISCARDED.

*LUMP

LUMP AGGREGATES A **TENCENTS** FILE ACCORDING TO THE DESCRIPTOR LIST TO MAKE A NEW **TENCENTS** FILE. EXACTLY ONE DESCRIPTOR OF THE FORM

/ST=0 OR /SMSA=0 OR /UA=0 OR /CO=0 OR /PL=0 OR /SCA=0

MUST BE USED. FOR EXAMPLE, TO MAKE SMSA OUTLINES,

```
*A M
*J S
*J
*LUMP
/SMSA=0
*E T
```

THIS WILL REMOVE ALL SEGMENTS WHOSE LEFT SMSA DESCRIPTOR=RIGHT SMSA DESCRIPTOR, BUILD NEW DESCRIPTORS FOR EACH SMSA ENCOUNTERED, AND PRESERVE GEOCODES TO THE TOP IN THE DESCRIPTOR LIST. ALL OTHER GEOCODES WILL BE SET TO ZERO. FOR EXAMPLE, AGGREGATING BY STATE PRESERVES ONE CODE, BY SMSA TWO CODES (STATE AND SMSA), BY COUNTY FOUR CODES (STATE,SMSA,URBAN AREA,COUNTY), ETC.

*NAME
*NAME SEQUENTIAL

NAME IS USED TO RENAME DESCRIPTORS AND COSMETIC LABELS. ALL POLYGONS MATCHING THE FIRST ITEM OF THE GEOCODE LIST WILL BE AFFECTED, WITH CHANGES COMING FROM THE SECOND AND SUBSEQUENT ITEMS ON THE GEOCODE LIST. COSMETIC LABELS MAY BE CHANGED ACCORDING TO CARDS FOLLOWING THE GEOCODE LIST, THE FIRST CARD FOR THE FIRST LABEL, THE SECOND FOR THE SECOND, ETC. IN THE FOLLOWING FORMAT--

X,Y,SIZE,ORIENTATION,LABEL LENGTH IN WORDS,LABEL FROM 1 TO 80 CHARS

VALUES NOT SUPPLIED--BLANKS OR JUST CONSECUTIVE COMMAS, ARE NOT CHANGED . FOR EXAMPLE--

```
*A M
*N
/SMSA=1111
/SMSA=1112,UA=1112
,,,,,SOMEWHERE USA
```

WILL CHANGE ALL COUNTIES WITH SMSA CODE 1111 TO 1112. THEY WILL HAVE URBAN AREA CODES OF 1112 AND LABELS READING #SOMEWHERE USA#.

THE **SEQUENTIAL** OPTION CHANGES ONLY THE FIRST MATCHING MAP ITEM. THE MAP FILE IS LEFT POSITIONED AT THAT POINT SO SUBSEQUENT NAME SEQUENTIALS MAY BE USED. AS MANY NAME SEQUENTIALS MAY BE USED AS DESIRED, BUT THE LAST ONE SHOULD REACH THE LAST MAP ITEM IN THE FILE. FOR EXAMPLE,

```
*N S
/TR=152100
```

```
/TR=152200
,,,,,152200
*N S
/TR=152200
/TR=152100
,,,,,152100
*N
```

WILL EXCHANGE TWO TRACT NUMBERS AND LABELS, PROVIDED 152100 PRECEDES 152200 ON THE MAP FILE. THE FINAL ***NAME** WILL MATCH ALL MAP ITEMS (AND LEAVE THEM UNCHANGED) UP TO THE END OF FILE.

*PLOT CONIC
*PLOT EQUIRECTANGULAR
*PLOT LINEAR
*PLOT MOVE

PRODUCES A PLOT OF THE MAP. THE EQUIRECTANGULAR PROJECTION IS THE DEFAULT. ONE TO FOUR PAIRS OF COORDINATES MAY BE SUPPLIED WITH THE **MOVE** OPTION TO MOVE OR SCALE THE MAP BEFORE PLOTTING.

*QUIT

TWO CONSECUTIVE QUIT COMMANDS WILL TERMINATE MAPEDIT.

*REPLACE OPTION

IS IDENTICAL TO THE SEQUENCE **DELETE** FOLLOWIED BY **APPEND** WITH THE SAME GEOCODE LIST FOR BOTH.

*SCALE CONIC
*SCALE EQUIRECTANGULAR
*SCALE LINEAR
*SCALE MOVE

SCALE PROVIDES A TRANSFORMATION TO CONIC OR EQUIRECTANGULAR COORDINATES, OR PROVIDES A GENERAL MAP FITTING OPERATION. FOR ONE POINT THE MAP IS TRANSLATED, FOR TWO, TRANSLATED AND SCALED, FOR THREE, TRANSLATED, SCALED AND ROTATED, AND FOR FOUR, TRANSLATED, SCALED , ROTATED AND DISTORTED. THESE POINTS ARE GIVEN IN THE ORDER X,Y (OLD POSITION), X,Y (NEW POSITION), WITH ONE TO FOUR CARDS FOR ONE TO FOUR POINTS. THUS TO SCALE THE MAP, TWO POINTS ARE REQUIRED, FOR EXAMPLE

```
*S M
0,0,0,0
1,1,57.3,57.3
```

WILL CONVERT A MAP FROM RADIANS TO DEGREES.
*S M

```
117.1,39.2,117.2,39.2
```

WILL MOVE THE MAP WEST .1 DEGREE.

A SPECIAL FORMAT MAY BE USED TO ROTATE ABOUT A POINT. FOR EXAMPLE,

```
*S M
117.1,39.2
180.
```

WILL ROTATE THE MAP 180 DEGREES ABOUT THE POINT 117.1,39.2 .

*UNRAVEL PLOT
*UNRAVEL

CONVERTS **TENCENTS** FORMAT TO STANDARD **NICKEL** FORMAT. SEPARATE POLYGONS WITH THE SAME DESCRIPTORS, FOR EXAMPLE ISLANDS, ARE DISTINGUISHED BY PART CODES. FOR EXAMPLE,

```
*A T
*L
/SMSA=0
*UNRAVEL PLOT
*E M
```

WILL AGGREGATE A US BY COUNTY MAP TO SMSAS . OBSERVE THAT SINCE BOTH STATE AND SMSA CODES ARE PRESERVED, MORE THAN ONE POLYGON WILL BE UNRAVELLED FOR SMSAS CROSSING STATE BOUNDARIES. THE **PLOT** OPTION PLOTS EACH POLYGON UNRAVELLED CENTERED AND ZOOMED ON A SEPARATE FRAME ON THE **FILM** FILE.

*Z NUMBER

THIS COMMAND SETS A SCALE FACTOR FOR THE LINE STRAIGHTENING ROUTINE WHEN PROCESSING DIGITIZER FILES. START WITH ABOUT 30, LARGER VALUES PRODUCE MORE STRAIGHTENING AND SMALLER VALUES LESS.

STANDARD NICKEL FORMAT

THE STANDARD NICKEL FORMAT TREATS EACH MAP ITEM AS SEPARATE. NO ADJACENCY INFORMATION IS KEPT FOR BOUNDARIES. EACH ITEM IS A LOGICAL RECORD ON TAPE OR ON DISK. EACH ITEM HAS AN ARRAY LENGTH AND AN ARRAY OF GEOCODES, 4 WORDS FOR MINIMUM AND MAXIMUM COORDINATE LIMITS, XMIN, YMIN,XMAX,YMAX, AN ARRAY LENGTH AND AN ARRAY OF COSMETIC LABELS (2 WORDS FOR X,Y AND 1 WORD EACH FOR SIZE, ORIENTATION, AND MESSAGE LENGTH, AND 8 WORDS FOR A MESSAGE OF UP TO 80 CHARACTERS) AND THE NUMBER OF POINTS, FOLLOWED BY THE LIST OF POINTS. THIS FORMAT CAN BE READ BY ONE FORTRAN READ STATEMENT

```
READ(12)NDES,(LDES(I),I=1,NDES),
1(XYLIM(I),I=1,4),
2(NCOS,((LCOS(I,J),I=1,13),J=1,NCOS),
3NPTS,(PTS(1,I),PTS(2,I),I=1,NPTS)
```

NDES ~ NUMBER OF GEOCODES
LDES ~ AN ARRAY OF GEOCODES
XYLIM ~ COORDINATE LIMITS FOR THIS ITEM
NCOS ~ NUMBER OF COSMETIC LABELS
LCOS ~ ARRAY OF COSMETIC LABELS
NPTS ~ NUMBER OF POINTS
PTS ~ AN ARRAY OF POINTS

COORDINATES ARE USUALLY IN WEST LONGITUDE AND NORTH LATITUDE IN DEGREES. THE DATA IS STORED AS FIXED OR FLOATING POINT ACCORDING TO THE USUAL FORTRAN NAMING CONVENTIONS WITH THE EXCEPTION OF LCOS(1,I), LCOS(2,I) WHICH ARE LONGITUDE,LATITUDE COORDINATES IN REAL FORMAT.

TENCENTS FORMAT

SOME MAP OPERATIONS ARE PERFORMED MORE EASILY IF ADJACENCY INFORMATION IS EXPLICITLY IN THE DATA STRUCTURE. AGGREGATION OF MAP ITEMS IS ONE EXAMPLE (THE ONLY SUCH OPERATION IMPLEMENTED SO FAR).

TENCENTS , A VARIATION ON THE **DIME** (DUAL INDEPENDENT MAP ENCODING) FORMAT, REPRESENTS THE MAP BY AN UNSORTED SET OF DIRECTED LINE SEGMENTS. ACCOMPANYING EACH SEGMENT ARE POINTERS TO DESCRIPTOR BLOCKS FOR THE MAP ITEM ON THE LEFT AND ON THE RIGHT, TAKING THE SEGMENT AS DIRECTED AWAY FROM YOU. THE **TENCENTS** FORMAT IS ONE FILE OF 2 LOGICAL RECORDS. THE FIRST RECORD CONTAINS ONE DESCRIPTOR BLOCK WITH GLOBAL INFORMATION FOLLOWED BY DESCRIPTOR BLOCKS FOR EACH MAP ITEM. THE DESCRIPTOR BLOCKS ARE AS IN THE STANDARD FORMAT, EXCEPT NPTS AND PTS ARE ABSENT. THEY MAY BE READ BY ONE FORTRAN READ STATEMENT (THE BLOCKED BINARY I/O BIT IN THE FET SHOULD ALSO BE SET)

```
READ(12)NDES,(LDES(I),I=1,NDES),
1(XYLIM(I),I=1,4),
2NCOS,((LCOS(I,J),I=1,13),J=1,NCOS)
```

FOR THE GLOBAL DESCRIPTOR BLOCK,

```
NDES    =  3
LDES(1) = NUMBER OF MAP ITEMS (NPOLY)
LDES(2) = NUMBER OF NODES (NNODE)
LDES(3) = NUMBER OF SEGMENTS (NSEG)
XYLIM - GLOBAL COORDINATE LIMITS
NCOS - NUMBER OF GLOBAL COSMETIC LABELS
LCOS - GLOBAL COSMETIC LABELS
```

THE SECOND RECORD CONTAINS THE DIRECTED LINE SEGMENTS. EACH MAY BE READ BY ONE FORTRAN READ STATEMENT (THE BLOCKED BINARY I/O BIT IN THE FET MUST BE SET)

```
READ(12)NODE1,NODE2,X1,Y1,X2,Y2,ITEML,ITEMR
```

THE SEGMENT GOES FROM NODE1 AT (X1,Y1) TO NODE2 AT (X2,Y2). THE MAP ITEMS ON THE LEFT AND RIGHT HAVE THE ITEML-TH AND ITEMR-TH DESCRIPTOR BLOCKS RESPECTIVELY. THE NODES ARE INTEGER VARIABLES THAT RANGE FROM 1 TO NNODE. ITEML AND ITEMR ARE INTEGERS THAT RANGE FROM 1 TO NPOLY. THE NUMBER OF DIRECTED LINE SEGMENTS IS NSEG.

INTERACTIVE FEATURES

MAPEDIT RUNS INTERACTIVELY WHEN THE **INPUT** FILE IS SET TO **TAPETTY** , THE STANDARD FILE NAME FOR TELETYPE INPUT AND OUTPUT. INTERACTIVE FACILITIES ARE AVAILABLE ONLY ON THE CDC 6000 MACHINES.

ALL THE MAPEDIT COMMANDS, GEOCODE STRINGS, AND OTHER INPUT DESCRIBED ABOVE MAY BE ENTERED FROM THE TELETYPE, WITH THE EXCEPTION OF *JIGSAW AND *UNRAVEL. THESE TWO COMMANDS, WHICH CONVERT BETWEEN NICKEL AND TENCENTS FORMAT, REQUIRE THE USE OF THE LARGE CORE MEMORY AND MUST BE RUN ON THE 7600. GEOCODE STRINGS WITH COORDINATE LIMITS MAY BE REPLACED, IF DESIRED, BY **/HIT** FOLLOWED BY A PAIR OF HITS AT THE LOWER LEFT AND UPPER RIGHT CORNERS OF THE REGION OF INTEREST. MAPEDIT RESPONDS **READY** WHENEVER READY FOR A NEW COMMAND. THE FILE **OUTPUT** MAY ALSO BE SET TO **TAPETTY** BUT THIS WORKS BEST ONLY FOR HIGH SPEED TERMINALS.

INTERACTION WORKS MORE MOST SMOOTHLY IF AN EMPTY COMMAND, A LINE WITH ONLY * IN COLUMN 1, IS USED TO EXECUTE THE PRECEDING COMMAND AND GEOCODE STRINGS. THIS WILL GIVE A #DIRECTIVE IGNORED# MESSAGE, WHICH MAY BE IGNORED.

GRAPHICS ROUTINES FOR ANY DEVICE SUPPORTED BY **GRAFPAC** MAY BE USED. THESE INCLUDE THE **VISTA 250, GT40,** AND **TEKTRONIX 4012.** WHEN THE GT40 OR 4012 ROUTINES ARE LOADED, THE **FILM** FILE IS AUTOMATICALLY SET TO TAPETTY ALSO.

THE *SCALE MOVE COMMAND SUPPORTS A DIRECT WAY TO INPUT POINTS, PROVIDED A PREVIOUS *PLOT HAS BEEN USED TO SEND A PICTURE TO THE SCREEN. TYPING **HIT** CONDITIONS MAPEDIT TO EXPECT TWO PAIRS OF (X,Y) COORDINATES. THESE ARE USED JUST AS IF THE FOUR VALUES HAD BEEN TYPED IN ON ONE LINE.

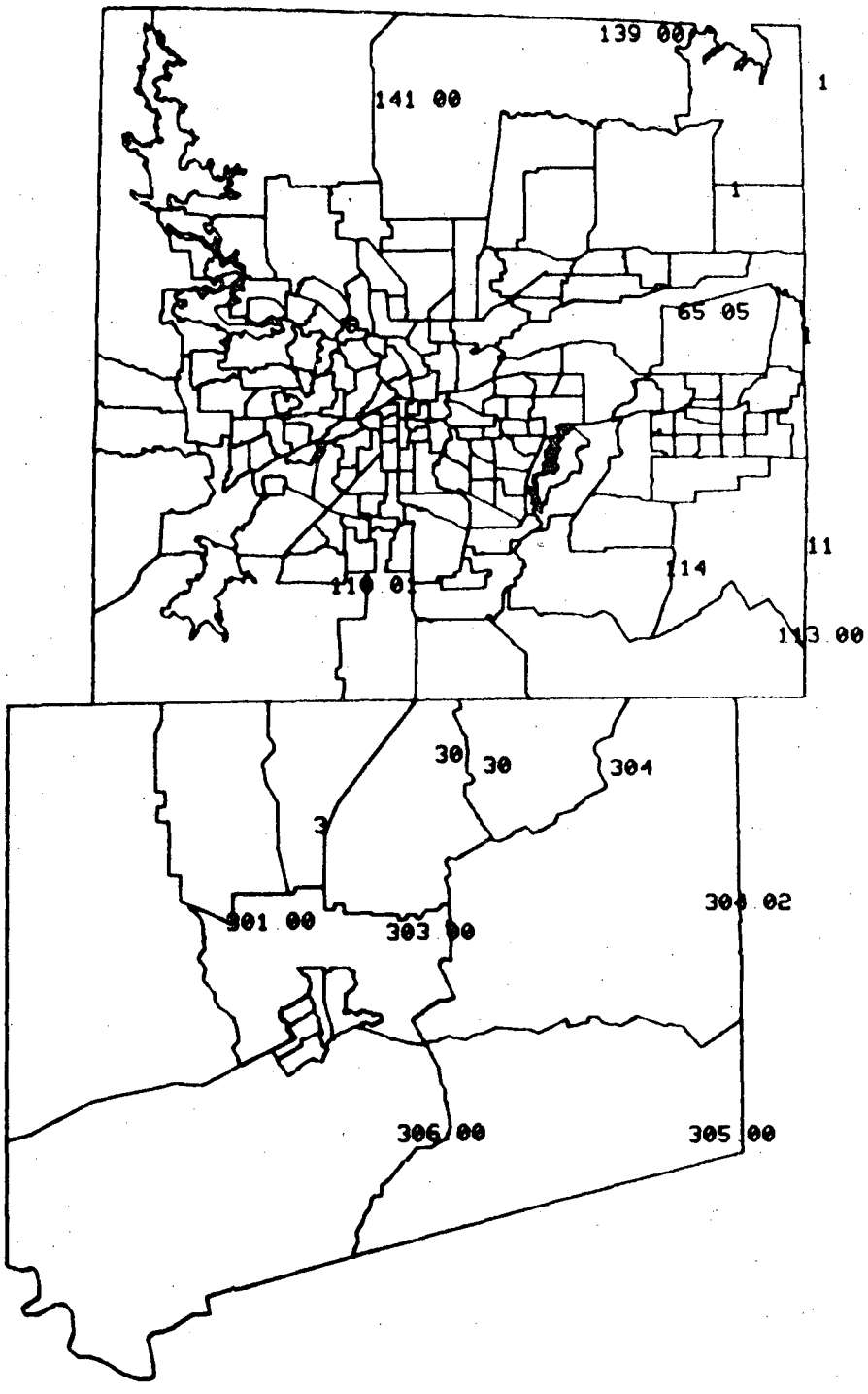
FOR EXAMPLE, TO RUN INTERACTIVELY ON THE TEKTRONIX 4012, RUN THE FOLLOWING CONTROL CARDS UNDER EITHER PTSS OR SESAME

```
DRIVES(1)
REQUEST(TAPE,27493)
COPY(TAPE/RX,MAPIN/RR)
FETCHPS(MAPEDIT,LGO,MAPEDIT)
FETCHPS(GRAPHIC,TXLGO,TXLGO)
LIBGEN(F=TXLGO,P=ULIB)
LINK(F=LGO,P=ULIB,EO=X)
MAPEDIT(TAPETTY)
7-8-9 EOR CARD
6-7-8-9 END OF JOB CARD
```

IMPLEMENTATION NOTES

THE PROGRAM IS WRITTEN ENTIRELY IN CDC FORTRAN. IF THE PROGRAM WERE MOVED TO ANOTHER MACHINE, THE FOLLOWING INCOMPATIBILITIES COULD BE EXPECTED.

A. RANDOM ACCESS TO LARGE CORE OR DISK - COULD BE REPLACED BY ALMOST ANY INDEXED SEQUENTIAL DISK ACCESS METHOD, BUT WITH A SEVERE PENALTY IN SPEED OVER DIRECT ACCESS TO LARGE CORE.
B. WORD LENGTH - THIS AFFECTS THE STORAGE OF ALPHANUMERIC DATA AND THE PRECISION OF ARITMETIC CALCULATIONS. THIRTY SIX BITS OR MORE SHOULD PROVIDE ENOUGH ACCURACY.
C. BIT MANIPULATION IS PERFORMED USING THE COMPILERS BUILT IN SHIFT AND BOOLEAN OPERATIONS. SEVERAL ROUTINES MUST BE CHANGED FOR A NEW WORD LENGTH AND THE EQUIVALENT SHIFT AND MASK OPERATIONS SUPPLIED.
D. GRAPHICS ROUTINES - THESE ALL OPERATE AT A RATHER LOW LEVEL-- LINES AND CHARACTERS. THEY SHOULD BE EASY TO REPLACE IF A WRITEUP OF OUR ROUTINES IS AVAILABLE. THEY DO REQUIRE TWO DIMNENSIONAL CLIPPING HOWEVER.



An SMSA tract outline map extracted by program MAPEDIT. These tract maps for most of the major SMSA's in the United States were used in the URBAN ATLAS Project carried out by the Bureau of the Census, U. S. Department of Labor, and Lawrence Berkeley Laboratory.

APPENDIX B

ZING USERS GUIDE

HARVARD HOLMES

1974

ZING USERS GUIDE

HARVARD HOLMES

1974

TO OBTAIN ADDITIONAL COPIES DO

```
LIBCOPY,MAPEDIT,ZINGUSR/RR,ZINGUSR.
BARB,ZINGUSR.
```

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INTRODUCTION

ZING IS THE SECOND (OR THIRD) IN A SERIES OF INTERACTIVE MAP EDITORS. IT IS USED TO CORRECT AND UPDATE THE GEOGRAPHIC BASE FILES PRODUCED BY THE MAPEDIT SYSTEM AT THE LAWRENCE BERKELEY LABORATORY. INFORMATION ABOUT RELATED PROGRAMS AND DATA BASES MAY BE FOUND IN THE LBL MAPPING SYSTEM SUMMARY.

THE PRODUCTION OF GEOGRAPHIC BASE FILES PASSES THROUGH SEVERAL STAGES - THE SELECTION OF MAPS, PHOTOREDUCTION, AUTOMATIC DIGITIZATION, DATA COMPRESSION AND REFORMATTING, JOINING INSETS TOGETHER, AND A MANUAL REVIEW AND CORRECTION OF REMAINING ERRORS. ZING IS USED FOR THE MANUAL REVIEW AND CORRECTION PROCESS. THIS IS ACCOMPLISHED AT AN ON-LINE GRAPHICS CONSOLE USING COMMANDS TO CHANGE POINTS AND LINES, RENAME POLYGONS, OR EVEN CREATE NEW POLYGONS.

ZING HAS BEEN MATCHED TO THE PARTICULAR REQUIREMENTS OF POLYGON EDITING. IT IS ABLE TO EDIT SEVERAL POLYGONS IN PARALLEL, MOVING SEVERAL POINTS BELONGING TO SEVERAL POLYGONS AT THE SAME TIME. IT ALSO ALLOWS AN INDIVIDUAL POLYGON TO BE EDITED IN CONTEXT, THAT IS, WHILE ADJACENT POLYGONS ARE DISPLAYED. IN ADDITION, ZING HAS BEEN DESIGNED TO MAINTAIN THE ESSENTIALLY SEQUENTIAL FILE STRUCTURE OF NICKEL FILES, THE STANDARD FORMAT FOR ARCHIVAL STORAGE AT LBL. IT DOES THIS BY PREPARING AN INDEX TO THE DISK FILE, AND REWRITING IN PLACE WHERE POSSIBLE, OR IF NOT POSSIBLE, A POLYGON IS MOVED TO THE END OF THE FILE AND THE HOLE LEFT OVER IS FILLED BY MOVING NEARBY POLYGONS. ZING DEPENDS ON THE FACT THAT NICKEL FILES CONTAIN INFORMATION ABOUT THEIR LENGTH WHICH OTHER PROGRAMS USE TO AVOID GARBAGE WHICH MAY HAVE BEEN INSERTED BY ZING.

JOB SETUP

FOR EDITING MAPS, **ZING** EXPECTS ONE FILE AS INPUT - THE MAP TO BE EDITED (USUALLY CALLED **NEWMAP**). FOR DIGITIZING CETA DATA, TWO ADDITIONAL FILES ARE NEEDED FOR DATA INPUT (TAPE2) AND OUTPUT (TAPE3). **ZING** ALSO USES A FILE FOR THE TELETYPE (TAPETTY) AND A FILE FOR THE GRAPHICS CONSOLE (FILM). THE ORDER OF THESE FILES IN THE PROGRAM IS **NEWMAP, TAPE2,TAPE3,TAPETTY,FILM.**

ZING RUNS ON A VARIETY OF GRAPHICS CONSOLES USING **GRAFPAC** FOR THE DISPLAY ROUTINES. BOTH **ZING** AND THE APPROPRIATE DISPLAY ROUTINES ARE AVAILABLE FROM THE **PROGRAM STORAGE SYSTEM.** IT IS MOST CONVENIENT TO RUN **ZING** USING **PTSS** (THE PEOPLES TIME SHARING SYSTEM) SINCE THE CONTROL CARDS NEEDED TO RUN THE EDITOR AND TO TERMINATE THE JOB CAN BE CREATED IN ADVANCE.

THE FOLLOWING IS A SAMPLE DECK.

```
JOBCARD
*B
LIBCOPY,MAPEDIT,ZING,ZINGLGO..
LIBCOPY,GRAPHIC,ZING,VVLGO.
REQUEST,T,03117.  (USE PROPER TAPE NUMBER)
COPY,T/RBX,CITY.
COMMON,PTSS.
PTSS.
EOR 789 - END OF RECORD
EOR 789 - END OF RECORD
EOR 789 - END OF RECORD
RUNEM
ZING,CITY.
CXIT.
EXIT.
DMP.
FIN.
PTSS,E.
CXIT.
EXIT.
FIN.
PTSS,E.
NOW GO RUNEM

SAVTAPE
NOR.  IF PARITY ERROR, DO ONE DROP
REQUEST,T,#,W.  (USE PROPER TAPE NUMBER)
COPY,CITY/RB,T/BX.
END.
CXIT.
EXIT.
FIN.
PTSS,E.
NOW GO SAVE TAP
```

ZING USERS GUIDE
JOB SETUP

THE FIRST RECORD CONSISTS OF CONTROL CARDS TO RETRIEVE **ZING** AND THE GRAPHIC ROUTINES, COPY THE DATA TO A DISK FILE, AND ENTER **PTSS.** THE SECOND AND THIRD RECORDS ARE EMPTY SINCE **PTSS** COPIES THEM TO INTERNAL FILES **PROGRAM** AND **DATA.** THE FOURTH RECORD IS USED BY **PTSS** AS SETS OF CONTROL CARDS. EACH SET IS TERMINATED BY A CARD BEGINNING 'NOW'. NOTE THAT DURING JOB SETUP, THE SECOND **LIBCOPY** CARD SHOULD REFER TO THE PROPER SUBSET FOR THE GRAPHICS DEVICE WHICH YOU ARE GOING TO USE - **VVLGO** FOR THE **VISTA 250, GTLGO** FOR THE **GT40,** OR **TXLGO** FOR THE **TEKTRONIX 4010 - 4012.** IN THIS EXAMPLE, WE ASSUME THAT THE DATA IS BOTH FETCHED FROM TAPE AND RESTORED TO TAPE AT THE END OF THE JOB. IT MAY HAPPEN THAT THE EDITING IS SPREAD OVER SEVERAL DAYS. YOU SHOULD THEN CONSIDER THE USE OF COMMON FILES WITH TAPE AS A BACKUP. IT MAY ALSO BE WISE TO DECLARE YOUR FILE COMMON TO PRESERVE IT IN CASE OF HARDWARE OR SOFTWARE ERROR. SEE THE SYSTEM DOCUMENTATION FOR MORE EXPLICIT DETAILS. IN THIS CASE THE INITIAL TAPE REQUEST MIGHT ALSO CREATE A COMMON FILE WITH SUBSEQUENT ACCESS TO THE FILE BY THE **COMMON** CONTROL CARD.

WHILE YOU ARE EDITING THE MAP, YOU WILL ALSO FIND IT CONVENIENT TO HAVE A PAPER COPY OF THE MAP FOR REFERENCE.

OPERATING PROCEDURE

THE PROCEDURE FOR OPERATING **ZING** IS DESCRIBED NEXT, BUT NO WORDS WILL EVER REPLACE SOME EXPERIMENTATION WITH THE SYSTEM. THE DISPLAY WHICH **ZING** USES CAN BE DIVIDED INTO THREE PARTS - THE DATA, WHICH OCCUPIES THE CENTRAL PORTION OF THE SCREEN, THE COMMENTS WHICH APPEAR AT THE TOP OF THE SCREEN, AND THE COMMANDS WHICH APPEAR AT THE RIGHT HAND EDGE OF THE SCREEN. THE DATA PORTION OF THE SCREEN DISPLAYS THE CURRENT MAP OR A LIST OF NAMES WHEN THE EDITOR IS IN SELECT MODE. THE COMMENTS ARE TO INFORM THE USER WHAT THE EDITOR IS DOING AND WHAT THE USER SHOULD DO NEXT. THE COMMANDS ARE A LIST OF ACTIONS AVAILABLE TO THE USER. THE GENERAL IDEA IS TO SELECT A POINT ON THE MAP AND THEN EXECUTE SOME COMMAND USING THAT POINT.

THE GENERAL TERM **HIT** IS USED TO DENOTE GRAPHIC COORDINATE INPUT, WHETHER IT BE FROM LIGHTPEN, TABLET, CURSORS, OR WHATEVER. ALL COMMANDS ARE INVOKED BY A HIT. COMMANDS WHICH REQUIRE ALPHANUMERIC INPUT WILL SO INFORM THE USER AND WILL FLASH THE MESSAGE TO WAKE HIM UP.

SOME COMMANDS REQUIRE NO DATA AS INPUT. OTHER COMMANDS ARE IMPLICIT, THAT IS, SOMETHING HAPPENS IMMEDIATELY UPON SELECTION OF A POINT. THE INDIVIDUAL COMMANDS ARE DESCRIBED IN THE NEXT SECTIONS.

TRACT SELECTION

THESE COMMANDS ARE USED TO SELECT TRACTS FOR EDITING. THESE COMMANDS ARE AUTOMATICALLY DISPLAYED WHEN THE PROGRAM BEGINS EXECUTION. BEFORE THESE COMMANDS ARE DISPLAYED, HOWEVER, THE PROGRAM MUST READ AND INDEX ALL THE POLYGONS. THIS MAY CAUSE A DELAY BETWEEN THE START OF EXECUTION AND THE DISPLAY OF THESE COMMANDS.

THE COMMENTS FOR THIS PHASE CONSIST OF THE WORD **SELECT** IN COMMENT 3.

TO SELECT A TRACT FOR EDITING SIMPLY POINT TO IT WITH THE LIGHT PEN. IT WILL BE DISPLAYED AT THE LEFT OF THE SCREEN. AS MANY TRACTS AS DESIRED MAY BE SELECTED. IF MORE THAN 20 ARE SELECTED, THEY WILL OVERLAY THE LIST OF TRACTS AVAILABLE. IF THE FIRST TRACT IN THE LIST IS SELECTED IN THIS MANNER, THEN THE INTERNAL COUNTER USED FOR **NEXT** WILL BE RESET TO THIS NAME.

NEXT

THE NEXT TRACT IS SELECTED FOR EDITING ACCORDING TO AN INTERNAL COUNTER. THE NAME OF THE TRACT IS DISPLAYED AT THE LEFT OF THE SCREEN.

GATHER

ALL TRACTS WHOSE ENCLOSING RECTANGLES OVERLAP THE ENCLOSING RECTANGLE OF THE FIRST TRACT ARE ADDED TO THE LIST OF SELECTED TRACTS. THESE NAMES ARE ALSO DISPLAYED AT THE LEFT OF THE SCREEN.

EDIT

THE SELECTED TRACTS ARE READ INTO MEMORY FOR EDITING, AND CONTROL PASSES TO THE EDITING PHASE.

DIGITIZE

CONTROL PASSES TO THE DIGITIZER PHASE FOR DIGITIZING C.E.T.A. CITIES.

PAGE

THE NEXT PAGE OF NAMES IS DISPLAYED. EACH PAGE EXCEPT THE LAST HAS 60 NAMES ON IT. PAGING FROM THE LAST PAGE RETURNS TO THE FIRST PAGE.

TYPE NAME

IF YOU DO NOT WISH TO PAGE THROUGH THE LIST OF TRACTS AND SELECT A TRACT WITH THE LIGHT PEN, THIS COMMAND ALLOWS YOU TO SELECT IT BY TYPING IN THE NAME AS IT WOULD ORDINARILY APPEAR ON THE SCREEN. THIS COMMAND MAY ALSO BE USED TO SEARCH FOR A PARTICULAR NAME SINCE THE NAME WILL NOT BE DISPLAYED AT THE LEFT OF THE SCREEN IF IT CANNOT BE FOUND. IT THE FIRST NAME ON THE LIST IS SELECTED IN THIS MANNER, THEN THE INTERNAL COUNTER USED IN **NEXT** IS RESET TO THIS NAME.

ADD TRACT

A NEW TRACT IS CREATED. YOU MUST TYPE IN A LIST OF DESCRIPTORS TO BE USED FOR THE NEW TRACT. COMMENTS GIVE THE ORDER OF ITEMS IN THE LIST OF DESCRIPTORS. ONLY AS MANY AS NEEDED MUST BE TYPED IN. A LABEL FOR THE TRACT IS CREATED FROM THE DESCRIPTORS. THIS LABEL IS THE SAME AS THE NAME WHICH APPEARS IN THE LIST OF NAMES. THE NEW TRACT IS GIVEN ONE POINT. THE POINT AND THE LABEL ARE LOCATED AT THE LAST ZOOM ORIGIN (SEE THE **ZOOM** COMMAND). THE NEW TRACT IS WRITTEN ON THE DISK. THE NEW TRACT IS ALSO SELECTED FOR EDITING.

ONLY 10 NEW TRACTS CAN BE ADDED IN ANY ONE EDITING SESSION. IF THE NEW TRACT CAUSES THE LIST OF NAMES TO EXCEED ITS ALLOWABLE LENGTH, THE PROGRAM STOPS. THE PROGRAM SHOULD BE RE-EXECUTED. IT WILL THEN EXTEND THE LIST OF NAMES TO ALLOW ROOM FOR 10 MORE NEW NAMES. THE TRACT WHICH CAUSED THE PROGRAM TO STOP WILL BE INCLUDED.

KILL TRACT

THE SELECTED TRACT IS DELETED. ONLY ONE TRACT AT A TIME CAN BE DELETED. IF MORE THAN ONE TRACT IS SELECTED, A WARNING MESSAGE IS ISSUED AND NO ACTION IS TAKEN. AT PRESENT THE LAST TRACT CANNOT BE DELETED. AN ATTEMPT TO DO THIS WILL CAUSE A WARNING MESSAGE AND THE COMMAND IS IGNORED.

BACKUP

THE LAST NAME ON THE LIST OF SELECTED TRACTS IS REMOVED.

STOP

THE PROGRAM ASKS YOU TO CONFIRM THE COMMAND BY TYPING **STOP**. IF **STOP** IS TYPED, THE PROGRAM TERMINATES. IF ANY OTHER INPUT IS RECEIVED, THE PROGRAM RETURNS TO THE BEGINNING OF THE SELECTION PHASE WITH ALL NAMES REMOVED FROM THE LIST OF SELECTED TRACTS.

EDITING TRACTS

IN THIS PHASE THE MAP ITSELF IS DISPLAYED, AND IT IS UPDATED AFTER EACH COMMAND TO REFLECT THE CURRENT STATE OF THE MAP.

THERE ARE THREE COMMENTS USUALLY DISPLAYED IN THIS PHASE. THE FIRST ONE, FARTHEST LEFT, IDENTIFIES THE TRACT ASSOCIATED WITH THE **NEXT** COMMAND. IF THE USER IS EDITING TRACTS IN SEQUENCE, THIS IS THE CURRENT ONE.

THE SECOND COMMENT TELLS WHICH TRACT, IF ANY, HAS BEEN SINGLED OUT FOR INDIVIDUAL EDITING (VIA THE **IDENT** COMMAND). IF ALL TRACTS ARE BEING EDITED, THIS COMMENT WILL SAY **ALL.**

THE THIRD COMMENT TELLS WHICH COMMAND IS THE DEFAULT COMMAND. THE DEFAULT COMMAND IS ALWAYS AN EDITING COMMAND AND IS EXECUTED AUTOMATICALLY IN **AUTO ON** MODE OR BY USE OF THE **INTERRUPT** KEY WHEN USED WITH THE **VISTA.**

A KEY FEATURE OF THIS PHASE IS THE USE OF THE **QUANTUM** BOX. THIS BOX, WHICH MAY BE VARIED IN SIZE, INDICATES THE LIMITS OF ELIGIBLE POINTS FOR A COMMAND. IN ADDITION THE QUANTUM BOX WILL 'LOCK ON' TO THE CLOSEST POINT WITHIN ITS BOUNDARIES WHENEVER A HIT FROM THE SCREEN IS RECEIVED. THUS WHEN EXISTING POINTS ON THE MAP ARE USED TO LOCATE EDITED POINTS, THE HIT DOES NOT HAVE TO BE LOCATED EXACTLY, BUT JUST CLOSE ENOUGH TO FIND THE DESIRED POINT IN THE BOX.

UNLESS OTHERWISE NOTED, COMMANDS IN THIS PHASE OPERATE ON THE CORE IMAGE OF THE MAP. THE DISK IMAGE IS NOT UPDATED WITH EACH COMMAND. THE INITIAL DISPLAY IN THIS PHASE SHOWS THE MAP WITH THE FIRST POLYGON POSITIONED ROUGHLY AT THE CENTER OF THE SCREEN. TO BE PRECISE, THE MINIMUM X AND Y BOUNDARY OF THE ENCLOSING RECTANGLE OF THE FIRST POLYGON IS POSITIONED AT THE CENTER OF THE SCREEN. WHATEVER ZOOM RATIO WAS PREVIOUSLY IN EFFECT IS USED FOR THE INITIAL DISPLAY. INITIALLY, THE ZOOM RATIO IS SET TO 10.0.

RELOAD

THIS COMMAND REPLACES IN CORE VERSIONS OF THE POLYGONS WITH OLD ONES READ IN FROM THE DISK. THIS IS USEFUL WHEN A POLYGON HAS BEEN UNINTENTIONALLY CHANGED OR WHILE EDITING ANOTHER POLYGON. EITHER ALL POLYGONS ARE REPLACED OR ONLY ONE PARTICULAR ONE, DEPENDING ON WHETHER A PARTICULAR POLYGON HAS BEEN SELECTED FOR EDITING. (SEE THE **IDENT** COMMAND.) SINCE INADVERTENT USE OF THIS COMMAND COULD DESTROY A LOT OF WORK, IT MUST BE CONFIRMED BY A SECOND HIT AFTER THE FIRST ONE. A COMMENT REMINDS THE USER TO CONFIRM THIS COMMAND.

UNDO

AT PRESENT THIS IS A DUMMY COMMAND. EVENTUALLY, IT WILL UNDO THE EFFECTS OF THE LAST EDITING COMMAND.

LABEL

A NEW LABEL CAN BE TYPED IN TO REPLACE THE OLD ONE. THE LABEL TO BE REPLACED IS IDENTIFIED BY A HIT FROM THE LIGHTPEN (TABLET, JOYSTICK, ETC.). IF A PARTICULAR TRACT HAS BEEN IDENTIFIED, THEN THAT LABEL IS CHANGED AND NO HIT IS REQUIRED. IF THE COMMAND IS ACCIDENTALLY SELECTED, A BLANK LINE WILL ABORT THE COMMAND.

NEW NAME

THIS COMMAND CHANGES THE GEOCODES IN THE LIST OF DESCRIPTORS FOR A POLYGON. A PARTICULAR TRACT MUST BE IDENTIFIED TO USE THIS COMMAND. PRESENTLY, THE LIST OF DESCRIPTORS CANNOT BE EXTENDED, ONLY CHANGED. FOR EXAMPLE, IF ONLY 4 DESCRIPTORS ARE USED, A FIFTH DESCRIPTOR CANNOT BE ADDED.

XTEND

THIS COMMAND IS USED TO DIGITIZE NEW TRACTS (CREATED BY ADD TRACT). THE PARTICULAR TRACT MUST BE IDENTIFIED, AND THEN EACH HIT IS ADDED TO THE END OF THE LIST OF POINTS FOR THE TRACT. WHEN USED WITH THE GT40 OR TECKTRONIX 4012, THIS COMMAND SIGNALS WITH A BELL WHEN IT IS READY FOR THE NEXT HIT. THIS IS VERY CONVENIENT FOR USE WITH THE GRAFPEN SINCE THEN THE USER DOES NOT HAVE TO WATCH THE SCREEN TO SEE WHEN THE PROGRAM IS READY FOR THE NEXT HIT.

IDENT

THIS COMMAND IDENTIFIES A POINT BY LONGITUDE, LATITUDE, AND THE POLYGON WHICH IT BELONGS TO. IT ALSO IDENTIFIES THE PARTICULAR POLYGON FOR EDITING OR OTHER OPERATIONS. IF A POLYGON IS IDENTIFIED, IT IS SHOWN IN THE SECOND COMMENT. ALL EDITING OPERATIONS WILL AFFECT THIS POLYGON ONLY. IF A

HIT OCCURS WHICH IS NOT AT A POINT BELONGING TO ANY POLYGON, THE IDENTIFIED POLYGON POINTER IS RESET TO EDIT ALL POLYGONS.

CORNER

THIS COMMAND IS USED TO MATCH UP COMMON BOUNDARIES SO THAT THEY COINCIDE. AFTER THE QUANTUM BOX HAS 'LOCKED ON' TO A POINT, ANY OTHER POINTS IN THE BOX (FROM OTHER POLYGONS) ARE MOVED TO THE CENTER OF THE BOX (TO COINCIDE WITH THE POINT 'LOCKED ON' TO). THEN, ANY NEARBY LINES (PASSING THROUGH THE BOX) HAVE A POINT ADDED AT THE CENTER OF THE BOX SO THAT ALL NEARBY POINTS AND LINES COME TO A CORNER AT THE SPECIFIED POINT. THIS COMMAND IS A COMBINATION OF **MOVE PT** AND **BREAK**.

ERASE PT

THIS COMMAND ERASES ALL THE POINTS IN THE LAST HIT. THE TWO LINES TO THE POINT ARE REPLACED BY ONE LINE CONNECTING THE PREVIOUS AND NEXT POINTS. THIS COMMAND IS USED TO ERASE **ZINGERS** (SINGLE OUT-OF-PLACE POINTS) AND TO REMOVE EXTRANEOUS POINTS ON A STRAIGHT LINE.

MOVE PT

AT THE FIRST SELECTION OF THIS COMMAND, THE EXISTING LOCATION OF THE QUANTUM BOX IDENTIFIES THE POINTS TO BE MOVED. A SUBSEQUENT HIT IDENTIFIES A NEW POINT, AND WHEN THE COMMAND IS SELECTED A SECOND TIME, THE IDENTIFIED POINTS ARE MOVED TO THE NEW LOCATION.

BREAK

AT THE FIRST SELECTION OF THIS COMMAND, THE FIRST LINE (FROM EACH POLYGON) THROUGH THE QUANTUM BOX IS IDENTIFIED. A SUBSEQUENT HIT IDENTIFIES A NEW POINT, AND WHEN THE COMMAND IS SELECTED A SECOND TIME, THE IDENTIFIED LINES HAVE THE NEW POINT ADDED TO THEM.

QBOX

THE SIZE OF THE QUANTUM BOX IS CHANGED ACCORDING TO THE X COORDINATE OF THE LAST HIT. THUS A HIT TO THE LEFT OF THE SCREEN PRODUCES A SMALL BOX, WHILE A HIT TO THE RIGHT PRODUCES A LARGE BOX. THE DEPENDENCE IS LOGARITHMIC, SO THE SIZE CHANGES MORE RAPIDLY TOWARD THE RIGHT OF THE SCREEN.

ZOOM

UPON SELECTION, A SCALE IS DISPLAYED AT THE TOP OF THE SCREEN. A HIT ON THE SCALE WILL CHANGE THE ZOOM FACTOR TO THAT VALUE. A HIT ON PART OF THE PICTURE WILL CENTER THE SUBSEQUENT DISPLAY ABOUT THAT POINT. WHEN THE ZOOM COMMAND IS SELECTED AGAIN, THE NEW PICTURE IS DISPLAYED. THE ZOOM FACTOR IS RELATIVE TO THE ORIGINAL MAP, NOT THE CURRENT DISPLAY. THUS REPEATED ZOOMS WITH A FACTOR OF 10, FOR EXAMPLE, WILL NOT KEEP INCREASING THE MAGNIFICATION. TO MOVE TO A NEW LOCATION ON THE MAP, FIRST ZOOM DOWN TO 1.0, THEN PICK THE NEW AREA ON THE REDUCED VIEW AND ZOOM BACK UP.

UP, DOWN, LEFT, RIGHT

THESE COMMANDS MOVE THE MAP ONE HALF OF THE SCREEN WIDTH UP, DOWN, LEFT, OR RIGHT RESPECTIVELY.

FINISH

MODIFIED TRACTS ARE REPLACED ON THE DISK AND CONTROL RETURNS TO THE POLYGON SELECTION PHASE.

STEP

MODIFIED TRACTS ARE REPLACED ON THE DISK AS FOR **FINISH**, BUT THE **NEXT**, **GATHER**, AND **EDIT** COMMANDS ARE AUTOMATICALLY EXECUTED. THUS, CONTROL RETURNS TO THE EDITOR WITH THE NEXT TRACT TO BE EDITED. THE FIRST COMMENT DISPLAYS THE NAME OF THIS TRACT.

AUTO

THIS COMMAND IS USED WITH THE GT40 AND TEKTRONIX 4012. IT SETS A FLAG SO THAT THE DEFAULT COMMAND IS AUTOMATICALLY EXECUTED AFTER EVERY HIT. ANOTHER HIT ON THIS COMMAND TURNS IT OFF ('AUTO OFF'). 'AUTO ON' MODE IS MOST COMMONLY USED WITH THE XTEND COMMAND AND THE GRAFPEN. BE CAREFUL.

TABLET

THIS COMMAND ESTABLISHES THE CORRESPONDENCE BETWEEN THE GRAFPEN TABLET AND DATA VALUES (NOT SCREEN VALUES). THREE POINTS ARE INPUT FROM THE TABLET AND THEN THREE POINTS FROM THE SCREEN. SUBSEQUENT HITS FROM THE TABLET ARE TRANSLATED ACCORDING TO THIS CORRESPONDENCE. SINCE THE CORRESPONDENCE IS FROM TABLET TO DATA, THE SCREEN IMAGE MAY BE CHANGED (ZOOMED) WITHOUT NEEDING TO REALIGN THE TABLET.

DIGITIZING CETA DATA

CETA (COMPREHENSIVE EMPLOYMENT AND TRAINING ACT) DATA IS CITY RELATED DATA WHICH IS TO BE DISPLAYED ON REGIONAL MAPS WITH COUNTY BORDERS. FOR THIS (AND OTHER) MAP SERIES IT IS NECESSARY TO DIGITIZE THE LOCATIONS OF THE CITIES INVOLVED. IT HAS BEEN FOUND EASIEST TO DO THIS BY DISPLAYING THE COUNTY MAP AND LOCATING THE CITY WITH A LIGHT PEN HIT. TO AID THE LOCATION PROCESS, THE CITIES ARE CODED BY COUNTY AND THE APPROPRIATE COUNTY IS AUTOMATICALLY DISPLAYED. COMMENTS 3, 4, AND 5 DISPLAY THE NAME OF THE COUNTY. CITIES ALREADY DIGITIZED ARE ALSO SHOWN ON THE MAP SO THAT NEW CITIES CAN BE LOCATED TO AVOID THEM.

THE CITIES TO BE DIGITIZED GO ON TAPE 2. THE OUTPUT IS ON TAPE 3.

THE FIRST TWO CARDS ON TAPE 2 ARE THE INPUT AND OUTPUT FORMATS RESPECTIVELY (SINCE THE OUTPUT MAY BE DIFFERENT FROM THE INPUT).

THE OUTPUT FORMAT IS COPIED TWICE ONTO TAPE 3 SO THAT TAPE 3 IS ALSO A VALID INPUT (WITH INPUT AND OUTPUT FORMATS THE SAME NOW).

BOTH TAPES ARE REWOUND AT THE BEGINNING.

IF A COUNTY OR BALANCE OF STATE IS NOT FOUND, THE PREVIOUS PICTURE IS DISPLAYED. YOU MUST THEN 'EXIT' TO THE 'SELECT' ROUTINE, PICK RELEVANT COUNTIES AND RETURN TO THE DIGITIZER. THIS OFTEN HAPPENS AT THE BEGINNING OF THE DECK, CREATING THE ILLUSION THAT YOU HAVE NOT ENTERED THE DIGITIZER WHEN IN FACT YOU HAVE ENTERED AND IMMEDIATELY EXITED.

YOU SHOULD HAVE AN ATLAS AND THE DATA DECK (OR A LISTING).

CONTROL CARDS (FOR THE GT40) -

```
JOBCARD
*C
FLOOR,2.
REQUEST,T,#####.  [USE PROPER TAPE NUMBER]
COPY,T/RBX,NEWMAP.
LIBCOPY,MAPEDIT,ZING,ZINGLGO.  (OR COMMON,ZING.)
LIBCOPY,GRAPHIC,ZING,GTLGO.  (OR COMMON,ZING.)
DISPOSE,TAPE3=PH,DT=R,R=[FLOOR 2].
COMMON,PTSS.
PTSS.
789
EMPTY RECORD
789
(I2,I4,I5,1X,3A10,2I13,1X,R2,1X,2F10.0)
```

```
(I2,I4,I5,1X,3A10,2I13,1X,R2,1X,/,2F14.6)
REST OF CETA DATA HERE
789
RUNEM
ZING,NEWMAP,DATA.  REPLACE TAPE 2 WITH DATA
CXIT.
EXIT.
DMP.
FIN.
PTSS,E.
CXIT.
EXIT.
FIN.
PTSS,E.
NOW GO RUNEM
QUIT.
REWIND,TAPE3.
COPYSBF,TAPE3,OUTPUT.
NOW GO QUIT
6789
[END OF JOB]
```

ZOOM

THIS COMMAND IS THE SAME HERE AS IN THE EDITOR.

UP, DOWN, LEFT, RIGHT

THESE COMMANDS ARE THE SAME AS IN THE EDITOR.

OK

THE CURRENT LOCATION OF THE CITY IS CONFIRMED AND THE NEXT CITY IS DISPLAYED IN THE COMMENTS (AND ON THE SCREEN IF A COORDINATE IS GIVEN). IF THERE ARE NO MORE CITIES, THE DIGITIZER RETURNS TO SELECT MODE.

EXIT

CONTROL RETURNS TO SELECT MODE WHERE YOU MAY CHOOSE YOUR OWN SET OF COUNTIES. THIS IS MOST USEFUL FOR POSITIONING MISCELLANEOUS DETAILS SUCH AS 'BALANCE OF STATE'. GOING TO

SELECT MODE AND RETURNING TO THE DIGITIZER DOES NOT ADVANCE THE CITY.

GRAPHIC CONSOLES

THE GRAPHIC CONSOLES ARE DESCRIBED IN SOME DETAIL IN THE GRAFPAC WRITEUP. THIS SECTION CLARIFIES SOME DETAILS WHICH ARE CONSOLE DEPENDENT.

VISTA 250

THE VISTA PRODUCES THREE KINDS OF INPUT - COORDINATE INPUT, MESSAGE INPUT (NOT USED), AND KEYBOARD INPUT. FOR THE SAKE OF STANDARDIZATION AMONG GRAPHIC DEVICES, COORDINATE INPUT IS THE STANDARD. KEYBOARD INPUT IS USED ONLY TO EXECUTE THE DEFAULT COMMAND. COORDINATE INPUT CAN BE PRODUCED BY THE TRACKING CROSS OR FROM DISPLAY AREAS ON THE SCREEN. EITHER TYPE OF INPUT CAN BE USED FOR COMMANDS OR DATA.

GT40

THE GT40 INTERFACES WITH THE TELETYPE SYSTEM, AND ALL INPUT IS IN THE FORM OF MESSAGES. COORDINATE INPUT IS DISTINGUISHED BY AN EXCLAMATION AS THE FIRST CHARACTER. THIS INPUT CAN BE PRODUCED BY POINTING TO A LIGHT SENSITIVE AREA ON THE SCREEN OR BY MOVING THE TRACKING CROSS AND DEPRESSING CONTROL A OR B. IN EITHER CASE THE PROGRAM CONVERTS THE COORDINATES TO OCTAL AND SENDS THEM WITH A CARRIAGE RETURN APPENDED. IN THE 6600 THIS INPUT IS CONVERTED TO COORDINATES IN THE PROPER SPACE. IF ANY OTHER INPUT IS RECEIVED, THE GRAPHIC ROUTINES WILL SEND THEM ON TO THE PROGRAM AS A MESSAGE. THE LIGHTPEN HIT INTERPRETER IN ZING DISTINGUISHES THREE KINDS OF MESSAGES. IF THE FIRST CHARACTER TYPED IN IS NOT A LETTER, THEN ZING ASSUMES A DECIMAL NUMBER HAS BEEN TYPED IN. IF A SINGLE LETTER IS RECEIVED, ZING ASSUMES THAT THE FIRST LETTER OF A COMMAND HAS BEEN TYPED. IF SEVERAL LETTERS ARE RECEIVED, ZING ASSUMES THAT A GRAFPEN HIT HAS BEEN RECEIVED.

TECTRONIX 4012

THE TEKTRONIX TERMINALS CAN PRODUCE ONLY COORDINATE INPUT WHEN INTERROGATED BY THE GRAPHIC ROUTINES. NO OTHER INPUT IS EVER RETURNED BY THE GRAFPAC INTERFACE.

APPENDIX C

A Users Guide To CARTE

Peter Wood

December, 1975

A USERS GUIDE TO CARTE

DECEMBER, 1975

COMMENTS AND QUESTIONS SHOULD BE DIRECTED TO

PETER WOOD, BLDG 50B, ROOM 2245, EXT 5228

TO GET A COPY OF THIS WRITEUP

LIBCOPY(CARTE,OUTPUT,GUIDE)

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INTRODUCTION

CARTE IS A PROGRAM FOR PRODUCING HIGH QUALITY THEMATIC MAPS ON MICROFICHE OR 35 MM MICROFILM. TWO CATEGORIES OF MAPPING ARE POSSIBLE -- ONE IS **CHOROPLETH** MAPPING WHERE THE SHADING CONFORMS TO GEOAREA OUTLINES SUPPLIED FROM A BASE MAP, THE OTHER IS **SYMBOL** MAPPING WHERE THE SHADING CONFORMS TO THE OUTLINES OF USER PLACED AND DEFINED SYMBOLS. TWO TYPES OF SHADING ARE POSSIBLE -- **CROSS-HATCH** SHADING FOR QUICK REFERENCE OR SINGLE-COLOR PRINTING, AND **MASK** SHADING FOR MULTI-COLOR PRINTING. THE PROGRAM OPERATES BY MATCHING SHADES GENERATED FROM A **DATA SET** OF NOMINAL, ORDINAL, OR INTERVAL DATA WITH AREAS FROM THE **BASE MAP** OR SYMBOL OUTLINES. A SET OF **DIRECTIVES** CONTROLS THE PROGRAM AND GIVES THE USER A WIDE RANGE OF OPTIONS IN DESIGNING THE GRAPHIC OUTPUT. THESE INCLUDE SUCH FEATURES AS SELECTION OF A PORTION OF A MAP TO BE DISPLAYED, PLACEMENT OF MAP, TITLES, AND LEGENDS, ARBITRARY OR AUTOMATIC SHADE ASSIGNMENT, AND EFFICIENT TABLE GENERATION. THIS USERS'S GUIDE THEN IS A DESCRIPTION OF HOW TO PREPARE MAPS AND TABLES USING CARTE . FOR MORE INFORMATION ON INTERNAL PROGRAM OPERATION SEE [1].

THE DIFFERENCES BETWEEN THE TWO CATEGORIES OF MAPPING ARE AS FOLLOWS -- CHOROPLETH INDICATES THE DISTRIBUTION OF ONE VARIABLE OVER MANY GEOAREAS, MORE OR LESS ACCURATELY REPRESENTED. IT IS DEPENDENT ON THE EXISTENCE OF A GEOGRAPHIC DATA BASE. SYMBOL INDICATES THE DISTRIBUTION OF ONE VARIABLE OVER MANY GEOAREAS OR LOCATIONS REPRESENTED ABSTRACTLY, AND THE DISTRIBUTION OF ANOTHER BY THE VARIOUS SYMBOL TYPES. SYMBOL MAPPING DOES NOT ALWAYS REQUIRE A GEOGRAPHIC DATA BASE AS SYMBOL LOCATIONS MAY BE INPUT WITH THE DATA SET AND SYMBOL OUTLINES AND MEANINGS ARE DEFINED THROUGH DIRECTIVES.

THERE IS A SEVEN STEP PROCESS WHICH SHOULD BE FOLLOWED WHEN PRODUCING A MAP. THESE STEPS ARE --

1. SELECT CHARACTERISTICS AND AREA TO BE MAPPED
2. PREPARE THE DATA SET(S)
3. PREPARE THE BASE MAP
4. DESIGN THE MAP AND TABLE
5. PREPARE THE DIRECTIVES
6. EXECUTE THE PROGRAM
7. REPEAT STEPS 4 TO 6 UNTIL MAP IS SATISFACTORY

THIS PROCEDURE IS ILLUSTRATED IN THE EXAMPLES AND EXPLAINED IN THE FOLLOWING SECTIONS.

PREPARING THE DATA SETS

AFTER SELECTING WHAT CHARACTERISTIC(S) TO DISPLAY ON A MAP(S), THE APPROPRIATE DATA SET(S) MUST BE PREPARED. THERE ARE 84 CHARACTERISTICS, BROKEN DOWN BY RACE, FROM THE 1970 CENSUS AVAILABLE FOR ANY AREA IN THE UNITED STATES (THE LEVELS OF AGGREGATION RANGE FROM CENSUS TRACT TO STATE TOTALS). THESE CHARACTERISTICS CAN BE AUTOMATICALLY MADE INTO DATA SETS FOR CARTE BY THE PROGRAM LOPSE. ALL OTHER TYPES OF DATA MUST BE PREPARED BY THE USER.

DATA SET STRUCTURE AND USE

A **DATA SET** CONSISTS OF A DESCRIPTIVE **HEADER CARD** AND A COLLECTION OF **DATA ITEMS** , FROM WHICH THE COLORS FOR THE MAP ARE GENERATED. THUS EACH DATA SET WILL OPTIMALLY HAVE THE SAME NUMBER OF DATA ITEMS AS THERE ARE SHADABLE AREAS ON THE MAP.

A **DATA ITEM** NORMALLY HAS THREE PARTS: ONE OR MORE KEYS (PRIMARILY FOR MATCHING THE DATA ITEM WITH AREAS OF THE MAP, VIA THE ***KEYS** DIRECTIVE); THE NAME OF THE AREA (FOR CHECKING DATA VALUES AND DISPLAY ON THE TABLE); AND A DATA VALUE (FOR GENERATING THE COLOR OF THE ASSOCIATED AREA ON THE MAP). MORE THAN ONE DATA VALUE CAN BE ENTERED, IF EXTRA DATA IS TO BE DISPLAYED IN THE TABLE, E.G., WHEN MAPPING THE PERCENT OF BLACKS IN AN AREA, IT IS SOMETIMES HELPFUL TO ALSO DISPLAY THE NUMBER OF BLACKS AND THE TOTAL POPULATION IN THE AREA. THIS CAPABILITY REQUIRES THAT THE DATA VALUE TO BE MAPPED BE EXTRACTED FROM THE DATA SET, WHICH IS DONE BY THE ***EXTRACT** DIRECTIVE.

THE SET OF DATA VALUES SPECIFIED BY THE ***EXTRACT** DIRECTIVE ARE TRANSFORMED INTO COLORS FOR SHADING THE MAP AS FOLLOWS. DIVISION POINTS FOR THE DATA ARE EITHER INPUT TO THE PROGRAM BY THE ***INTERVALS** DIRECTIVE OR ARE GENERATED BY THE PROGRAM ITSELF (WITH ONLY THE DESIRED NUMBER OF DIVISIONS SPECIFIED BY THE ***INTERVALS** DIRECTIVE). EACH DATA ITEM IS THEN ASSIGNED A COLOR ACCORDING TO THE INTERVAL, DEFINED BY THE DIVISION POINTS, IN WHICH ITS DATA VALUE FALLS. IN THE CASE OF NOMINAL DATA, SUCH AS FORESTS, WETLANDS, ETC., OR ORDINAL DATA, SUCH AS LOW, HIGH, THE COLORS ARE ASSIGNED BY MATCHING THE DATA VALUE WITH THE INPUT DIVISION POINTS. AN IMPORTANT SIDE EFFECT OF THIS PROCESS IS THAT THE DATA RANGES DEFINED BY THE DIVISION POINTS ARE DISPLAYED AS THE COLOR OR SHADE CODE OF THE MAP.

2.2 DATA SET FORMAT

EACH DATA SET COMPRISES ON LOGICAL RECORD AND BEGINS WITH A **HEADER CARD** WHICH DESCRIBES THAT DATA SET. THE HEADER CARD CONSISTS OF THE KEYWORD DATA BEGINNING IN COLUMN ONE SEPARATED BY A COMMA FROM A STRING OF UP TO 7 DESCRIPTORS IN FREE FORMAT (I.E. ALSO SEPARATED BY COMMAS). IN ORDER, THESE DESCRIPTORS, WITH DEFAULT VALUES INDICATED IN PARENTHESES, ARE: THE DATA SET NUMBER (0); THE NUMBER OF DATA ITEMS (0); THE NUMBER OF KEYS PER DATA ITEM (4); THE NUMBER OF COMPUTER WORDS NEEDED TO STORE AN ITEM NAME AT TEN CHARACTERS PER COMPUTER WORD (3); THE NUMBER OF DATA VALUES PER DATA ITEM (3); THE NUMBER OF COMPUTER WORDS NEEDED PER DATA VALUE (1), AND THE NUMBER OF FIELDS OF SYMBOL MAPPING INFORMATION (0). THE SIXTH DESCRIPTOR WILL BE DIFFERENT FROM ONE ONLY IF A NOMINAL OR ORDINAL DATA VALUE EXCEEDING TEN CHARACTERS IS TO BE ENTERED.

AFTER THE HEADER CARD IS DECODED, THE **DATA ITEMS** ARE INPUT TO CARTE BY A FORMATTED FORTRAN READ. THUS EACH DATA SET SHOULD BE IN BCD CARD IMAGE FORM. THE ACTUAL FORMAT OF A DATA ITEM (UNIFORM THROUGHOUT A DATA SET) MAY BE SPECIFIED BY USING THE ***FORMAT** DIRECTIVE. THE DEFAULT FORMAT IF (I3,I5,I4,I8,3A10,3F10.1) FOR 4 KEYS, 3 WORDS OF NAME, AND 3 DATA VALUES. FIGURE ONE SHOWS A SAMPLE DATA SET OF 4 DATA ITEMS IN THIS DEFAULT FORMAT.

PREPARING THE DATA SETS
DATA SET FORMAT

FIGURE ONE. SAMPLE CHOROPLETH MAP DATA SETS

DATA SET 1 CONSISTING OF 4 DATA ITEMS, EACH WITH 4 KEYS, 3 WORDS OF NAME, AND 3 DATA VALUES

THE DATA ITEM FORMAT IS (I3,I5,I4,I8,3A10,3F10.1)

EACH DATA SET FORMS A SEPARATE LOGICAL RECORD

```
COL
1

DATA,1,4,4,3,3,1          (DATA SET HEADER CARD)
  4     0    0       1COUNTY ONE--ARIZONA       100.    5.     3.1
  4     0    0       3COUNTY TWO--ARIZONA        99.    7.     7.3
  6     0    0       1COUNTY ONE--CALIFORNIA    203.   75.     4.5
  6     0    0       3COUNTY TWO--CALIFORNIA     75.   20.     2.1

     KEYS          NAME                    DATA VALUES
```

(PHOENIX DATA SET CONSISTING OF 233 DATA ITEMS)

```
DATA,   1,   233,   4,   3,   3,   1          (DATA SET HEADER CARD)
  4 6200   13   10100TONTO DIV          204.0     204.0     100.0
  4 6200   13   20200SALT RIVER DIV     994.0      83.0       8.4
  4 6200   13   30300SUN CITY (U)     7658.0    7621.0      99.5

       .  .    .    .    .    .    .    .

       .  .    .    .    .    .    .    .

       .  .    .    .    .    .    .    .

  4 6200   13   623200ST JOHNS DIV     814.0       0.        0.
  4 6200   13   723300GILA BEND       3469.0     236.0       6.8
```

DATA SETS FOR SYMBOL MAPPING

THE DIFFERENCES BETWEEN CHOROPLETH AND SYMBOL MAPPING ARE SIGNIFICANT AND SHOULD BE MADE EXPLICIT. IN CHOROPLETH MAPPING SHADES ARE GENERATED FOR EACH DATA ITEM IN THE DATA SET. THESE ARE THEN MATCHED WITH AREAS FROM THE MAPFILE VIA THE *KEYS DIRECTIVE SO EACH AREA RECEIVES ITS APPROPRIATE SHADE. DATA ITEM NAMES ARE NOT DISPLAYED ON THE MAP, UNLESS THEY ARE PART OF THE MAP ITSELF.

IN SYMBOL MAPPING SHADES ARE GENERATED FOR EACH DATA ITEM ALSO. EACH ITEM IS THEN ASSOCIATED WITH A SYMBOL BY A SYMBOL CODE. THE SYMBOL IS DRAWN AT AN XY COORDINATE SPECIFIED BY THE USER AND GIVEN ITS APPROPRIATE SHADE. XY COORDINATES CAN BE EASILY GENERATED FOR A DATA SET BY USING THE DIGITIZE MODE OF ZING [3]. IF NO XY COORDINATE IS SUPPLIED, THE PROGRAM WILL ATTEMPT TO GENERATE ONE FROM THE APPROPRIATE GEOAREA OF THE BASE MAP. ALSO, THE DATA ITEM NAME IS DRAWN TO THE RIGHT OR LEFT OF THE SYMBOL OR AT A USER SPECIFIED COORDINATE. THE ALLOWABLE SYMBOLS ARE DEFINED BY THE USER THROUGH DIRECTIVES (*U).

THUS SYMBOL MAPS REQUIRE MORE FIELDS OF INFORMATION THAN CHOROPLETH MAPS. THE NUMBER OF ADDITIONAL FIELDS CAN RANGE FROM ONE TO FIVE. THE SEVENTH PARAMETER ON THE DATA SET HEADER CARD SHOULD BE SET APPROPRIATELY

ADDITIONAL DATA SET STRUCTURE FOR SYMBOL MAPS

NO. FIELDS	COMPONENTS
1	SC
2	SC,LF
3	SC,SX,SY
4	SC,SX,SY,LF
5	SC,SX,SY,LX,LY

WHERE SC=SYMBOL CODE,LF=LABEL FLAG (0~RIGHT OF SYMBOL,1~LEFT), SX=SYMBOL ORIGIN X COORDINATE,SY=Y COORDINATE,LX=LABEL X COORDINATE, LY=YCOORDINATE. THE SYMBOL CODE SHOULD BE INPUT IN R FORMAT, THE LABEL IS THE DATA ITEM NAME, AND THE XYS SHOULD BE IN THE MAP FILE COORDINATE SYSTEM.

FIGURE SEVEN SHOWS A SAMPLE SYMBOL DATA SET.

PREPARING THE BASE MAP

THE BASE MAP FOR CARTE IS NORMALLY PREPARED BY THE EDITING PORTION OF LBL'S COMPUTER MAPPING SYSTEM, THE **MAPEDIT SYSTEM** . THE MAP SHOULD BE PREPARED IN MAPEDIT'S NICKEL FORMAT. THIS CONSISTS OF A SERIES OF BINARY RECORDS, EACH DESCRIBING ONE GEOGRAPHICAL AREA. THE STRUCTURE OF EACH RECORD IS AS FOLLOWS:

NO.DESCRIPTORS~DESCRIPTORS~CARTESIAN LIMITS~NO.LABELS~LABELS~NO.POINTS~POINTS

THE INCLUDE UP TO 9 GEOGRAPHICAL AREA CODES, FOLLOWED **DESCRIPTORS** BY OTHER CODES OF USE IN PROCESSING THE MAP. THE CODE DEFINITIONS IN ORDER ARE:

STATE
SMSA
URBAN AREA
COUNTY
PLACE
MCD (MINOR CIVIL DIVISION)
SCA (STANDARD CENSUS AREA)
TRACT
ED (ENUMERATION DISTRICT)
INSET NUMBER
PART (LETER SUFFIX FOR SPLIT TRACTS)
ISLAND POINTS
MAP SCALE (DIGITIZER SCALE)

THE DESCRIPTORS ARE USED IN MATCHING THE DATA SET WITH THE MAP (SEE THE *KEYS DIRECTIVE).

THE USER IS REFERRED TO THE MAPEDIT WRITEUP [2] FOR DETAILED INSTRUCTIONS ON HOW TO PREPARE THE MAP.

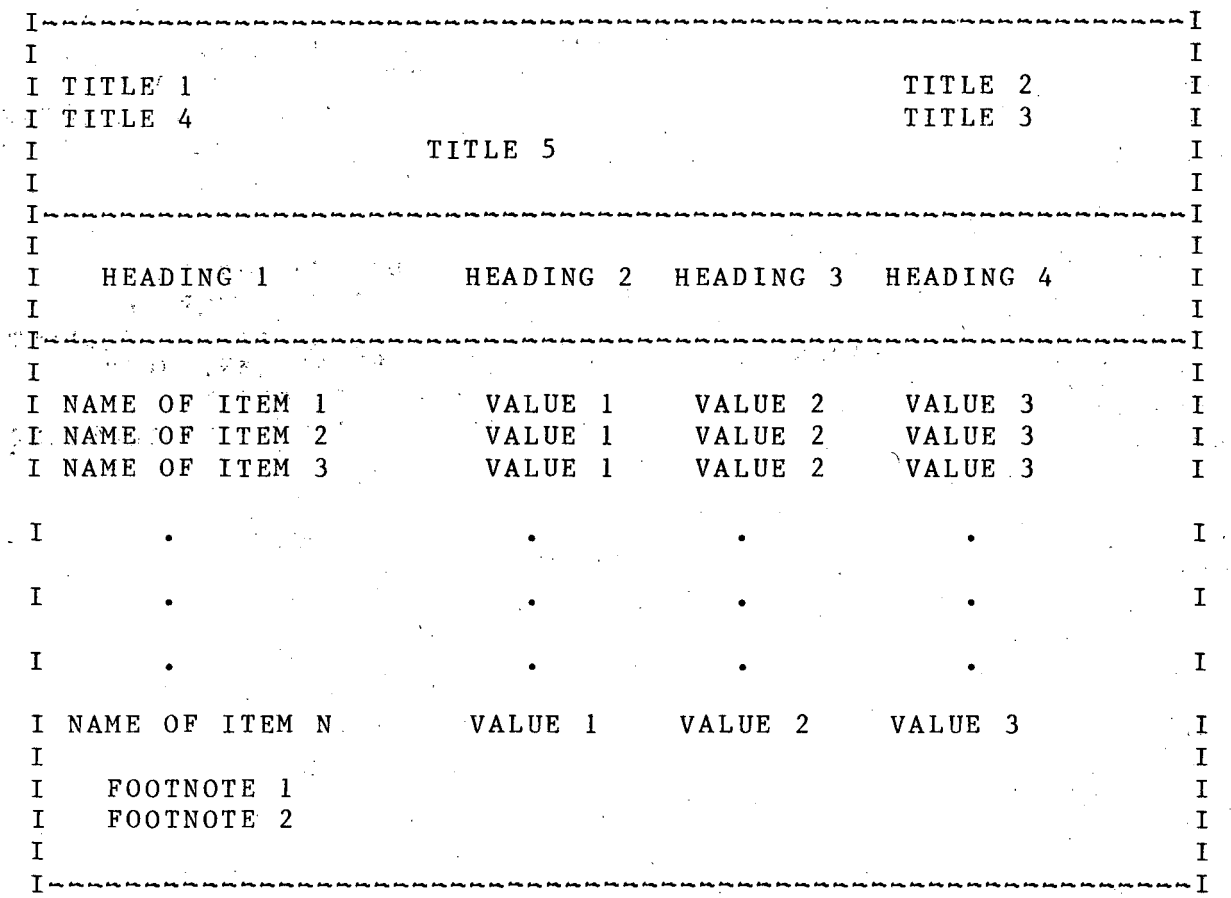
DESIGNING THE MAP AND TABLE

A THEMATIC **MAP** CONSISTS OF THE SHADED GEOGRAPHICAL AREAS PLUS DESCRIPTIVE INFORMATION SUCH AS TITLES AND LEGENDS. THE IMPACT OF A MAP DEPENDS UPON THE PLACEMENT AND INTEGRATION OF THESE ELEMENTS. CARTE ALLOWS EXACT SPECIFICATION OF BOTH THE MAP AND THE DESCRIPTIVE INFORMATION. HOWEVER, BEFORE THIS CAN BE DONE, IT IS NECESSARY TO BLOCK OUT THE MAP ON A GRID SO THE PLACEMENT OF THE ELEMENTS CAN BE INPUT TO THE PROGRAM. ANY CONVENIENT GRID CAN BE USED (VIA THE ***PICTURE SPACE** DIRECTIVE) AS CARTE ALLOWS THE USER TO DEFINE THE UNITS AND SHAPE OF THE SCREEN OR PICTURE SPACE. THIS STEP IS ILLUSTRATED IN THE EXAMPLES.

THE **TABLE** SHOULD ALSO BE BLOCKED OUT. TITLE SPECIFICATIONS SHOULD BE MADE IN PICTURE SPACE UNITS. THE PLACEMENT OF THE TABLE BODY AND FOOTNOTES ARE PROGRAM GENERATED. THIS ALLOWS THE PROGRAM TO PUT THE MAXIMUM AMOUNT OF INFORMATION PER PAGE. THE TABLE WILL DISPLAY THE NAME OF EACH DATA ITEM AND ITS DATA VALUES. THUS A COLUMN HEADING IS REQUIRED FOR THE ITEM NAMES AND FOR EACH DATA VALUE. FIGURE TWO SHOWS THE GENERAL STRUCTURE OF A TABLE.

FIGURE TWO. STRUCTURE OF A TABLE

TITLE PLACEMENT MAY BE SPECIFIED BY THE USER



DIRECTIVE FUNDAMENTALS

CARTE IS CONTROLLED THROUGH DIRECTIVES. THEY ARE THE MEANS OF COMMUNICATING MAP AND TABLE SPECIFICATIONS TO THE PROGRAM, AS WELL AS INDICATING THE TYPE OF MAP TO BE MADE AND HOW TO MATCH AREAS WITH DATA ITEMS.

THE **BASIC DIRECTIVE** CONSISTS OF AN ASTERISK IN COLUMN ONE FOLLOWED BY A KEYWORD INDICATING THE TYPE OF COMMAND BEING GIVEN. AN EXAMPLE IS ***GO** , A DIRECTIVE WHICH TELLS THE PROGRAM TO DRAW THE MAP AS HAS BEEN SPECIFIED. THE DIRECTIVE MAY REQUIRE THAT ONE OR MORE PARAMETERS FOLLOW THE KEYWORD, E.G., ***TITLES**,2 WHICH INDICATES THAT THE MAP IS TO HAVE TWO TITLES AND IMPLIES THAT THE TITLE TEXT WILL FOLLOW IMMEDIATELY.

SO THE PROGRAM EXPECTS SOME DIRECTIVES TO BE FOLLOWED BY **TEXT PACKETS.** THESE ARE COMPOSED OF A **HEADER CARD,** CONSISTING ONLY OF NUMERICAL PARAMETERS, AND AS MANY CARDS OF TEXT AS ARE NEEDED TO INPUT THE TEXT. THE FIRST TWO PARAMETERS OF A HEADER CARD ARE AN INDEX NUMBER AND THE NUMBER OF CARDS OF TEXT THAT FOLLOW. THESE TWO PARAMETERS ARE ALWAYS REQUIRED. A COMPLETE ***TITLES** DIRECTIVE MIGHT BE AS FOLLOWS --

```
*TITLES,2
1,1  (TITLE 1, 1 CARD OF TEXT, DEFAULT PLACEMENT
LAWRENCE BERKELEY LABORATORY
2,1  (TITLE 2, 1 CARD OF TEXT, DEFAULT PLACEMENT
MAP ONE. DISTRIBUTION OF AMERICAN INDIANS
```

PLEASE NOTE THAT --

1. ALL KEYWORDS MAY BE ABBREVIATED, ONLY THE FIRST LETTER IS CHECKED.

2. ALL PARAMETERS ARE IN FREE FORMAT, SEPARATED FROM EACH OTHER AND KEYWORDS BY A COMMA.

3. COMMENTS MAY TERMINATE A PARAMETER STRING, PROCESSING STOPS AT NON-NUMERIC DATA.

4. ALL BLANKS EXCEPT ONE WILL BE STRIPPED FROM THE END OF A TEXT CARD. TEXT INPUT ALWAYS BEGINS WITH COLUMN ONE.

ONCE SPECIFIED, A DIRECTIVE REMAINS IN FORCE UNTIL CHANGED BY THE USER. THE SOLE EXCEPTION IS THAT THE TABLE MUST BE REQUESTED EACH TIME BY THE ***REPORT** DIRECTIVE. THE PRESERVATION OF PREVIOUS SPECIFICATIONS MEANS THAT AFTER THE FIRST MAP HAS BEEN DRAWN, VERY FEW DIRECTIVES ARE NEEDED TO DESCRIBE SUCCEEDING MAPS. SUPPOSE THAT ON A SECOND MAP THE USER DESIRES ONLY TO CHANGE THE TEXT OF THE SECOND TITLE. THE TITLE DIRECTIVE WOULD BE AS FOLLOWS --

```
*TITLES,2    (STILL 2 TITLES
2,1    (REPLACE TITLE 2 WITH THE FOLLOWING 1 CARD OF TEXT
MAP TWO:  PERCENT BELOW POVERTY
```

PREPARING THE DIRECTIVES
DIRECTIVE FUNDAMENTALS

A COMPLETE DESCRIPTION OF EACH DIRECTIVE IS GIVEN IN THE FOLLOWING SECTIONS. THE DIRECTIVES HAVE BEEN DIVIDED INTO FIVE GROUPS -- THOSE OF A GENERAL NATURE, THOSE DESCRIBING THE DATA, THE MAP, THE TABLE, AND THE SYMBOLS. FIGURE THREE LISTS THE DIRECTIVES IN EACH GROUP.

IT SHOULD BE NOTED THAT SOME DIRECTIVES MUST FOLLOW OTHERS FOR THE PROGRAM TO OPERATE PROPERLY. *OUTLINE SHOULD FOLLOW *KEYS, *ZOOM AND ALL DIRECTIVES DESCRIBING MAP, TITLE, AND LEGEND PLACEMENT SHOULD FOLLOW THE *PICTURE SPACE DIRECTIVE.

FIGURE THREE. THE DIRECTIVES GROUPED BY SECTION

GENERAL DIRECTIVES
- *GO
- *KEYS
- *MAPTYPE
- *CONSTANTS
- *WATCH

DATA DIRECTIVES
- *DATA
- *EXTRACT
- *FORMAT
- *INTERVALS

MAP DIRECTIVES
- *PICTURE SPACE
- *XYMAP SPACE
- *ZOOM
- *TITLES
- *LEGEND
- *OUTLINE
- *ARROW (NOT IMPLEMENTED)
- *BOXES
- *SCALE (NOT IMPLEMENTED)

TABLE DIRECTIVES
- *REPORT
- *HEADINGS
- *NOTES

SYMBOL DIRECTIVES
- *USER DEFINED SYMBOL
- *VERTICAL SYMBOL LEGEND

GENERAL DIRECTIVES

1. ***GO,(MAP PAGE #)** THIS DIRECTIVE TELLS THE PROGRAM THAT THE MAP IS FULLY SPECIFIED, AND THAT MAP PRODUCTION SHOULD NOW BE ATTEMPTED. THE OPTIONAL MAP PAGE # (INTEGER) WILL APPEAR ON ALL FRAMES OF THE MAP BEING DRAWN. DEFAULT -- *GO,1

2. ***KEYS,KEYDAT1=KEYMAP1,KEYDAT2=KEYMAP2,...,KEYDAT4=KEYMAP4.** THIS DIRECTIVE INDICATES HOW TO MATCH THE DATA WITH THE MAP. UP TO FOUR KEY PAIRS MAY BE SPECIFIED. THE FIRST ELEMENT OF EACH PAIR IS THE DATA KEY NUMBER TO BE USED, THE SECOND ELEMENT IS THE MAP KEY NUMBER TO BE USED. SEE SECTION THREE FOR THE MEANING OF MAP KEYS (DESCRIPTORS).

THE FIRST DATA KEY SPECIFIED HAS AN ADDITIONAL USE. KEY VALUES OF ZERO ARE EXCELUDED FROM THE HISTOGRAM, ARE NOT SHADED ON THE MAP, AND ARE SET OFF FROM OTHER ELEMENTS IN THE TABLE. TYPICALLY, SUCH DATA ITEMS ARE STATE TOTALS WHEN COUNTIES ARE BEING MAPPED. DEFAULT -- *KEYS,1=1

3. ***MAPTYPE,SHADING TYPE, MAP TYPE** SHADING TYPE EQUALS HATCH OR MASK. HATCH PUTS THE ENTIRE MAP ONE ONE FRAME, WHILE MASK PRODUCES ONE FRAME FOR THE TITLING INFORMATION AND AREA OUTLINES, AND ONE FOR EACH SHADE.

MAP TYPE EQUALS CHOROPLETH OR SYMBOL. CHOROPLETH COMPLETELY SHADES POLYGONS FROM THE MAP FILE, SYMBOL SHADES ONLY USER DEFINED SYMBOLS FROM THE DATA FILE.

LIMIT -- 8 SHADES FOR CROSS HATCH, 20 FOR MASK

DEFAULT -- *MAPTYPE,MASK,CHOROPLETH

4. ***CONSTANTS,C1,C2,C3,...,C12** CHANGES DEFAULTS FOR UP TO TWELVE CONSTANTS. THE ORDER IS IMPLICIT, SO A NEW VALUE FOR CONSTANT THREE MUST BE PRECEDED BY THREE COMMAS.

C1--MINIMUM VISIBLE MAP LABEL SIZE. ZERO SUPPRESSES ALL LABELS.
C2--RELATIVE SIZE FOR AUTOMATICALLY CENTERED AREA LABELS.
C3--MINIMUM TABLE CHARACTER SIZE
C4--DATA SUPPRESSION VALUE (GETS ASTERISK IN TABLE)
C5--MAXIMUM NUMBER OF DIGITS ALLOWED IN GENERATED SHADE CODE
C6--MAXIMUM RANGE OF NUMBERS ALLOWED IN GENERATED SHADE CODE
C7--MINIMUM LEGEND CHARACTER SIZE
C8--MINIMUM SHADE CODE CHARACTER SIZE
C9--MAXIMUM NUMBER OF SHADE LINE CUT POINTS
C10--MAP DESCRIPTOR NUMBER WHICH IF ZERO, THAT AREA IS NOT TO BE SHADED. IF C10 IS LESS THAN 0, NO SHADING WILL BE DONE. IF C10 = -1, THEN NO SHADING AND NO SYMBOL CLIPPING
C11--MAP COMPOSITION INDICATOR. 1=OUTLINES AND TITLES ON SAME FRAME 2=SEPARATE OUTLINES AND TITLES, 3=DO BOTH
C12--SHADE TO BE ASSIGNED MAP AREAS NOT MATCHING DATA ITEMS

DEFAULT -- *CONSTANTS,7,1,1,-1.0,2,3,1,1,10,0,1,1

5. ***WATCH,K1,K2,...,KN** PRINT ADDITIONAL INFORMATION ABOUT PROGRAM

OPERATIONS AS SELECTED BY THE KEYWORDS. KEYWORDS MAY BE ENTERED IN ANY ORDER. THEY ARE:

ARRAYS GIVES EXECUTION TIME SIZE AND INDICATES STATUS CHANGES OF MAJOR ARRAYS
BINS DISPLAYS DATA DISTRIBUTION OVER 100 BINS AND COLORS AS ASSIGNED IN DATA ITEM ORDER
COLORS DISPLAYS AREA AND ITEM MATCHING AND COLORS IN AREA ORDER
DATA ECHOES ALL DATA ITEMS AS READ
LABELS DISPLAYS RESULTS OF ATTEMPTS AT CENTERING AREA LABELS AUTOMATICALLY
MAP ECHOES MAP DESCRIPTORS AND FIRST LABEL OF EACH AREA
REPORT DISPLAYS SUMMARY OF PROGRAM GENERATED TABLE FORMAT
TITLES DISPLAYS RESULTS OF ATTEMPTS AT MAP TITLE PLACEMENT AND LEGEND BOX CONSTRUCTION
ZERO TURNS OFF ALL KEYWORDS

ALL KEYWORDS MAY BE ABREVIATED TO THEIR FIRST LETTER. FOR DESCRIPTIONS OF KEYWORD OUTPUT SEE SECTION 8.2.

DATA DIRECTIVES

1. ***DATA,N** USE DATA SET NUMBER N FOR THE NEXT MAP. DEFAULT -- USE NEXT DATA SET ON FILE DATA.

2. ***EXTRACT,N** USE THE NTH COLUMN OF DATA VALUES TO SHADE THE MAP. DEFAULT -- *EXTRACT,3

3. ***FORMAT,(FORMAT)** READ THE DATA ITEMS IN THE FOLLOWING FORMAT. KEYS SHOULD BE IN I FORMAT, NAMES IN A FORMAT, AND DATA VALUES IN F FORMAT. FIFTY CHARACTER LIMIT. DEFAULT -- *FORMAT,(I3,I5,I4,I8,3A10, 3F10.1)

4. ***INTERVALS,D1,D2,D3,...,DN** USE THESE DIVISION POINTS TO ASSIGN COLORS TO THE DATA ITEMS. DIVISION POINTS MAY BE REAL OR INTEGER NUMBERS, OR WORDS. DATA VALUES SHOULD BE NUMBERS OR WORDS, RESPECTIVELY. IF ONLY ONE DIVISION POINT IS ENTERED, THE PROGRAMS ASSUMES IT IS THE NUMBER OF DIVISION POINTS (REQUIRED TO BE 2 OR MORE) IT SHOULD TRY TO GENERATE. NUMBERS ARE SEPARATED BY COMMAS, WHILE CHARACTER DIVISION POINTS ARE SEPARATED BY A USER-DEFINED BREAK CHARACTER. THIS CHARACTER SHOULD IMMEDIATELY FOLLOW THE COMMA AFTER THE KEYWORD INTERVALS, E.G.

```
*INTERVALS,/STATEWIDE/COUNTYWIDE/BY CITY/
```

THE DIVISION POINTS BECOME THE SHADE CODE DISPLAYED ON THE MAP, EXCEPT WHEN 2 *INTERVALS DIRECTIVES HAVE BEEN ENCOUNTERED ,THE FIRST ONE BEING ALPHANUMERICS, THE SECOND NUMBERS. IN THIS CASE THE ALPHANUMERICS BECOME THE SHADE CODE, WHILE THE COLORS ARE ASSIGNED ON THE BASIS OF THE NUMBERS. DEFAULT -- *INTERVALS,8

MAP DIRECTIVES

1. ***PICTURE SPACE,XMIN,XMAX,YMIN,YMAX** USE THESE VALUES TO DEFINE THE LIMITS OF THE FULL SCREEN OR PICTURE SPACE. IF THE RANGES ARE NOT EQUAL, ADJUST THE ALLOWABLE PICTURE OR FRAME TO THE RECTANGLE DEFINED BY THE RATIO OF X TO Y RANGE. DEFAULT -- *PICTURE SPACE,0,4095,0,4095

2. ***XYMAP SPACE,XMIN,XMAX,YMIN,YMAX** USE THESE VALUES TO DEFINE THE PORTION OF THE PICTURE SPACE ALLOWED FOR THE MAP.
DEFAULT -- *XYMAP SPACE,0,4095,0,4095

3. ***ZOOM,LONGMIN,LONGMAX,LATMIN,LATMAX , TYPE** TYPE = 0 -- ZOOM IN ON THE AREA OF THE INPUT MAP DEFINED BY THESE COORDINATES. ONLY THAT PORTION WITHIN THE GIVEN RECTANGLE WILL APPEAR IN THE SCREEN MAP SPACE. BORDER LINE AREAS WILL BE CLIPPED TO FIT THE RECTANGLE. TYPE = 1 -- DISPLAY ONLY AREAS TOTALLY WITHIN THE ZOOM BOX. TYPE = -1 -- DISPLAY ONLY AREAS NOT TOTALLY WITHIN THE ZOOM BOX.
DEFAULT -- PUT THE ENTIRE MAP FILE IN THE SCREEN MAP SPACE

4. ***TITLES,N** DRAW N TITLES IN THE PICTURE SPACE. THIS DIRECTIVE WILL EXPECT N TEXT PACKETS TO FOLLOW, ALTHOUGH NONE ARE REQUIRED. THE HEADER CARD FOR TITLE TEXT PACKETS HAS THE FOLLOWING PARAMETERS --

INDEX NUMBER, NO. TEXT CARDS, CHARACTER SIZE,XMIN,XMAX,YMIN,YMAX

THE CHARACTER SIZE MAY RANGE FROM 1 (SMALLEST) TO 4. THE LAST FOUR PARAMETERS DEFINE A BOX IN PICTURE SPACE WITHIN WHICH THE TITLE MUST FIT. THE TITLE WILL BE CENTERED HORIZONTALLY IN THIS SPACE, AND BROKEN INTO AS MANY LINES OF TEXT AS NECESSARY IF IT WILL NOT FIT ON ONE LINE. THE PROGRAM WILL NOT EXCEED THE LIMITS OF THE BOX, EVEN IF IT HAS TO CUT SHORT THE TEXT. DEFAULT --

```
*TITLES,1
1,1,4,0,4095,4000,4095
MAP ONE
```

LIMIT -- 25 TITLES OF 120 CHARACTERS EACH

5. ***LEGEND,N,XMIN,XMAX,YMIN,YMAX** DRAW N LEGENDS AND THE SHADE CODE WITHIN THE BOX IN PICTURE SPACE DEFINED BY THE LAST FOUR PARAMETERS. THIS DIRECTIVE EXPECTS N TEXT PACKETS TO FOLLOW. THE HEADER CARD PARAMETERS ARE --

INDEX NUMBER, NO. TEXT CARDS, MAXIMUM CHARACTER SIZE

```
DEFAULT - *LEGEND,1,0,4095,0,425
          1,1,2
          LEGEND
```

LIMIT -- 2 LEGENDS OF 80 CHARACTERS EACH

6. ***OUTLINE,S0(A,B,C,D)X,S1(A,B,C,D)X,...,S4(A,B,C,D)X** THROUGH THIS DIRECTIVE THE OUTLINES OF AN AREA FROM THE MAP FILE CAN BE SUPPRESSED (S0) OR DRAWN IN ONE OF FOUR WIDTHS (S1 - S4). THE LETTERS WITHIN PARENTHESES ARE MAP DESCRIPTOR VALUES. THEY MUST AGREE IN ORDER AND NUMBER WITH THE MAP KEYS SPECIFIED ON THE *KEYS DIRECTIVE.

EITHER SPECIFIC VALUES OR A -1 (INDICATING ANY VALUE IS ACCEPTABLE) MAY BE ENTERED. THE LINE WIDTH CHOSEN IS THE ONE WHICH MOST NEARLY MATCHES. THE X IF SPECIFIED (SOME NUMBER) WILL ALLOW AREA LINES TO BE DRAWN ONLY IN ONE DIRECTION.

DEFAULT -- *OUTLINE,S1(-1)

7. ***ARROW,X1,Y1,X2,Y2** DRAW AN ARROW POINTING FROM (X1,Y1) TO (X2, Y2). THE ARROW HEAD WILL APPEAR AT POINT TWO. COORDINATES ARE IN PICTURE SPACE UNITS.

8. ***BOXES,N,X1,Y1,X2,Y2,...,XN,YN** THESE PICTURE SPACE COORDINATES DESCRIBE FIGURE I WHICH IS TO BE DRAWN ON EACH MAP, E.G., A BOX AROUND AN INSET. IF POINT INPUT NEEDS MORE THAN ONE CARD, END THAT CARD WITH A Y VALUE FOLLOWED BY //. LIMIT - 10 FIGURES TOTALLING 100 POINTS.

9. ***SCALE,W,U,X1,Y1** DRAW A MAP SCALE CENTERED AT PICTURE SPACE POINT (X1,Y1). W IS THE HORIZONTAL WIDTH IN MAP COORDINATES (LONGITUDE) AND U IS A WORD DESCRIBING THE UNITS OF MEASUREMENT (MILES).

TABLE DIRECTIVES

1. *REPORT,N,(PAGE NO),(COLUMN TO BE USED IN CALCULATING VERTICAL PERCENTAGE), (TOTAL DIGITS),(DIGITS TO RIGHT OF DECIMAL POINT) THIS DIRECTIVE INSTRUCTS THE PROGRAM TO ATTEMPT TO MAKE A TABLE OF THE DATA ITEMS FOR THE CURRENT MAP AND INDICATES THAT THERE WILL BE N TITLES ON THE TABLE. THE PROGRAM EXPECTS N TEXT PACKETS TO FOLLOW. THE HEADER CARDS FOR THE TEXT PACKETS HAVE THE SAME PARAMETERS AS THOSE FOR THE *TITLES DIRECTIVE. THE OPTIONAL EXTRA PARAMETERS ALLOW THE USER TO INSTRUCT THE PROGRAM TO CALCULATE A VERTICAL PERCENTAGE OF ANY COLUMN OF HIS DATA VALUES AND APPEND IT AS AN ADDITIONAL COLUMN IN THE TABLE. THE VALUE FROM THE FIRST DATA ITEM WILL BE USED AS THE TOTAL. THE USER SPECIFIES THE COLUMN FORMAT (AS IN FORTRAN'S F FORMAT).
DEFAULT -- *REPORT,1,1,0,0,0 (IF REPORT IS REQUESTED)
1,1,4,0,4095,4000,4095
TABLE ONE

LIMIT -- 8 TITLES OF 100 CHARACTERS EACH

2. *HEADINGS,N THERE WILL BE N COLUMN HEADINGS IN THE TABLE, AND UP TO N TEXT PACKETS FOLLOW. THE PROGRAM REQUIRES AT LEAST ONE COLUMN HEADING FOR EACH COLUMN OF THE TABLE. ASSUMING THE CONFIGURATION IN FIGURE TWO, TEXT PACKETS INDEXED ONE TO FOUR WOULD FORM THE HEADINGS FOR THE COLUMNS OF THE TABLE. THE HEADER CARD PARAMETERS FOR THESE HEADINGS ARE --

INDEX NUMBER, NO. TEXT CARDS, COLUMN TYPE

COLUMN TYPE INDICATES THE DATA TYPE FOR THAT COLUMN OF THE TABLE.(1 IMPLIES CHARACTER DATA, 2 NUMERIC DATA). THERE MAY BE MORE HEADINGS THAN COLUMNS IN THE TABLE. THESE EXTRA HEADINGS ARE EXPECTED TO SPAN MORE THAN ONE COLUMN OF THE TABLE. THE PARAMETERS OF THE HEADER CARDS FOR SUCH HEADINGS ARE --

INDEX NUMBER, NO. TEXT CARDS, COLUMN STARTS OVER, COLUMN ENDS OVER

DEFAULT -- 4 COLUMN TABLE WITH 4 HEADINGS

```
*HEADINGS,4
1,1,1
HEADING ONE
2,1,2
HEADING TWO
3,1,2
HEADING THREE
4,1,2
HEADING FOUR
```

LIMIT -- 10 HEADINGS OF 60 CHARACTERS EACH

3. *NOTES,N PUT N FOOTNOTES AT THE BOTTOM OF THE TABLE. THE PROGRAM EXPECTS N TEXT PACKETS TO FOLLOW. THE HEADER CARD PARAMETERS ARE --

INDEX NUMBER,NO.TEXT CARDS,TYPE NUMBER, TYPE ELEMENT NUMBER

A FOOTNOTE CAN BE BOUND TO AN ELEMENT OF A CERTAIN TYPE. THE TYPES ARE:

0 -- NOTHING (DEFAULT)
1 -- TITLE
2 -- HEADING
3 -- NAME

THE TYPE ELEMENT NUMBER IS AN INDEX NUMBER FOR TITLES AND HEADINGS, OR A SEQUENCE NUMBER FOR DATA ITEM NAMES. THUS 1,1,1,1 BINDS THE FIRST FOOTNOTE TO THE FIRST TITLE, WHILE 1,1,3,1 BINDS THE FIRST FOOTNOTE TO THE NAME OF THE FIRST DATA ITEM. FOOTNOTES APPEAR AT THE BOTTOM OF THE TABLE NUMBERED BY THEIR INDEX NUMBER. IF A FOOTNOTE IS BOUND TO A TITLE, HEADING, OR NAME, THE INDEX NUMBER OF THE FOOTNOTE APPEARS AS A SUPERSCRIPT AFTER THE APPROPRIATE TITLE, HEADING, OR NAME.

DEFAULT -- NO FOOTNOTES

LIMIT -- 6 FOOTNOTES OF 100 CHARACTERS EACH

SYMBOL DIRECTIVES

1. ***USER DEFINED SYMBOL,CODE,TEXT,N OR N,X1,Y1,X2,Y2,...,XN,YN** THIS DIRECTIVE DEFINES A SYMBOL TO BE PLOTTED AT COORDINATES SPECIFIED OR IMPLIED FROM THE DATA FILE, MATCHED WITH DATA ITEMS BY THE CODE, AND WHOSE MEANING IS DEFINED BY THE TEXT. THE CODE CAN BE UP TO TEN CHARACTERS AND IS PACKED WITH LEADING ZEROES. THE TEXT CAN BE UP TO THIRTY CHARACTERS LONG.

IF N IS A NEGATIVE NUMBER A CIRCLE IS GENERATED WITH RADIUS OF -N. OTHERWISE N IS THE NUMBER OF POINTS IN THE FIGURE. THE POINTS MUST BE CLOCKWISE FOR OUTER EDGES OF SYMBOLS AND COUNTER-CLOCKWISE FOR INNER EDGES OF SYMBOLS (THESE ARE DISTINGUISHED BY CLOSING THE OUTER EDGE AND CONCATENATING THE CLOSED INNER EDGE ALL WITHIN THE TOTAL POINT COUNT).

THE POINTS DESCRIBE A FIGURE CENTERED AT (0,0) . THE ACTUAL CENTERS COME FROM THE DATA ITEMS.

ALSO THE FIRST POINT SHOULD BE THE FURTHEST AWAY FROM (0,0) AS IT IS USED TO CALCULATE THE SYMBOLS RADIUS. THE MAXIMUM PERMISSIBLE RADIUS IS 400 OR ONE TENTH OF THE FULL SCREEN.

POINTS CAN BE CONTINUED ON MORE THAN ONE CARD IN THE SAME MANNER AS USED BY THE *BOXES DIRECTIVE. ONE *U DIRECTIVE IS REQUIRED TO DEFINE EACH USER SYMBOL.

LIMIT -- TEN SYMBOLS

DEFAULT -- NO SYMBOLS

2. ***VERTICAL SYMBOL LEGEND,N,XMIN,XMAX,YMIN,YMAX** THIS DIRECTVE DEFINES THE SPACE FOR A SYMBOL LEGEND IN THE SAME MANNER AS THE *LEGEND DIRECTIVE. THE SYMBOLS ARE DRAWN AT ACTUAL SIZE. ONLY A VERTICAL LEGEND BOX IS POSSIBLE.

LIMIT -- TWO LEGENDS OF 80 CHARACTERS EACH

DEFAULT -- NONE

EXECUTING THE PROGRAM

CARTE, AS IMPLEMENTED AT LBL, RUNS ON THE 7600 AND REQUIRES 70000B WORDS OF CORE TO START. TO COMPLETE A JOB, THREE INPUT FILES MUST BE PREPARED, THE PROGRAM FETCHED AND EXECUTED, AND THE OUTPUT FILE(S) DISPOSED TO MICROFICHE OR 35MM MICROFILM. THE PROGRAM WILL GET BOTH SMALL AND LARGE CORE MEMORY AS IT IS REQUIRED.

THE INPUT FILES CONTAIN THE DATA, THE MAP, AND THE DIRECTIVES. DATA SHOULD BE ON THE FILE DATA, THE MAP ON MAP, AND THE DIRECTIVES ON INPUT. BOTH DATA AND MAP ARE REWOUND BY THE PROGRAM BEFORE EXECUTION.

THE PROGRAM RESIDES IN PSS LIBRARY CARTE AS SUBSET CARTLGO. IT MAY BE FETCHED BY THE FETCHPS CONTROL CARD.

THE MAP IS CREATED ON THE OUTPUT FILE FILM. THE MAP IS PRODUCED AS ONE OR MORE FRAMES WHOSE NAMES RANGE FROM COLOR1 TO COLORN. N IS THE NUMBER OF DIVISIONS OF THE DATA. COLOR1 ALWAYS CONTAINS AT LEAST THE MAP OUTLINE AND LABELS AND THE TABLE FRAMES. COLOR2-N CONTAIN ONLY SHADING. THE DIFFERENT FRAMES OF FILM WILL BE COMBINED BY THE PRINTING PROCESS TO PRODUCE A MULTI-COLOR MAP.

FILM CAN BE DISPOSED TO MICROFILM OR MICROFICHE. SINCE THE MAP OUTPUT FILES ARE WRITTEN IN THE META LANGUAGE, THE MODE ON THE DISPOSE CARD MUST BE SET TO META (M=ME). A COMPLETE CONTROL CARD SEQUENCE FOR MAKING MAPS IS GIVEN BELOW --

```
MAP,,,70000.ACCTNO,NAME
FETCHMT(DATA,LIBNO)
FETCHMT(MAP,LIBNO)
FETCHPS(CARTE,CARTE,CARTLGO)
CARTE.
DISPOSE(FILM=MF,M=ME)
```

THE FIRST FRAME OF EVERY CARTE RUN IS A TEST FRAME FOR THE COM. EACH FRAME OF THE MAP WILL BE LABELED BY ITS COLOR NAME AND A SEQUENCE NUMBER. THE TABLE FRAMES ARE LABELED BY ONLY A SEQUENCE NUMBER. (THESE SEQUENCE NUMBERS SHOULD BE PAGE NUMBERS OF THE FINAL ATLAS SUPPLIED BY THE USER THROUGH THE *GO AND *REPORT DIRECTIVES). EACH MAP IN A SERIES IS MADE BY COMBINING ALL THE FRAMES WITH THE SAME SEQUENCE NUMBER. THE TABLE FOR EACH MAP PRECEDES ITS FRAME ON COLOR1.

CARTE ALSO PRODUCES SOME PRINTED OUTPUT. THE STANDARD OUTPUT INCLUDES - THE DIRECTIVES AS READ BY THE PROGRAM; THE ELAPSED TIME; THE LIMITS OF THE INPUT AND DRAWN MAP; A HISTOGRAM OF THE DATA; THE NUMBER OF UNMATCHED AREAS; AND TERMINATION INFORMATION.

EXAMPLES

THIS SECTION CONTAINS EXAMPLES OF HOW TO MAKE MAPS USING CARTE. THESE EXAMPLES ARE NECESSARILY LIMITED IN SCOPE, BUT USERS ARE ENCOURAGED TO EXTEND AND APPLY THEM TOWARDS THEIR OWN MAPMAKING EFFORTS.

A FIRST MAP

A MAP OF THE DISTRIBUTION OF AMERICAN INDIANS IN PHOENIX, ARIZONA IS DESIRED. THIS IS ONE OF THE CHARACTERISTICS AVAILABLE FROM THE 1970 CENSUS, SO THE DATA SET IS PREPARED BY USING THE PROGRAM LOPSE. A BASE MAP OF PHOENIX, COMPOSED OF 233 CENSUS TRACTS, IS PREPARED USING MAPEDIT. THEN THE MAP IS DESIGNED. FIGURE FOUR SHOWS THE MAP BLOCKED OUT ON A GRID. NEXT, THE DIRECTIVES ARE PREPARED.

FIRST THE GENERAL DIRECTIVES ARE MADE. THE CENSUS TRACT NUMBERS ARE THE FOURTH KEY IN THE DATA SET PREPARED BY LOPSE AND THE EIGHT KEY IN THE NICKEL FILE PRODUCED BY MAPEDIT. THUS THE FOURTH KEY FROM THE DATA AND THE EIGHTH KEY FROM THE MAP FORM A KEY PAIR. NO OTHER KEY PAIRS ARE NEEDED BECAUSE EACH TRACT NUMBER FOR PHOENIX IS UNIQUE. THE MAPTYPE MUST ALSO BE SELECTED. ALTHOUGH A MULTI-COLOR MAP IS DESIRED, IT IS PREFERRABLE AT THIS STAGE TO MAKE CROSS-HATCH MAPS BECAUSE THE WHOLE MAP WILL BE ON ONE FRAME. THUS IT WILL BE EASIER TO ASSESS THE IMPACT OF THE MAP AS A WHOLE. THE DIRECTIVE FILE SO FAR IS --

```
*KEYS,4=8
*MAPTYPE,HATCH
```

NEXT DIRECTIVES DESCRIBING THE DATA ARE PREPARED. IN THIS CASE, THE DEFAULT VALUES ARE SUFFICIENT. THE DATA SET FROM LOPSE WAS PREPARED IN CARTE'S DEFAULT FORMAT, THE THIRD DATA VALUE FROM THIS FIRST DATA SET IS TO BE MAPPED, AND, SINCE THE DISTRIBUTION OF THE DATA IS UNKNOWN, THE PROGRAM WILL BE ALLOWED TO GENERATE THE DIVISION POINTS FOR THE DATA.

NOW THE MAP IS DESCRIBED. THE PICTURE SPACE UNITS ARE SET AS 0 TO 1200. THE MAP IS CENTERED IN THE PICTURE SPACE, BUT ROOM IS LEFT AROUND THE EDGES FOR TITLES AND A LEGEND. THE TITLES AND THE LEGEND ARE ALSO TRANSLATED INTO DIRECTIVES. THUS ADDED TO THE DIRECTIVE FILE ARE --

```
*PICTURE SPACE,0,1200,0,1200
*XYMAP SPACE,200,1000,200,1000
*LEGEND,1,0,200,0,500
1,1
BY CENSUS TRACT
*TITLES,4
1,1,4,0,1200,1100,1200 (CENTERED HORIZONTALLY ON THE SCREEN)
MAP ONE
2,1,4,0,1200,1000,1100
DISTRIBUTION OF AMERICAN INDIANS
3,1,3,600,1200,100,200 (CENTERED IN THE RIGHT HALF OF THE SCREEN)
US DEPARTMENT OF LABOR
4,1,3,600,1200,0,100
LAWRENCE BERKELEY LABORATORY
```

THE MAP HAS BEEN COMPLETELY SPECIFIED. WITH THE ADDITION OF A *GO DIRECTIVE, THE FIRST PASS MAP OF PHOENIX CAN BE PRODUCED. FIGURE FIVE SHOWS THE COMPLETE JOB NECESSARY TO GENERATE THIS MAP.

FIGURE FOUR. AN EXAMPLE OF MAP DESIGN

A SQUARE PICTURE SPACE RANGING FROM 0 TO 1200 IS DEFINED

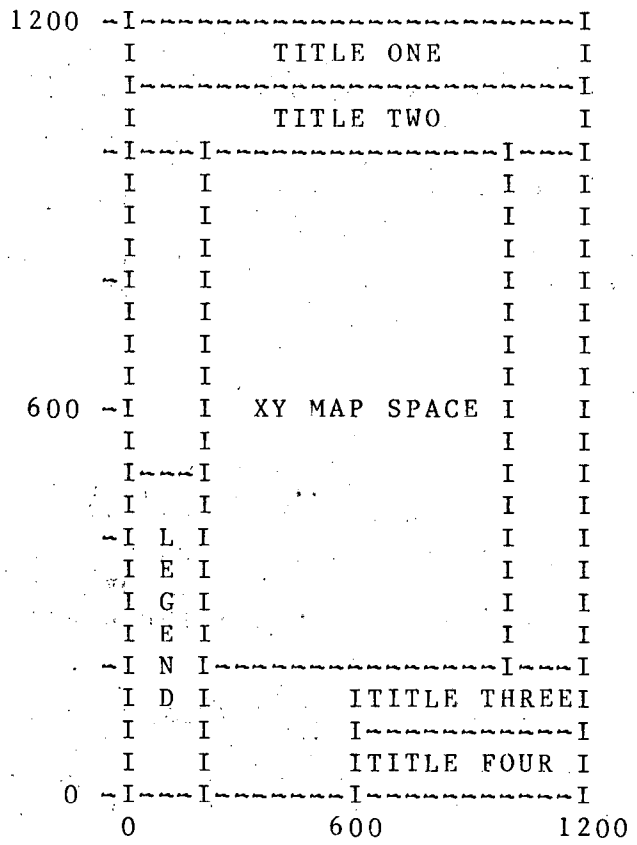


FIGURE FIVE. DECK SETUP FOR A FIRST CROSS-HATCH MAP

```
MAP,,,70000.ACCTNO,NAME
FETCHMT(DATA,LIBNO)
FETCHMT(MAP,LIBNO)
FETCHPS(CARTE,CARTE,CARTLGO)
CARTE.
DISPOSE(FILM=MF,M=ME)
7/8/9
*KEYS,4 8
*MAPTYPE,HATCH,CHOROPLETH
*PICTURE SPACE,0,1200,0,1200
*XYMAP SPACE,200,1000,200,1000
*LEGEND,1,0,200,0,500
1,1
BY CENSUS TRACT
*TITLES,4
1,1,4,0,1200,1100,1200
MAP ONE
2,1,4,0,1200,1000,1100
DISTRIBUTION OF AMERICAN INDIANS
3,1,3,600,1200,100,200
US DEPARTMENT OF LABOR
4,1,3,600,1200,0,100
LAWRENCE BERKELEY LABORATORY
*GO
6/7/8/9
```

REFINING THE MAP

THREE REFINEMENTS ARE MADE FOR THE SECOND MAP OF PHOENIX. THE CENTRAL PART OF THE SMSA, WHERE MANY SMALL CENSUS TRACTS OF INTEREST ARE LOCATED, IS ZOOMED IN UPON. THE USER SUPPLIES HIS OWN DATA DIVISION POINTS, DERIVED FROM THE HISTOGRAM OF THE DATA GENERATED ON THE FIRST PASS. AND THE TRACT NAMES ARE SUPPRESSED BECAUSE THE NUMBERS ADD LITTLE TO MAP IMPACT AND ARE TOO LARGE RELATIVE TO TRACT AREAS, SO THE PROGRAM TRUNCATES THEM.

THE CENTRAL PART OF PHOENIX IS BROUGHT INTO FOCUS BY USING THE ***ZOOM** DIRECTIVE. ALL TRACTS OUTSIDE THE RECTANGLE DESCRIBED BY THE DIRECTIVE ARE DISCARDED AND THOSE ON THE BOUNDARY ARE CLIPPED TO CONFORM TO THE NEW MAP LIMITS. THE COORDINATES OF THE RECTANGLE ARE DERIVED BY ESTIMATION FROM THE PRE- VIOUS PASS'S LIMITS, WHICH WERE PRINTED BY THE PROGRAM.

THE DIVISION POINTS ARE ENTERED BY THE ***INTERVALS** DIRECTIVE. THE FOUR DIVISION POINTS DEFINE THREE INTERVALS, BUT, SINCE THE PROGRAM ASSUMES THAT THEY LIE BETWEEN THE MINIMUM AND MAXIMUM DATA VALUES, FIVE INTERVALS ARE ACTUALLY GENERATED.

THE TRACT NAMES ARE SUPPRESSED BY USING THE ***CONSTANTS** DIRECTIVE. SETTING CONSTANT ONE TO ZERO SUPPRESSES ALL LABELS INPUT FROM THE MAP FILE. SO THREE DIRECTIVES ARE ADDED TO THE DIRECTIVE FILE. THE VALUES GIVEN ARE ARBITRARY, AND INACCURATE, BUT ILLUSTRATE THE USE OF THESE DIRECTIVES.

```
*ZOOM,170.35,172.14,67.33,68.77
*INTERVALS,10,20,40,70
*CONSTANTS,0
```

THE DIVISION POINT GIVEN ON THE ***INTERVALS** DIRECTIVE ARE ENCODED INTO THE SHADE CODE AND DISPLAYED IN THE LEGEND BOX. IN THIS CASE, THE SHADE CODE WOULD BE --

```
ABOVE 70
40 - 70
20 - 39
10 - 19
BELOW 10
```

GENERATING A TABLE

SUPPOSE A TABLE OF THE CENSUS TRACT DATA IS DESIRED. THERE ARE THREE ELEMENTS OF THE TABLE THAT A USER CAN SPECIFY - TITLES, COLUMN HEADINGS, AND FOOTNOTES. FOR THIS EXAMPLE, IT IS ASSUMED THAT THERE IS DEFAULT TITLE PLACEMENT FOR AT LEAST FOUR TITLES. THE TITLES DESIRED FOR THE TABLE ARE THE SAME AS THOSE INPUT FOR THE MAP. HOWEVER, THE MAP AND TABLE ARE INDEPENDENT OF EACH OTHER, SO THE TITLES MUST BE ENTERED AGAIN. THIS IS DONE BY --

```
*REPORT,4 (REQUEST A TABLE, WITH 4 TITLES)
1,1,3
US DEPARTMENT OF LABOR
2,1,3
LAWRENCE BERKELEY LABORATORY
3,1,4
TABLE ONE
4,1,4
DISTRIBUTION OF AMERICAN INDIANS
```

THE TABLE WILL HAVE FOUR COLUMNS: ONE FOR TRACT NAMES, AND ONE FOR EACH OF THE THREE COLUMNS OF DATA VALUES. THUS FOUR COLUMN HEADINGS ARE REQUIRED.

```
*HEADINGS,4
1,1
TRACT NUMBER
2,1
TOTAL POPULATION
3,1
TOTAL INDIANS
4,1
PERCENT OF TRACT
```

THESE 18 CARDS SPECIFY COMPLETELY THE DESIRED TABLE. THEY ILLUSTRATE A SIMPLE TABLE. MORE COMPLEX ONES CAN BE GENERATED BY USING MORE OF THE TABLE DIRECTIVE OPTIONS.

MULTIPLE MAPS

ONCE A MAP HAS BEEN DESIGNED AND SPECIFIED, IT IS EASY TO GENERATE MORE MAPS OF THE SAME AREA, PROVIDED THERE ARE MORE DATA SETS. IN THIS EXAMPLE A SECOND MAP AND TABLE ARE PRODUCED BY THE PROGRAM. ALL PREVIOUS DIRECTIVES REMAIN ACTIVE UNTIL SPECIFICALLY ALTERED, WITH THE EXCEPTION THAT NO TABLE IS GENERATED UNLESS A *REPORT DIRECTIVE IS ENCOUNTERED. THE SECOND CHARACTERISTIC MAPPED WILL BE THE DISTRIBUTION OF SPANISH AMERICANS IN PHOENIX. THE DATA SET IS IN THE SAME FORMAT AS THE FIRST. THE SAME COLUMN OF DATA VALUES WILL BE EXTRACTED. THE POSITION OF THE BASE MAP REMAINS THE SAME (IT CANNOT BE CHANGED AT THIS POINT). THE ELEMENTS THAT NEED TO BE CHANGED ARE THE INTERVALS FOR DIVIDING THE DATA, AND SOME TITLES AND COLUMN HEADINGS. THE PROGRAM ALLOWS THE USER TO CHANGE ONLY THOSE ELEMENTS THAT NEED TO BE CHANGED. THE DIRECTIVES ARE --

```
*INTERVALS,20,45,55,65,75 (SIX INTERVALS ARE PRODUCED)
*TITLES,4 (STILL 4 TITLES, TEXT OF SOME WILL BE CHANGES)
1,1 (REPLACE TEXT OF TITLE 1 WITH FOLLOWING 1 CARD OF TEXT)
MAP TWO
2,1
DISTRIBUTION OF SPANISH AMERICANS
*REPORT,4
3,1 (REPLACE TEXT OF TITLE 3 WITH FOLLOWING 1 CARD OF TEXT)
TABLE TWO
4,1
DISTRIBUTION OF SPANISH AMERICANS
*HEADINGS,4
3,1 (CHANGE TEXT OF HEADING 3)
TOTAL SPANISH AMERICANS
*GO
```

THESE FEW DIRECTIVES WILL PRODUCE THE SECOND MAP AND TABLE. PROVIDED THERE ARE ENOUGH DATA SETS ON THE DATA FILE, ANY NUMBER OF MAPS AND TABLES CAN BE GENERATED AFTER THE FIRST, BY REPEATING THE PROCESS OF MAKING THE SECOND MAP. FIGURE SIX CONCLUDES THESE EXAMPLES BY SHOWING THE COMPLETE JOB NECESSARY TO PRODUCE 35MM FILM READY FOR MULTI-COLOR PRINTING OF THE TWO MAPS AND TABLES DESCRIBED IN THIS CHAPTER.

EXAMPLES
MULTIPLE MAPS

FIGURE SIX. A SAMPLE JOB PRODUCING TWO MULTI-COLOR MAPS AND TABLES

```
MAP,,,70000.ACCTNO,NAME
FETCHMT(DATA,LIBNO)
FETCHMT(MAP,LIBNO)
FETCHPS(CARTE,CARTE,CARTLGO)
CARTE.
DISPOSE(FILM=35,M=ME)
7/8/9
*KEYS,4=8 (MATCH CENSUS TRACT CODES
*PICTURE SPACE,0,1200,0,1200 (DEFINE PICTURE SPACE UNITS
*XYMAP SPACE,200,1000,200,1000 (DEFINE MAP SPACE IN PICTURE SPACE
*LEGEND,1,0,200,0,500
1,1
BY CENSUS TRACT
*TITLES,4 (4 TITLES FOR THE MAP FOLLOW
1,1,4,0,1200,1100,1200 (TITLE 1,1 CARD, SIZE 4, PLACED IN GIVEN
RECTANGLE
MAP ONE
2,1,4,0,1200,1000,1100
DISTRIBUTION OF AMERICAN INDIANS
3,1,3,600,1200,100,200
US DEPARTMENT OF LABOR
4,1,3,600,1200,0,100
LAWRENCE BERKELEY LABORATORY
*ZOOM,170.35,172.14,67.33,68.77 (FILTER THE MAP THRU WINDOW DESCRIBED
*INTERVALS,10,20,40,70 (DIVIDE THE DATA AT THE FOLLOWING POINTS
*CONSTANTS,0 (SUPPRESS ALL LABELS FROM THE MAP FILE
*REPORT,4 (MAKE A TABLE, WITH 4 TITLES
1,1,3
US DEPARTMENT OF LABOR
2,1,3
LAWRENCE BERKELEY LABORATORY
3,1,4
TABLE ONE
4,1,4
DISTRIBUTION OF AMERICAN INDIANS
*HEADINGS,4 (4 COLUMN HEADINGS FOR TABLE
1,1
TRACT NUMBER
2,1
TOTAL POPULATION
3,1
TOTAL INDIANS
4,1
PERCENT OF TRACT
*GO (GO DRAW MAP AS SPECIFIED
*INTERVALS,20,45,55,65,75 (INPUT NEW DATA DIVISION POINTS
*TITLES,4 (CHANGE 2 MAP TITLES
1,1
MAP TWO
2,1
DISTRIBUTION OF SPANISH AMERICANS
*REPORT,4 (REQUEST TABLE, AND CHANGE 2 TITLES
3,1
TABLE TWO
```

```
4,1
DISTRIBUTION OF SPANISH AMERICANS
*HEADINGS,4 (CHANGE 1 HEADING
3,1
TOTAL SPANISH AMERICANS
*GO (GO DRAW MAP AS SPECIFIED
```

A FIRST SYMBOL MAP

SUPPOSE WE DESIRE A MAP OF CALIFORNIA INDICATING THE AMOUNT OF FEDERAL FUNDING RECEIVED AND THE TYPE OF AREA RECEIVING THE MONEY. FROM THE GOVERNMENT WE GET THE AMOUNT AND TYPE EACH AREA RECEIVES. THERE ARE FOUR TYPES -- CITIES,COUNTIES,CONSORTIA, AND BALANCE OF STATE . WE DEFINE SYMBOL CODES CY, CO, CC, ST RESPECTIVELY AND GIVE THE APPROPRIATE ONE TO EACH DATA ITEM. THE COORDINATES ARE DIGITIZED USING ZING [3]. THE DATA SET MIGHT LOOK LIKE THE ONE DEPICTED IN FIGURE SEVEN. THE MAP IS PREPARED USING MAPEDIT.

NOW WE PREPARE THE DIRECTIVES. THE MAPTYPE DESIRED IS CROSS-HATCH SYMBOL. THE FIRST KEY OF THE DATA IS TO BE MATCHED WITH THE FOURTH MAP KEY (THE COUNTY CODES). THIS IS REQUIRED ONLY FOR AUTOMATIC PLACEMENT OF SYMBOLS BY THE PROGRAM (WHICH IS DONE IF COORDINATE FIELDS ARE MISSING, BLANK, OR ZERO ON THE DATA SET).

THE DATA SET FORMAT MUST BE SPECIFIED, ALONG WITH THE DATA VALUE COLUMN TO BE EXTRACTED. FOR THIS FIRST PASS THE DEFAULT BINNING IS ACCEPTABLE. FOR THIS MAP WE WILL USE THE DEFAULT PICTURE AND XY MAP SPACE, ALONG WITH THE DEFAULT TITLE AND LEGEND PLACEMENT. THE DIRECTIVES SO FAR ARE --

```
*MAPTYPE,HATCH,SYMBOL
*KEYS,1=4
*FORMAT,(I2,A10,F10.0,1X,R2,3F14.6)
*EXTRACT,1
*TITLES,1
1,1
FUNDING BY PRIME SPONSOR
```

NOW WE DEFINE THE SYMBOLS. ONE DIRECTIVE IS REQUIRED FOR EACH SYMBOL. THEY WILL BE --CY-CITY-TRIANGLE,CO-COUNTY-SQUARE, CC-CONSORTIUM-CIRCLE, AND ST-BALANCE OF STATE-LARGE CIRCLE. SO WE ADD THE FOLLOWING DIRECTIVES TO THE DIRECTIVE FILE --

```
*USER DEFINED SYMBOL,CY,CITY,4,0,35,25,-25,-25,-25,0,35
*USER DEFINED SYMBOL,CO,COUNTY,5,25,25,25,-25,-25,-25,-25,25,25,25
*USER DEFINED SYMBOL,CC,CONSORTIA,-25
*USER DEFINED SYMBOL,ST,BALANCE OF STATE,-35
```

NOTE THAT THE FIGURES ARE DESCRIBES AS CENTERED ABOUT THE ORIGIN, GO CLOCKWISE, ARE CLOSED, AND , IN THE CASE OF CIRCLES, ONLY THE NEGATIVE RADIUS IS GIVEN.

THE SYMBOL CODE MUST BE ENTERED CAREFULLY . ANY EXTRA BLANKS WILL CAUSE A MISMATCH WITH THE DATA (AND VICA-VERSA). THE TEXT DEFINITION WILL APPEAR ALONGSIDE THE SYMBOL IN THE SYMBOL LEGEND, WHICH WE ENTER BY --

```
*VERTICAL SYMBOL LEGEND,1
1,1
SYMBOL DEFINITIONS
```

WITH THE ADDITION OF THE *GO DIRECTIVE A FIRST SYMBOL MAP CAN BE PRODUCED.

FIGURE SEVEN. A SAMPLE SYMBOL DATA SET

DATA SET 1 CONSISTING OF 7 DATA ITEMS, EACH WITH 1 KEY, 1 WORD OF NAME, 1 DATA VALUE, AND 4 FIELDS OF SYMBOL INFORMATION

THE DATA ITEM FORMAT IS (I2,A10,F10.0,1X,R2,3F14.6)

ALL NAMES WILL BE DRAWN TO THE RIGHT OF THE SYMBOL, EXCEPT SF AND MARIN

```
COL
1


DATA 1,7,1,1,1,1,4
 1ALAMEDA     134000 CC  .544705    -9.25014
75SAN FRAN    703000 CY  .494       -9.234406 1.0
41MARIN       101000 CO  .493       -9.220755 1.0
 1BERKELEY    150000 CY  .531675    -9.230723
 1OAKLAND     175000 CY  .542415    -9.240447
13RICHMOND     45000 CY  .5321      -9.212278
  STATE       907000 ST  .643418    -9.364874

KEYS NAME     VALUE CODE SYMBOL-X-- Y          LABEL FLAG
```

ERROR MESSAGES AND THE *WATCH OUTPUT

CARTE GENERATES ADDITIONAL OUTPUT WHEN CERTAIN ERRORS ARE DETECTED OR THE *WATCH DIRECTIVE IS USED. THE FIRST SECTION LISTS THE ERROR MESSAGES AND THEIR PROBABLE CAUSES. THE SECOND EXPLAINS THE VARIOUS *WATCH OUTPUTS.

ERROR MESSAGES

FATAL ERRORS

***** EOF ON DATA, SEARCHING FOR DATA SET N

PROBABLE CAUSE-MISSING DATA FILE,OUT OF RANGE VALUE ON *DATA DIRECTIVE, OR MORE DIRECTIVE SETS THAN DATA SETS.

***** BAD DATA SET HEADER CARD

PROBABLE CAUSE- KEYWORD DATA NOT STARTING IN COLUMN1, COMMA DELIMITERS MISSING, OR FIRST CARD OF LOGICAL RECORD NOT HEADER CARD

***** ERROR IN DIRECTIVE WITH KEY LETTER N

PROBABLE CAUSE- TOO FEW NUMERICAL PARAMETERS

***** END OF DIRECTIVES

PROBABLE CAUSE- TOO FEW DIRECTIVES. THIS IS ALSO THE NORMAL TERMINATION MESSAGE

***** ARRAY I OF LENGTH J DOES NOT FIT IN SCM
***** MEMORY OVERFLOW IMMINENT

PROBABLE CAUSE- THERE ARE 2 PROBABLE CAUSES FOR THIS MESSAGE- THE DATA SET OR THE ARRAYS USED TO SHADE AN AREA ARE TOO LARGE. A DATA SET MUST ALL FIT IN MEMORY AT ONCE, SO IT SHOULD SATISFY THE FOLLOWING FORMULA:

(NKEYS + NWNS + NDVS * NWDV + NFSYMS)*NITEMS < 32,768 (100,000B)

WHERE NKEYS= NO. KEY PAIRS SPECIFIED ON *KEYS DIRECTIVE
NWNS = NO. WORDS / NAME (FROM DATA SET HEADER CARD)
NDVS = NO. DATA VALUES (FROM DATA SET HEADER CARD)
NWDV = NO. WORDS/DATA VALUE (FROM DATA SET HEADER CARD)
NFSYMS = NO. FIELDS OF SYMBOL INFORMATION (FROM DATA SET HEADER CARD)
NITEMS= NO. DATA ITEMS (FROM DATA SET HEADER CARD)

THE SIZE OF THE SHADING ARRAYS IS LARGELY PROGRAM DETERMINED. IT IS COMPUTED FROM THE SIZE OF THE LARGEST SHADABLE REGION. HOWEVER THE USER DOES HAVE CONTROL OVER THE NUMBER OF SEGMENTS ALLOWED FOR EACH SHADE LINE. TO CHANGE THIS SEE THE *CONSTANTS DIRECTIVE

WARNINGS

***** MAP IS MISSING

PROBABLE CAUSE- MISSING MAP FILE OR INACCURATE ZOOMING DISCARDED

ENTIRE MAP

***** NO MATCH FOR AREA WITH KEYS = ...

PROBABLE CAUSE- NO DATA ITEM FOR THIS AREA (KEYS ARE IN ORDER SPECIFIED BY *KEYS DIRECTIVE)

***** NEED I SEGMENTS, ALLOWED ONLY J

PROBABLE CAUSE- MORE SEGMENTS NEEDED TO CORRECTLY SHADE AN AREA (SEE * CONSTANTS DIRECTIVE)

***** MAP TITLE I NEEDS J MORE LINES WITH K MORE CHARACTERS

PROBABLE CAUSE- TEXT OF TITLE; COULD NOT FIT IN SPACE PROVIDED. FOR DEFAULT PICTURE SPACE UNITS,(0,4095) THE SPACE REQUIRED TO DRAW A CHARACTER IS

SIZE	X	Y	THESE VALUES CAN BE EASILY
1	24	38	CONVERTED TO YOUR PICTURE SPACE UNITS
2	31	52	E.G. 24 X OR 38 Y
3	40	64	~~~~ = ~~~ ~~~~ = ~~~
4	48	77	4096 XMAX-XMIN 4096 YMAX-YMIN

***** NO COLORS ASSIGNED-; DIVISIONS OVER DATA RANGE OF X TO Y, CHECK INTERVALS, EXTRACT, KEYS (FIRST DATA KEY) AND FORMAT DIRECTIVES

PROBABLE CAUSE- INTERVALS OUT OF DATA RANGE, WRONG COLUMN OF DATA VALUES EXTRACTED, KEYS=0 FOR ALL DATA ITEMS, OR DATA READ IN INCORRECT FORMAT.

*WATCH OUTPUT

THIS SECTION DESCRIBES THE OUTPUT GENERATED BY USE OF THE * WATCH DIRECTIVE OR BY CERTAIN ERROR CONDITIONS. THE OUTPUT IS DESCRIBED IN KEYWORD ORDER. THOSE WITH AN * ARE PRIMARLY OF TECHNICAL INTEREST KEYWORDS SHOULD MAINLY BE USED FOR CHECKING FOR CORRECT INPUT.

*1. **ARRAYS** - GIVES SIZE, LOCATION, AND STATUS CHANGES OF THE MAJOR DYNAMIC ARRAYS. THE LOCATION OF THE BEGINNING OF FREE SPACE IS ALSO GIVEN. EACH ARRAY IS IDENTIFIED BY AN INDEX NUMBER.

INDEX	USE
1	MAP KEYS
2	SHADE LINE X VALUES
3	SHADE LINE Y VALUES
4	SHADE LINE SEGMENT COUNTS
5	POINTS
6	MAP POINTERS
7	DATA KEYS
8	DATA VALUES
9	DATA NAMES
10	COLORS
11	SYMBOL OUTLINES
12	DATA ITEM NAME CHARACTER COUNT
13	ARRAY OF SYMBOL INFORMATION

THIS IS OF USE IN DETERMINING CRITICAL POINTS OF MEMORY USAGE AND TO WATCH THE OPERATION OF THE PROGRAM.

2. **BINS** - GIVES THE DISTRIBUTION OF EXTRACTED DATA VALUES OVER 100 BINS AND THE COLORS ASSIGNED IN DATA ITEM ORDER.

3. **COLORS** GIVES THE COLORS IN POLYGON ORDER

4. **DATA** - ECHOES THE DATA ITEMS AS READ

*5. **LABELS** - GIVES RESULTS OF ATTEMPT TO AUTOMATICALLY PLACE AN AREA'S LABELS INSIDE IT'S BOUNDARY. THERE ARE 6 POSSIBLE TERMINAL STATES:

1	HORIZONTAL COMPLETE FIT
2	VERTICAL COMPLETE FIT
3	AREA LESS THAN CHARACTER HEIGHT TALL
4	NO FEASIBLE REGIONS FOUND
5	TRUNCATED ONE WORD LABEL
6	LABEL BROKEN INTO WORDS (FIRST WORD ON TOP)

AFTER GIVING THE TERMINAL STATE, THE NUMBER OF LABELS, THE NUMBER NOT PLACED, REGIONS USED, AND NO. SHADE LINES, THE LABELS AS PREPARED BY THE ROUTINE ARE DISPLAYED. THIS INCLUDES: X, Y, SIZE, OVENTATION, NUMBER OF CHARACTERS, AND TEXT. FOR TERMINAL STATES 5 AND 6, INFORMATION ABOUT THE REGIONS FOUND IS ALSO GIVEN. THIS INCLUDES: NUMBER OF CHARACTERS THAT WILL FIT INSIDE, THE INDEX AND SEGMENT NUMBERS OF THE SHADE LINES USED, ITS PLACE RELATIVE TO OTHER REGIONS (1=TOP), AND THE RANGE OF LABELS ALLOWED TO BE PLACED INSIDE THAT REGION.

6. **MAP** ECHOES NO. GEOCODES, GEOCODE VALUES, AND FIRST 30 CHARACTERS OF FIRST LABEL FOR EACH AREA READ FROM THE MAP FILE.

*7. **REPORT** - GIVES REPORT GENERATION INFORMATION. THE FIRST SEVEN VALUES PRINTED ARE: NO. DATA ITEMS, NO. BLANK LINES COMPUTED, NO. LINES FOR HEADINGS, NO. LINES FOR NOTES, NO. BODY TEMPLATE REPETITIONS, NO. LINES IN THE REPORT BODY, AND THE CHARACTER SIZE, FOLLOWING IS THE NO. CHARACTERS PER LINE, THE WIDTH OF THE SCREEN, AND THE X AND Y SIZE OF A CHARACTER. THEN COME THE BODY, HEADING, AND FOOTNOTE SPECIFICATIONS. EACH COLUMN OF THE BODY, EACH HEADING AND EACH FOOTNOTE IS REPRESENTED BY 3 VALUES.

TYPE	VALUE1	VALUE2	VALUE3
BODY	1= CHARACTERS	WITH IN	NO. DIGITS TO RIGHT
BODY	2= NUMBERS	CHARACTERS	OF DECIMAL POINT
AL POINT			
HEADING	STARTING COL	ENDING COL	CHARS/LINE OF HEADING
DING			
FOOTNOTE	TYPE	ELEMENT	CHARS/LINE

0=NOTHING
1= TITLE
2= HEADING
3= NAME

8. **TITLES** GIVES RESULT OF ATTEMPT TO DRAW LEGEND BOX. THERE ARE 5 POSSIBLE TERMINAL STATES:

0 NO SHADE CODE SUPPLIED
1 UNABLE TO FIT LEGEND TEXT IN SPACE PROVIDED
2 NO HORIZONTAL SOLUTION
3 HORIZONTAL SOLUTION
4 NO VERTICAL SOLUTION
5 VERTICAL SOLUTION

THEN THE TITLES, LEGENDS, AND SHADE CODE ARE DISPLAYED ALONG WITH THE STATE OF SPACE ALLOCATION WHEN THE ROUTINE TERMINATED. THIS OUTPUT WILL RESULT AUTOMATICALLY IF NOT ENOUGH SPACE IS GIVEN TO DRAW THE LEGEND BOX COMPLETELY.

REFERENCES

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2. MAPEDIT USERS GUIDE BY B BENSON AND HH HOLMES

3. ZING USERS GUIDE BY HH HOLMES

INDEX

MAP 4B - PERCENTAGE OF OCCUPIED UNITS FOR
1-PERSON HOUSEHOLDS 65 YEARS OLD AND OVER

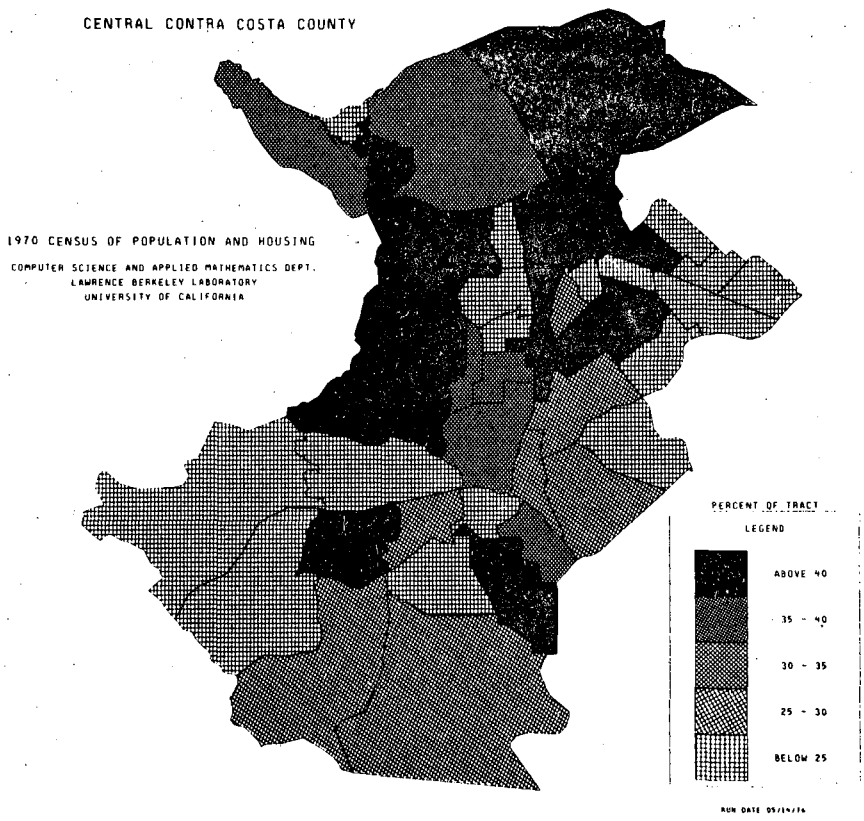
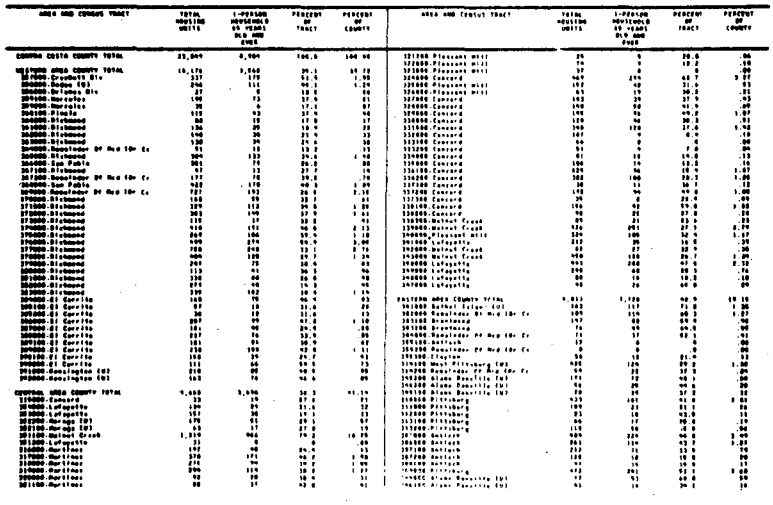


TABLE 3 - PERCENTAGE OF OCCUPIED UNITS BY
1-PERSON HOUSEHOLD 65 YEARS OLD AND OVER

CONTRA COSTA COUNTY



A TYPICAL MAP AND REPORT GENERATED BY THE PROGRAM CARTE.

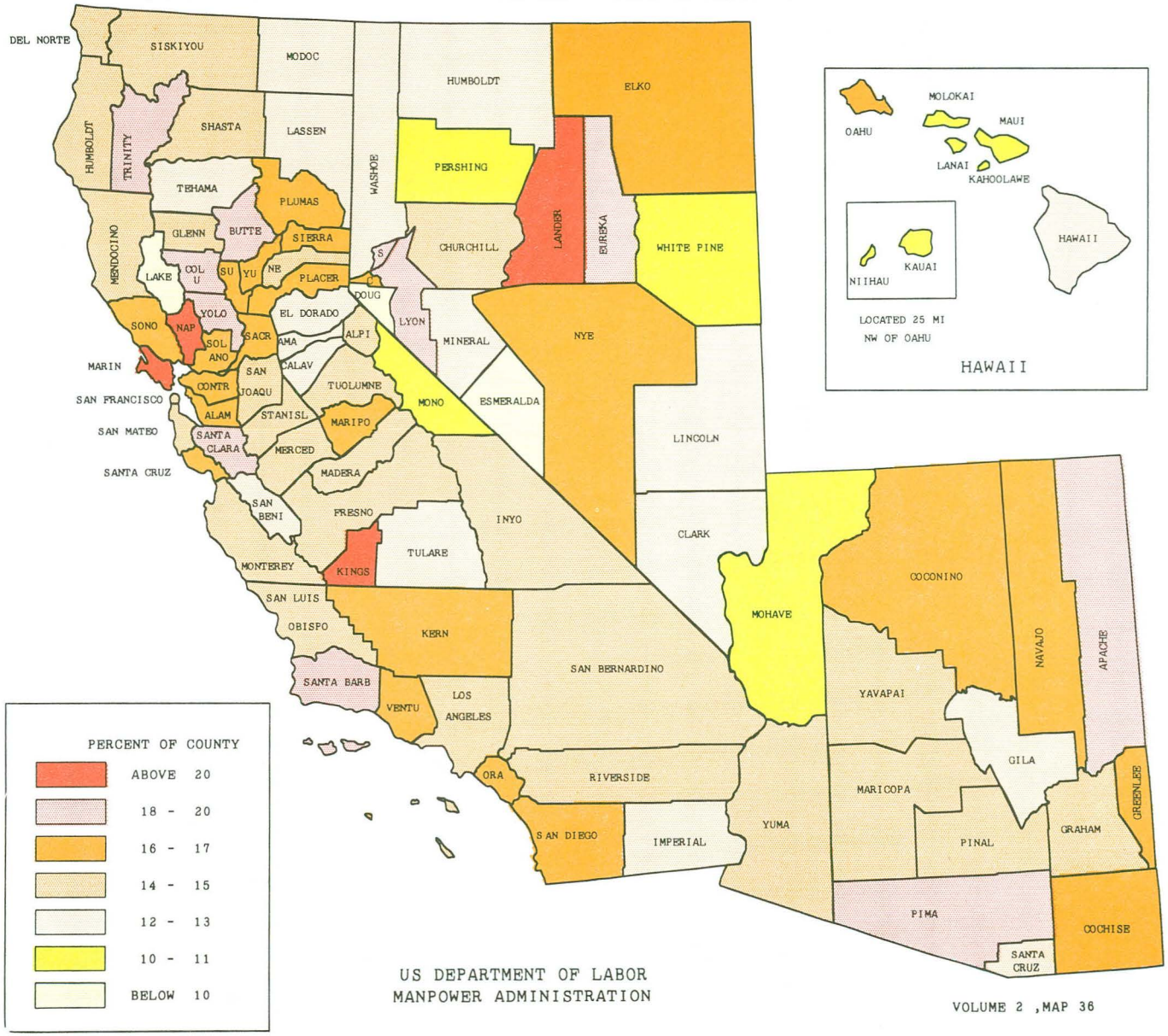
APPENDIX D

SAMPLE COLOR MAPS

PROFESSIONAL WORKERS - ALL FEMALES

RUN DATE 73/04/30.
LAWRENCE BERKELEY LABORATORY
1970 CENSUS OF POPULATION

ARIZONA - CALIFORNIA - HAWAII - NEVADA -- FEDERAL REGION IX



US DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

VOLUME 2 ,MAP 36

U S DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

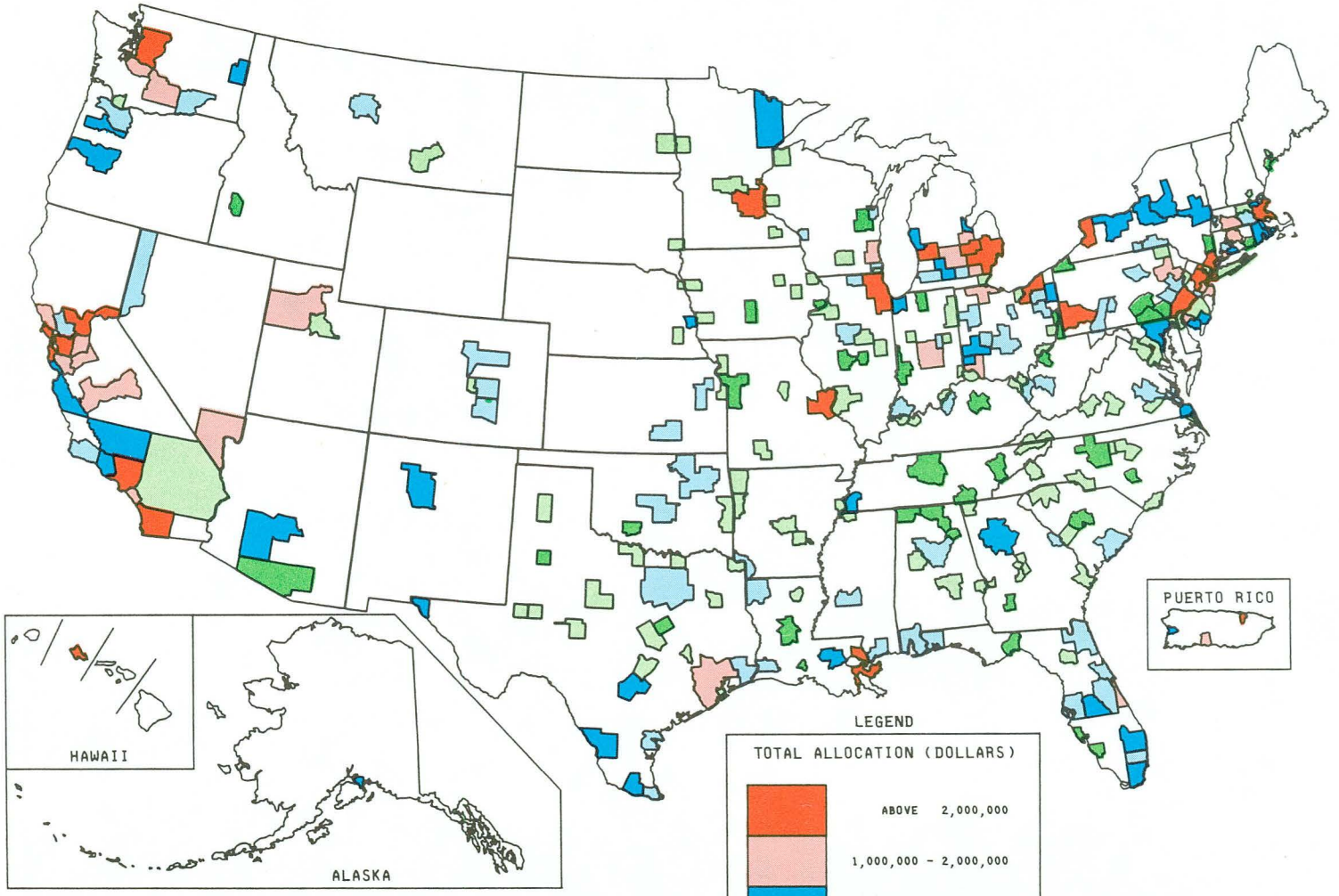
TABLE 36

RUN DATE 73/04/30.
LAWRENCE BERKELEY LABORATORY

PROFESSIONAL WORKERS - ALL FEMALES

STATE AND COUNTY	TOTAL ALL OCCUPATIONS	PROFESSIONAL OCCUPATIONS	PERCENT OF COUNTY	PERCENT OF REGION
ARIZONA	230852	37089	16.1	7.2
Apache	2405	479	19.9	.1
Cochise	6113	1050	17.2	.2
Coconino	6188	1099	17.8	.2
Gila	2655	345	13.0	.1
Graham	1495	219	14.6	.0
Greenlee	846	150	17.7	.0
Maricopa	140643	21597	15.4	4.2
Mohave	2860	313	10.9	.1
Navajo	4187	668	16.0	.1
Pima	44012	8293	18.8	1.6
Pinal	6334	948	15.0	.2
Santa Cruz	1635	197	12.0	.0
Yavapai	4322	680	15.7	.1
Yuma	7157	1051	14.7	.2
CALIFORNIA	2855187	452482	15.8	87.4
Alameda	161602	27023	16.7	5.2
Alpine	69	10	14.5	.0
Amador	1300	161	12.4	.0
Butte	12050	2233	18.5	.4
Calaveras	1365	171	12.5	.0
Colusa	1511	284	18.8	.1
Contra Costa	73167	12932	17.7	2.5
Del Norte	1780	274	15.4	.1
El Dorado	6272	809	12.9	.2
Fresno	49381	7694	15.6	1.5
Glenn	2081	306	14.7	.1
Humboldt	11578	1743	15.1	.3
Imperial	8162	1065	13.0	.2
Inyo	2104	311	14.8	.1
Kern	37978	6083	16.0	1.2
Kings	6632	1338	20.2	.3
Lake	2181	206	9.4	.0
Lassen	1786	239	13.4	.0
Los Angeles	1105110	162658	14.7	31.4
Madera	4123	585	14.2	.1
Marin	29947	6489	21.7	1.3
Mariposa	711	119	16.7	.0
Mendocino	6252	939	15.0	.2
Merced	11203	1769	15.8	.3
Modoc	1048	142	13.5	.0
Mono	683	69	10.1	.0
Monterey	30852	4687	15.2	.9
Napa	10768	2229	20.7	.4
Nevada	3136	459	14.6	.1
Orange	195681	31989	16.3	6.2
Placer	9013	1539	17.1	.3
Plumas	1458	243	16.7	.0
Riverside	56679	8930	15.8	1.7
Sacramento	89629	14655	16.4	2.8
San Benito	2241	286	12.8	.1
San Bernardino	81538	12384	15.2	2.4
San Diego	166534	28192	16.9	5.4
San Francisco	143021	22287	15.6	4.3
San Joaquin	34783	5449	15.7	1.1
San Luis Obispo	13264	2087	15.7	.4
San Mateo	92562	13621	14.7	2.6
Santa Barbara	37511	6783	18.1	1.3
Santa Clara	149911	28946	19.3	5.6
Santa Cruz	16858	2716	16.1	.5
Shasta	9248	1429	15.5	.3
Sierra	286	47	16.4	.0
Siskiyou	3476	506	14.6	.1
Solano	19206	3250	16.9	.6
Sonoma	25231	4470	17.7	.9
Stanislaus	23236	3684	15.9	.7
Sutter	4719	843	17.9	.2
Tehama	3444	412	12.0	.1
Trinity	694	138	19.9	.0
Tulare	24543	3360	13.7	.6
Tuolumne	2617	376	14.4	.1
Ventura	46502	7645	16.4	1.5
Yolo	12671	2523	19.9	.5
Yuba	3799	665	17.5	.1
HAWAII	117398	18675	15.9	3.6
Hawaii	9121	1237	13.6	.2
Honolulu	97007	16102	16.6	3.1
Kauai	4405	517	11.7	.1
Maui	6865	819	11.9	.2
NEVADA	73384	9600	13.1	1.9
Churchill	1207	189	15.7	.0
Clark	38899	4830	12.4	.9
Douglas	1177	82	7.0	.0
Elko	2017	323	16.0	.1
Esmeralda	39	0	.0	.0
Eureka	120	23	19.2	.0
Humboldt	936	124	13.2	.0
Lander	260	67	25.8	.0
Lincoln	308	38	12.3	.0
Lyon	865	172	19.9	.0
Mineral	1124	147	13.1	.0
Nye	628	106	16.9	.0
Pershing	353	37	10.5	.0
Storey	183	33	18.0	.0
Washoe	21705	2864	13.2	.6
White Pine	1021	118	11.6	.0
Carson City City	2542	447	17.6	.1

MAP 4 - Allocation of Total CETA Title II Funds For Public Service Employment - FY 1974 United States by Standard Metropolitan Statistical Area

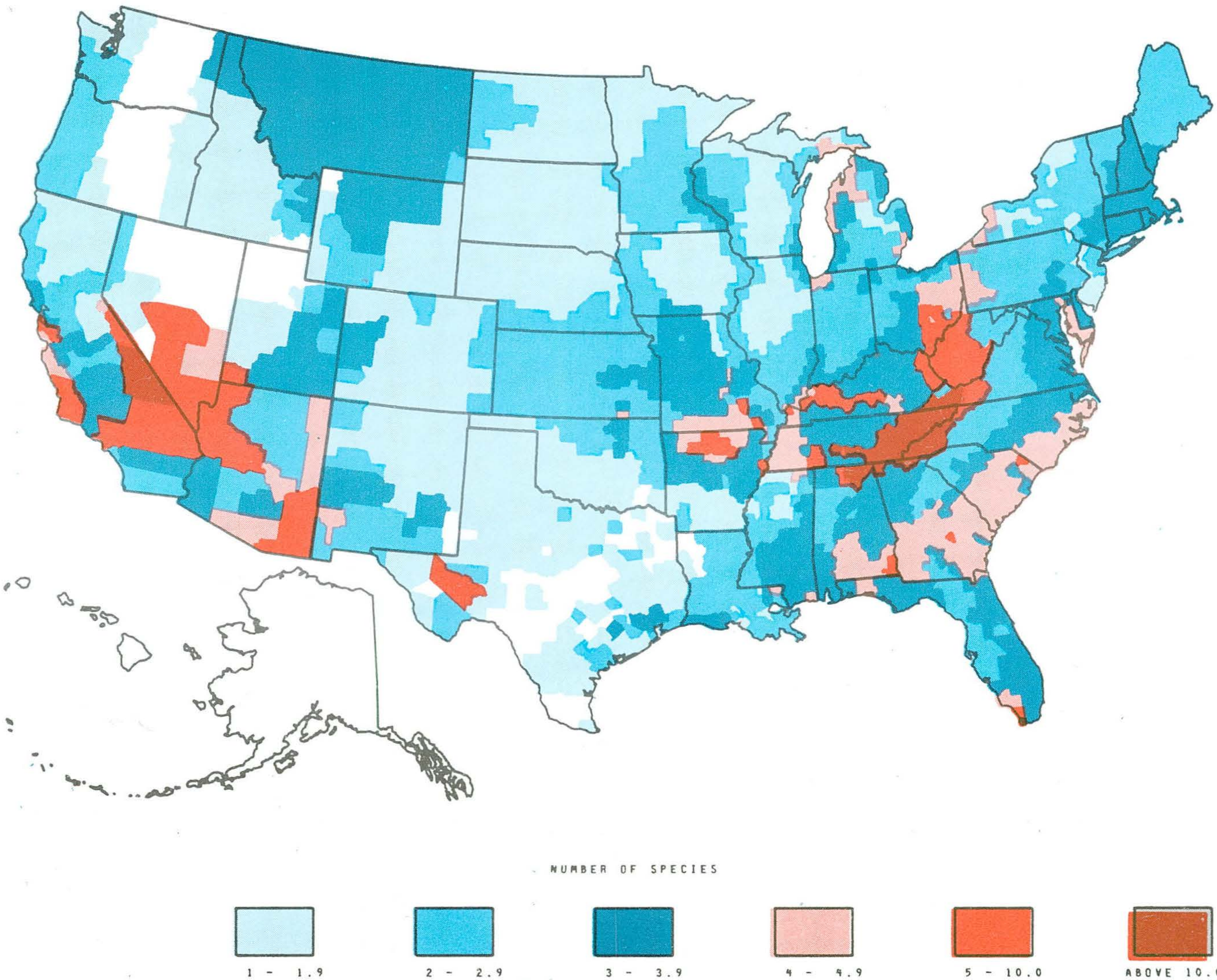


MEDIAN SMSA ALLOCATION
$ 246,300

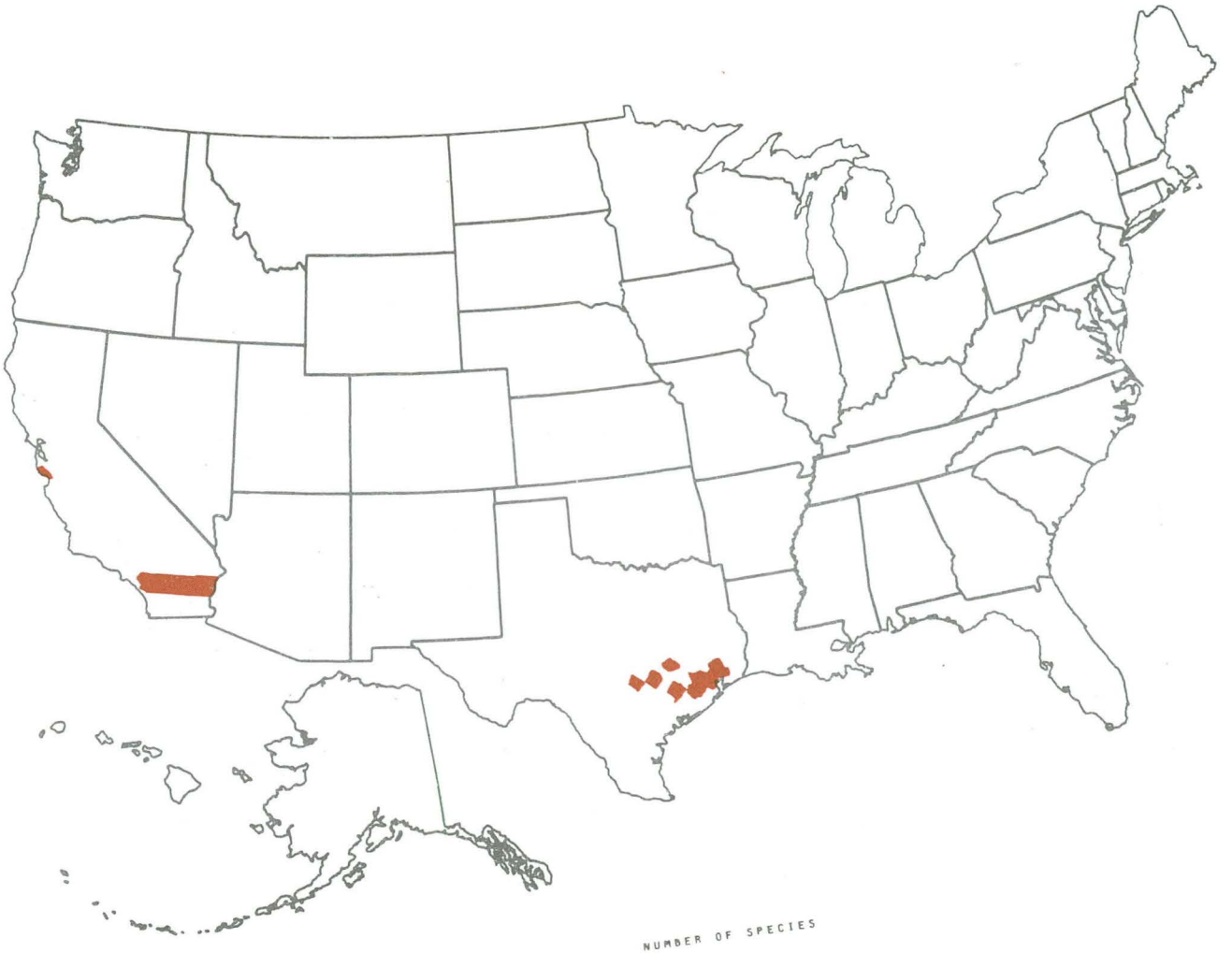
U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA

TOTAL ENDANGERED ANIMAL SPECIES BY COUNTY



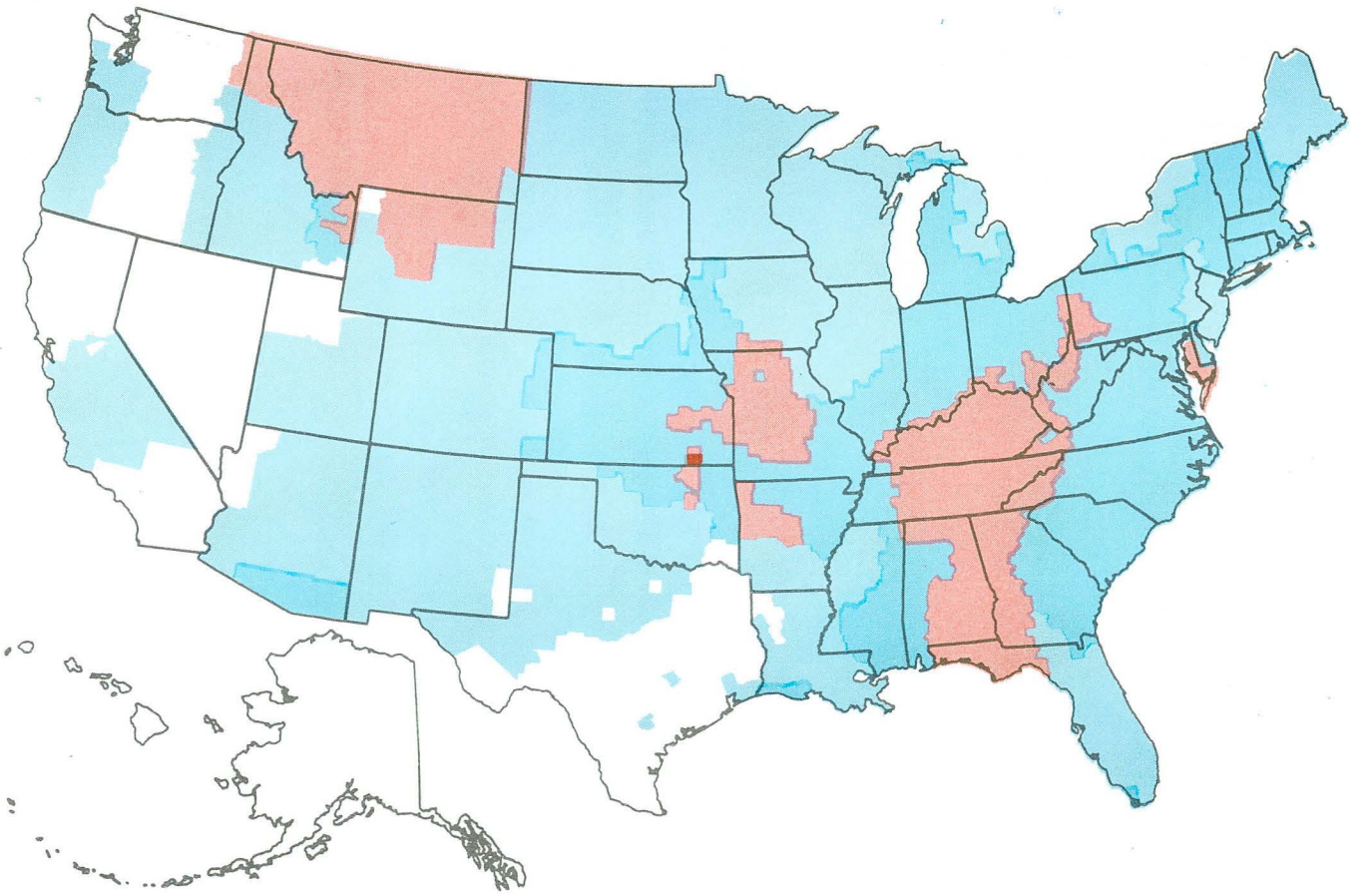
ENDANGERED AMPHIBIANS BY COUNTY



NUMBER OF SPECIES

1 - 1.9

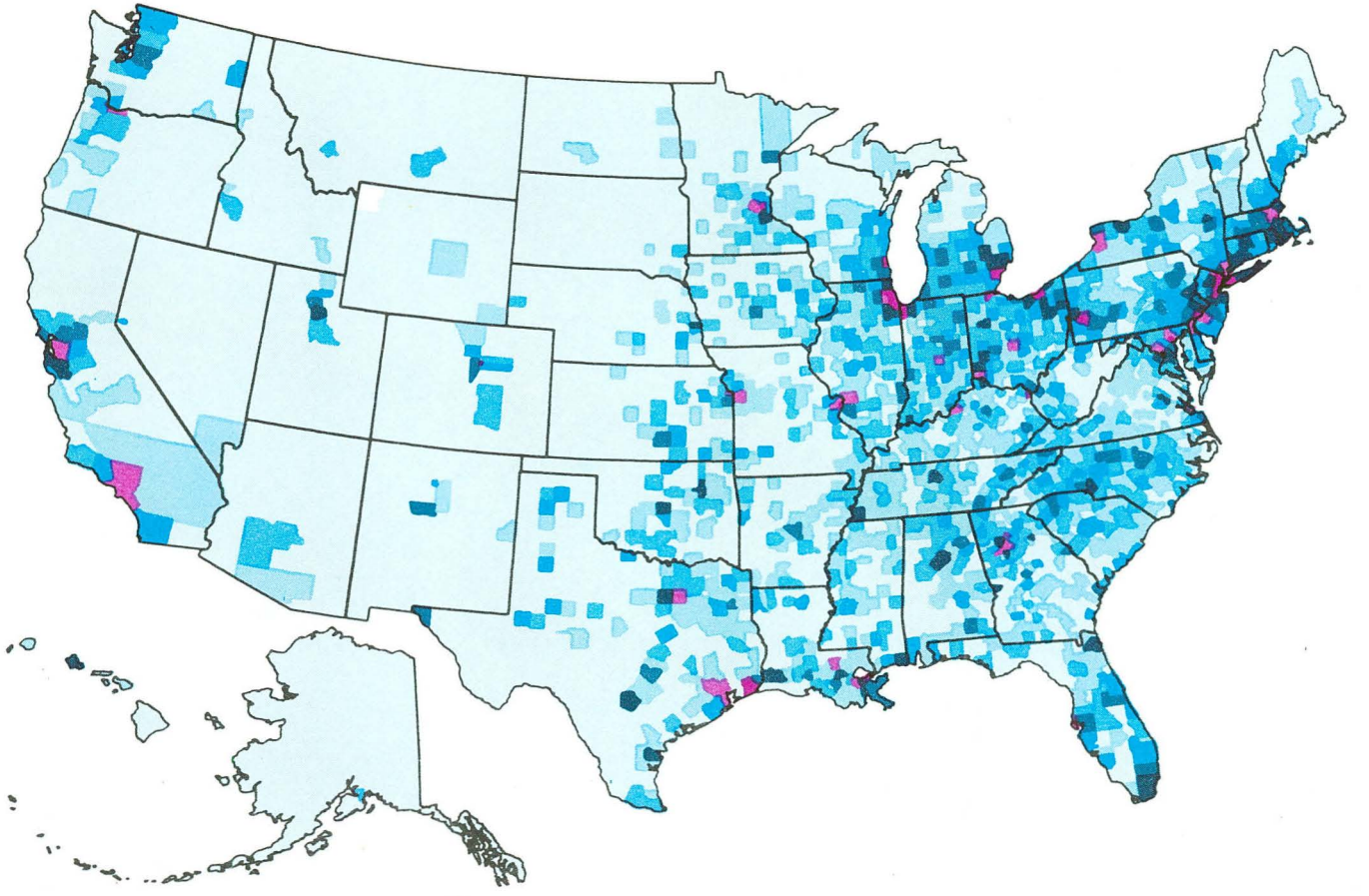
ENDANGERED MAMMALS BY COUNTY



NUMBER OF SPECIES

1 - 1.9 | 2 - 2.9 | 3 - 3.9 | 4 - 5.0

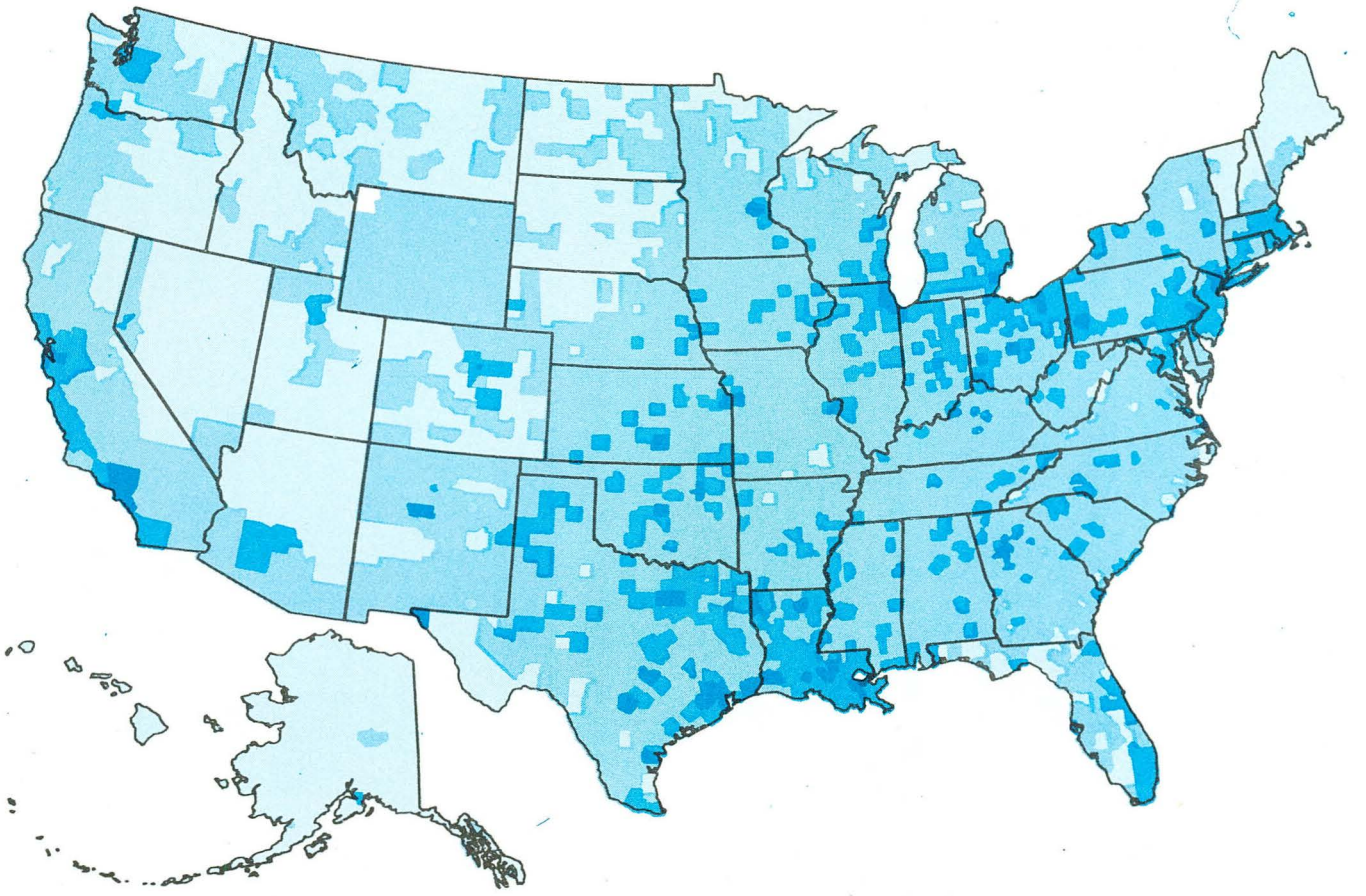
HYDROCARBON EMMISSIONS PER SQUARE MILE



THOUSANDS OF KILOGRAMS

BELOW 1.0	1 - 1.9	2 - 3.9	4 - 7.9	8 - 15.9	16 - 31.9	32 - 64.0	ABOVE 64.0

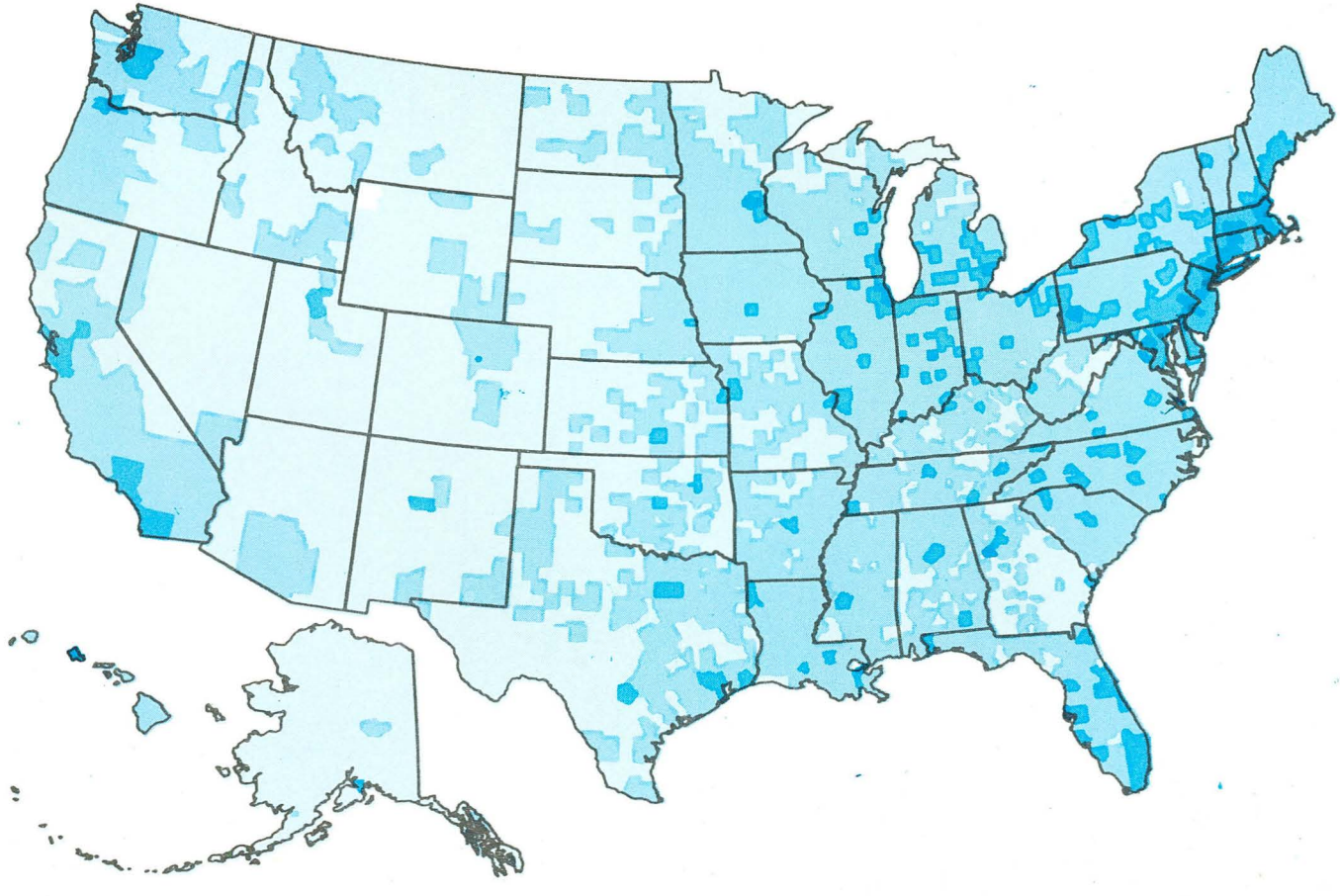
NATURAL GAS USE PER SQUARE MILE



BILLIONS OF BTU

BELOW 1 | 1 - | 10 - 99 | 100 - 1,000 | ABOVE 1,000

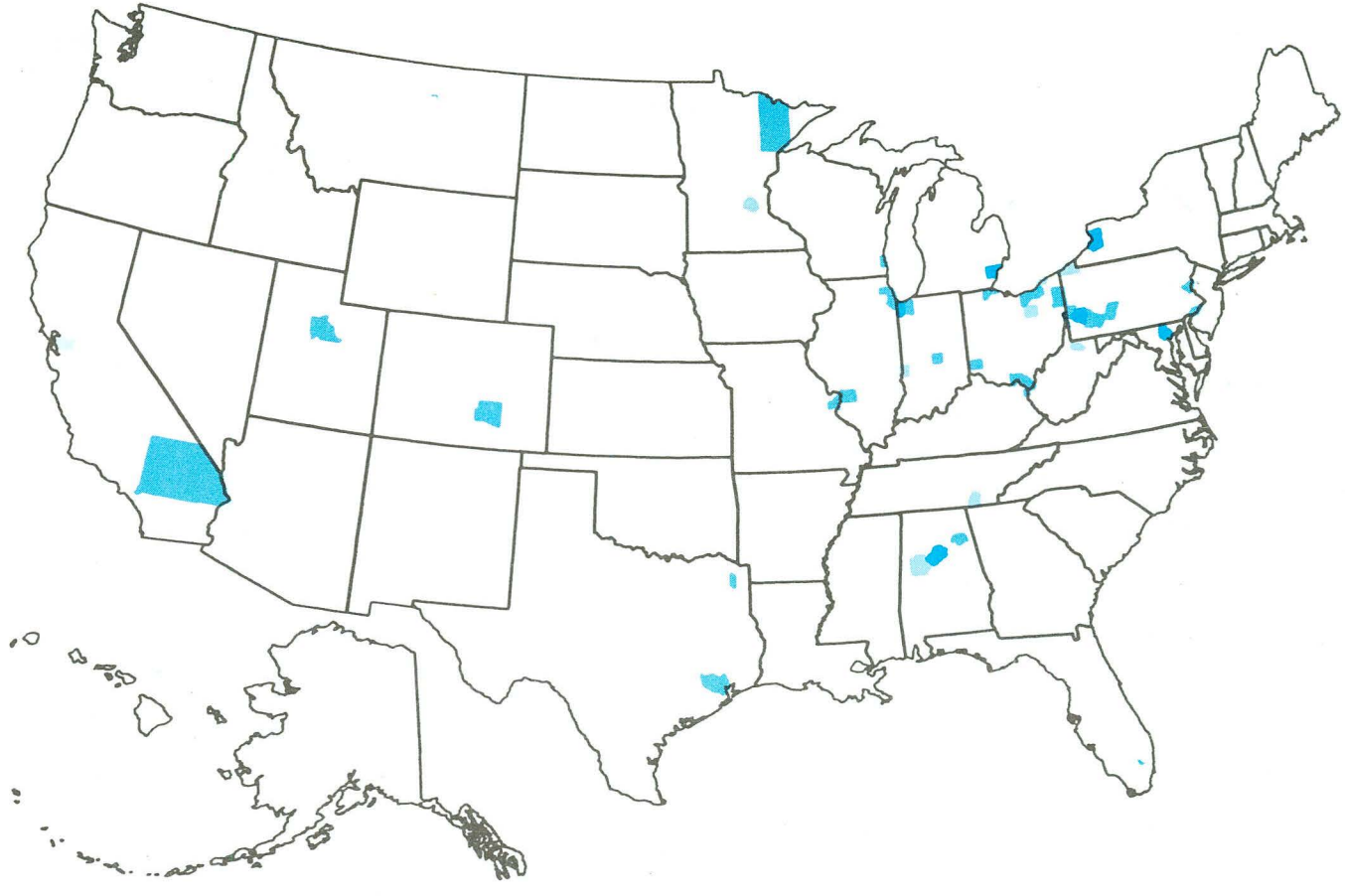
OIL USE PER SQUARE MILE



BILLIONS OF BTU

BELOW 1	1 - 9	10 - 99	100 - 999	1,000 - 10,000	ABOVE 10,000

COKE PRODUCTION BY COUNTY



BILLIONS OF BTU

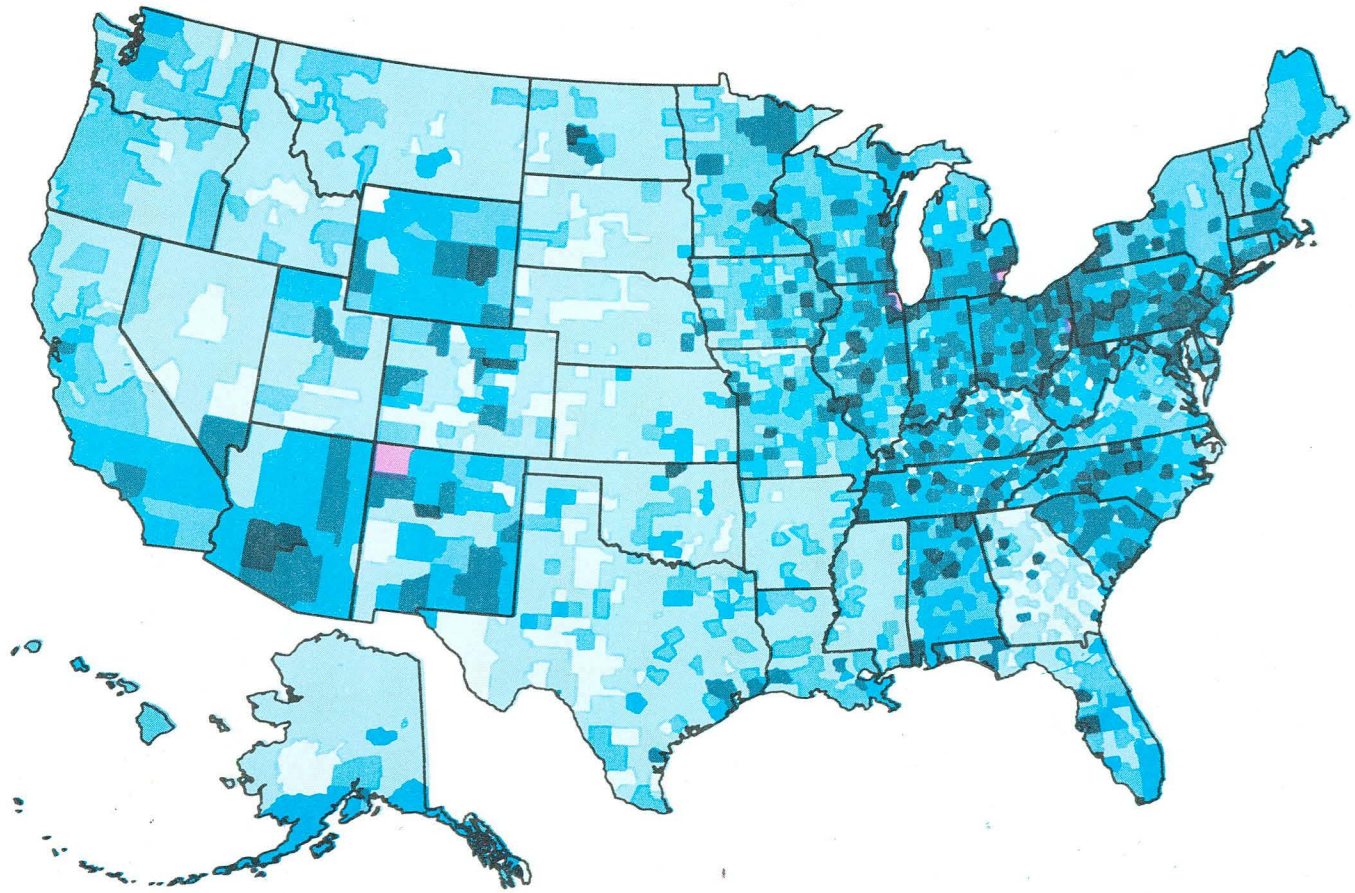
100 - 999

1,000 - 9,999

10,000 - 100,000

ABOVE 100,000

ANNUAL PARTICULATE EMMISSIONS



THOUSANDS OF KILOGRAMS

BELOW 1 | 1 - 9 | 10 - 99 | 100 - 999 | 1,000 - 9,999 | 10,000 - 100,000 | ABOVE 100,000

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This report was done with support from the United States Energy Research and Development Administration. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the United States Energy Research and Development Administration.

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