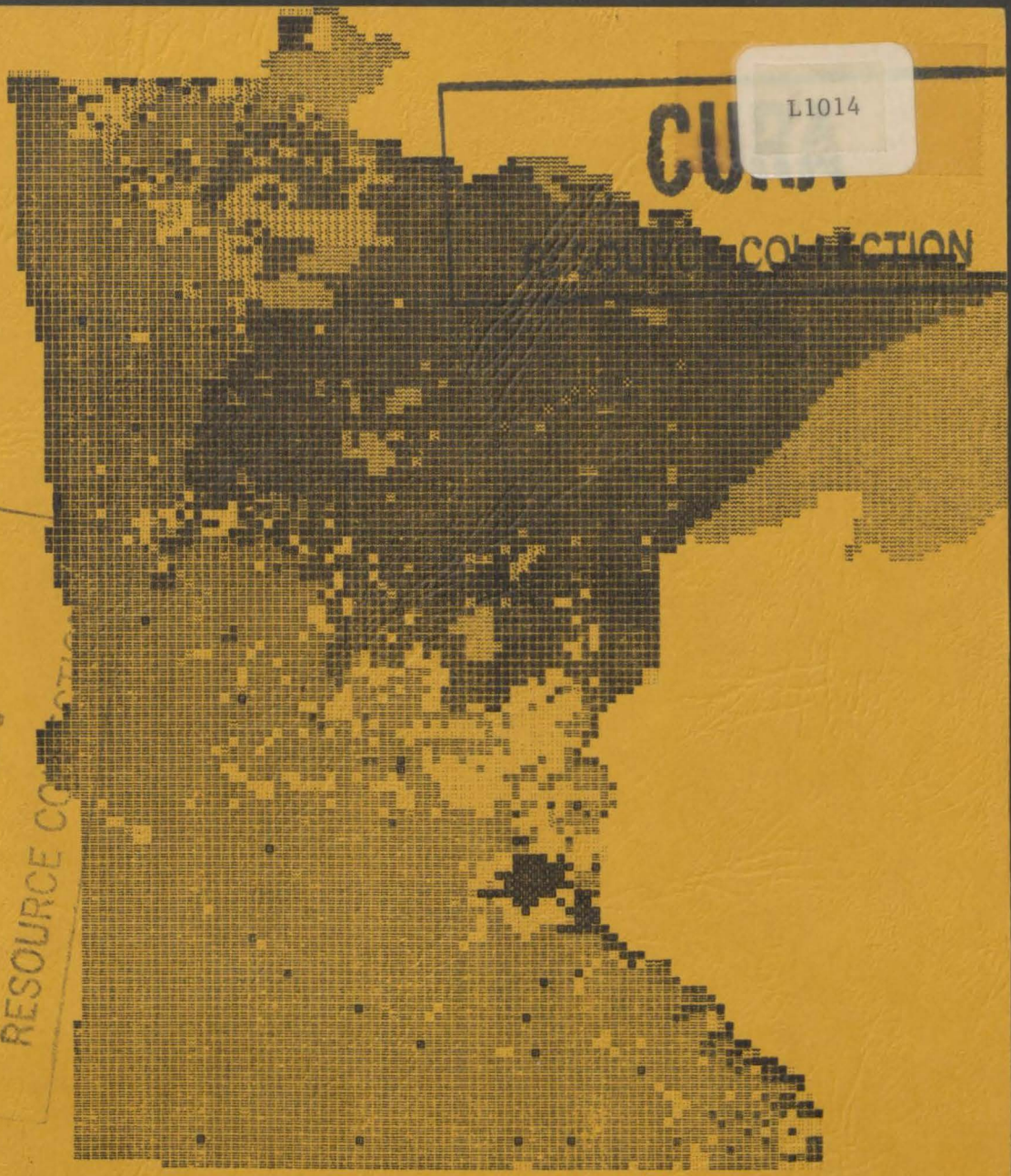

MLMIS

MINNESOTA LAND MANAGEMENT INFORMATION SYSTEM

A Guide to the C.R.T. Data Entry System. CURA and Minn. State Planning Agency. by Kenneth Kozar and John Schmitt June 1974.

COPY 1

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UNIVERSITY OF MINNESOTA
CENTER FOR URBAN AND
REGIONAL AFFAIRS

STATE PLANNING AGENCY

A GUIDE TO THE C.R.T. DATA ENTRY SYSTEM 4001

KENNETH KOZAR
JOHN SCHMITT

JUNE, 1974

THE MINNESOTA LAND MANAGEMENT INFORMATION SYSTEM STUDY

The Minnesota Land Management Information System project is an endeavor of the Center for Urban and Regional Affairs (CURA) of the University of Minnesota and the State Planning Agency. Important contributions to the project have been made by other executive and legislative branches of state government, numerous University departments, and other institutions.

The primary goal of this project is to improve the quality of public-private sector land use decisions. The project is doing this by building a data bank containing information on physical resources, relative accessibility to market of these resources, and information on current land use, zoning, and ownership patterns.

Concurrent with the data collection effort is a research program that is using the collected data to simulate land use decisions and conflicts.

** GUIDE TO READERS **

Since this report may have several different audiences, a summary of each of the sections is provided to aid readers in selection of those sections of interest.

- Section I first contains an overview of the CURA/MLMIS effort including an explanation of the MLMIS data structure. The Cathode Ray Tube (CRT) entry system is then explained in general terms. This section should be read by all.

- Section II is a description of the hardware/software systems used in the system development. Those readers with an interest should read this section. Detailed internal documentation is complete but only available under special circumstances after contacting the CURA/MLMIS director. This is due to the fact that the hardware/software system used is so unique that the concepts are much more valuable than the actual working system to those other than CURA/MLMIS staff.

- Section III is designed for use by a data entry clerk to detail CRT operating instructions. Other readers completely unfamiliar with computer terminals or CRT devices may also find the section of value.

- Section IV is designed for supervisory level users of the system and for system types who desire greater detail on system design techniques used. Data entry clerks should also become familiar with the procedure specified in this section.

- Section V describes the actual process of entering data using the system. Individuals desiring more than the overview in Section I should read parts A. and B. of the Section V. Data entry clerks should be familiar with all of the contents of this section.

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ACKNOWLEDGEMENTS

The authors would like to thank the many organizations and individuals that have made this effort possible. Special thanks go to the Information Resources Development Fund for providing financial assistance, the West Bank Computer Center for hardware scheduling and software assistance, Jack Shea for editing the report and accepting the challenge of being the real user of the system, and Kristine Manlove and Joan Prochaska for typing and secretarial assistance.

I. INTRODUCTION

The Minnesota Land Management Information System (MLMIS) sponsored by the Center for Urban and Regional Affairs (CURA) at the University of Minnesota, is an accumulation and storage of resource data to provide information to plan the preservation and the development of land in the state of Minnesota. Working under contract with the Minnesota State Planning Agency, CURA/MLMIS will accumulate and structure land and water resource data for the State Planning Agency to allow analysis and mapping to aid in planning the use of Minnesota's vast resources.

To build the resource data bank, the systems group at CURA/MLMIS is engaged in a unique data entry project. The main task of the group is not to do initial data collection, but to computerize data sources which already exist. For example, highway maps depict transportation networks and soils maps provide soil resource data. As a result of these varied data sources, a great deal of cooperation and coordination is necessary between CURA/MLMIS and other agencies who originally collected the data.

THE DATA STRUCTURE-LAND SURVEY SYSTEM

A necessity for data accumulation is a framework or structure in which to organize the data. Many land records are kept by government agencies using the land survey system. Land is also often acquired and disposed of using the units specified in the land survey system. Thus, the decision was made to use this system to organize the data structure. As shown in Fig. 1., the basic data collection unit is the quarter-quarter

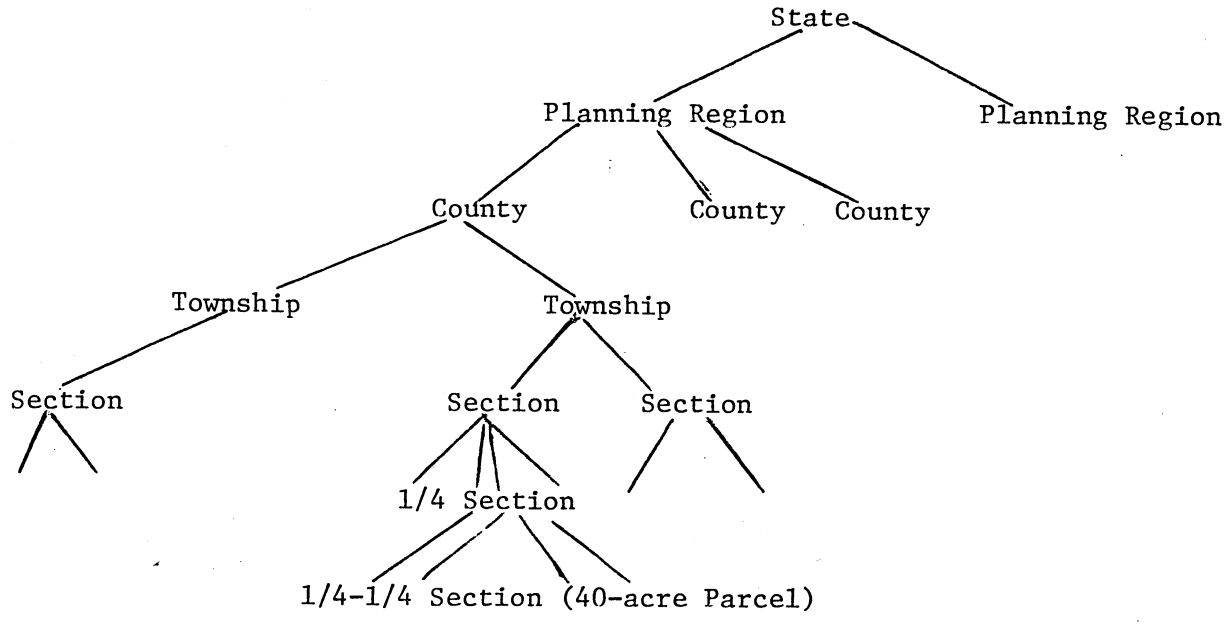


Fig. 1.--Classification System Hierarchy

State of Minnesota consisting of thirteen development regions consisting of eighty-seven counties containing approximately 2500 townships consisting of approximately 1.4 million forty-acre parcels.

section or forty acre cell. Fig. 2. exhibits how the land survey system divides a township of land into forty acre parcels. A township can be represented by a matrix of 576 cells. Due to original surveying errors, there are a number of townships containing parcels outside the regular 576 cell grid. These irregular parcels are handled differently in the data entry process.

COLLECTION OF LAND COVER DATA

MLMIS was a derivative of the State Land Use Mapping (SLUM) project at the University of Minnesota. The SLUM project had as its goal the establishment and computerization of the land survey data structure described earlier and the interpretation and encoding of the variable of land cover. Using aerial photograph interpretation, each 40 acre parcel of land in the state was classified into one of the nine land cover categories. The categories included dominant land cover of forest, cultivation, water, marsh, urban residential, extraction, pasture or open, urban non-residential, and transportation.

Computerization of the interpreted land cover data was a several step process. First, a punch card with mark sense capabilities was prepunched with locational data for each 40 acre data cell. Land cover was penciled onto this prepunched card from maps coded by the photo-interpreters. Conversion of the mark sense cards to magnetic tape media was then made. These tapes, in turn, were converted to a form readable on the University's Control Data Corporation 6600 computer. Computer generated maps were printed to allow error checking against the original source document. The final computer product was a set of twelve

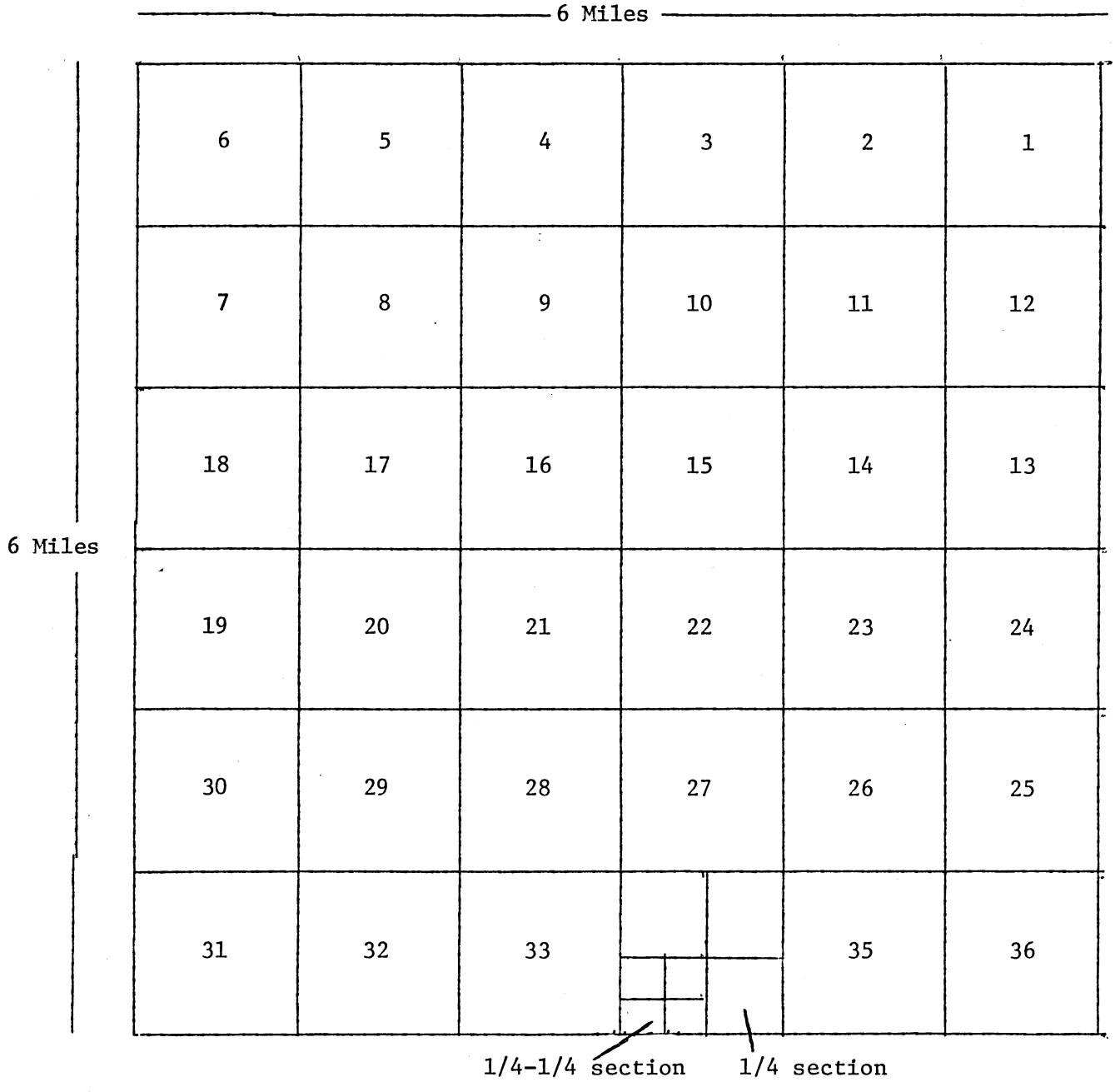


Fig. 2.--A Standard Land Survey Township

Each of the 36 sections is divided into sixteen quarter-quarter sections which is equivalent to a forty-acre cell. There are 36 x 16 or 576 forty acre cells in a standard township. These 576 cells comprise a 24 by 24 matrix.

computer tapes with approximately 1,365,000 records, one for each forty acre parcel in the state. These records contain data including land cover, a parcel's orientation to water, local governmental unit to which a parcel belongs and ownership data. The land cover data was used to produce a color land cover map of the State of Minnesota. The computer tapes produced by the SLUM project now serve as input to the MLMIS CRT data entry system.

NEED FOR SPATIAL DATA ENTRY

The land cover map produced by the SLUM project was merely a by-product of a more important creation, the establishment of a data structure having a place or cell for any data collected in the State of Minnesota. A logical step to follow was to fill the cells with other resource data needed to create information for resource management.

The original data entry method of using punched cards was not feasible for entering new data because of the size of the data structure and the problem of starting with a spatial map, converting it to record data on a card, which loses the spatial effect, and converting the data within the computer to create another spatial map for error checking. A method was needed to create a spatial pattern the computer could recognize as being representative of a certain land segment. The data entry method developed was that of using a position on a cathode ray tube (CRT) screen to represent a position within a township grid. Thus, the location code for each parcel would not be input to enter data for a parcel as was done when entry was done using cards. The location code was implicit from the position on the CRT screen.

HARDWARE AVAILABLE

To implement the CRT data entry, considerable software development was needed. One reason for this need was that existing hardware at the University was used since it was readily available. The computer facility available included a Control Data Corporation 6600 located at the University Computer Center where the original data was stored on magnetic tapes and a CDC 3200 located at the West Bank Computer Center with four disk drives and ten CDC 211 cathode ray tube units. The 6600-3200 are several miles apart but are linked via a high speed telephone line. This enables data exchange between the two machines. Fig. 3. demonstrates the data exchanges made between the two computers.

The advantage of the 6600-3200 link was to use the strengths of each machine. The 6600 installation provides tremendous computing power, software library packages, and tape librarian privileges. The 3200 installation allows private disk pack privileges, scheduled computer time, and is located in close proximity to the CURA/MLMIS offices. The CRT software on the 3200 must be run as a batch job due to operating system limitations. This means that no other 3200 jobs may be run while the CRT job is up. As a result, CRT time is a scarce resource and is treated as such. If there is the potential for cutting CRT usage by additional data preparation, the additional preparation is undertaken.

SOFTWARE DESCRIPTION

The software development was modularized whenever possible. For example, one program prepares files at the 6600 for transfer to the 3200.

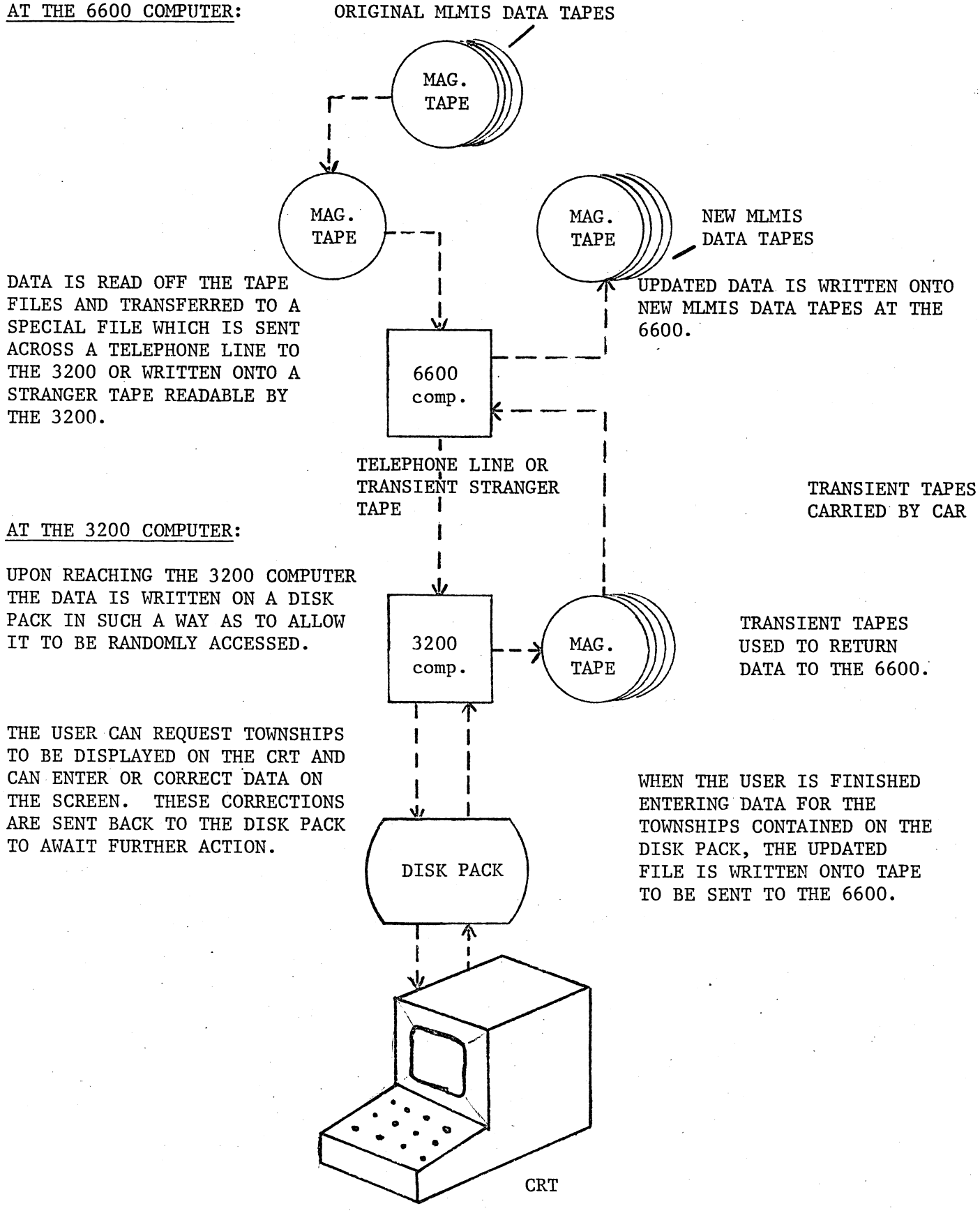


FIG. 3. -- HARDWARE CONFIGURATION USED WITH THE MLMIS CRT DATA ENTRY SYSTEM

Another program does the data transfer and builds the files on the 3200 disk packs. A third program, discussed in more detail below, is the interactive program which allows data entry via the CRT. A fourth program prints hard copy maps from files built by the data entry clerks when they enter the data. A fifth program builds back-up tapes to prevent loss of data if a disk failure were to occur. Programming was done in the FORTRAN programming language with some assembly language routines. The programs will only work on the machines located at the Univeristy of Minnesota because of the unique hardware/operating system environment. However, the concepts developed could be of extreme value in systems design.

The computer center at the 3200 site has developed an executive CRT control system (EXEC) which allows several CRT programs to operate at one time. The MLMIS data entry program is one of the programs run under EXEC. To use the data entry program, the data entry clerks call the computer operator a few minutes before the previously scheduled CRT time. The clerks then proceed to the room where the CRTs are housed to wait a few minutes for the EXEC to come up. After logging into the system and identifying to EXEC that the MLMIS data entry program is to be used, the clerks are ready to identify the township for which they desire to enter or correct data. This township must be in a county which was previously structured on the 3200 disk. Some data entry has already taken place. When the county is brought from the 6600 and set up on the 3200, the administrator in charge of CRT entry has an option of filling some data fields. By specifying the value of the variable that is predominant for a county on a data card, this value will be written into every data record for the county. Then, the data entry clerk has the task of changing only the data records that do not follow the dominant value.

Each variable to be entered to the new data file has a separate routine to allow entry. The choice of the variable to be entered is made by the

data entry clerk by selection from a "menu" of available routines. (See Appendix B.) The clerk types in the acronym for the variable to be entered such as LAND for land cover and sends the command. The computer responds with a blank township outline screen for one-half of a township. The entire township cannot be presented due to screen size limitations.

Next, the clerk must request the township where entry or correction is to take place. The computer responds with a screen filled with whatever data is stored in the data file for the requested township for the variable originally selected from the menu. (See Fig. 4.) Two adjacent characters on the screen represent one quarter-quarter section cell. The two character configuration is a square cell which minimizes distortion. The clerk uses a transparent grid (as shown in Appendix C) taped to the screen to identify the grid network. The North or South boxes (Fig. 4.) indicate which half of the township is displayed. The ↑ and ↓ keyboard symbols are used to move either to the North or South half of the township. The number of irregular parcels, or parcels that lie outside the standard 576 cells shown in Fig. 2., is also displayed on the screen. These parcels are not displayed on the screen and data for them is entered using a special entry technique. This method will be discussed later.

Correction or entry of data in the 576 grid cells in a regular township can take place in several ways. To make corrections to previously entered data, the line skip (Y-direction) and skip (X-direction) keys are used to move a cursor (entry marker) to the desired position on the screen. The cursor indicates where on the screen a change would be made if a keyboard key was pressed. The correct two character code is then entered via the keyboard.

This method would be much too slow for the vast amounts of data entry. As a result, a special "FILL" command was developed. This command allows

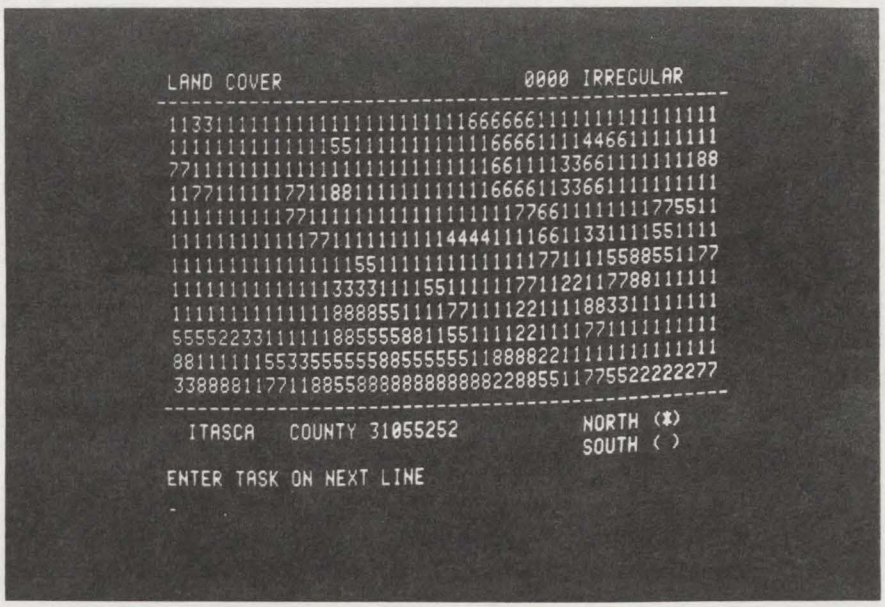


FIG. 4. -- A CRT SCREEN OF LAND COVER DATA AS SEEN BY A CRT DATA ENTRY CLERK.

filling an entire township, a string of numerically continguous sections, or a single section with a value. "FILL" allows blocks of like data to be entered more quickly than by doing parcel by parcel entry.

To safeguard the data file, no data is actually entered or changed on the data file until the clerk issues an update command. This allows the clerk to build the desired spatial pattern and modify it until the desired pattern is reached. The clerk then issues the update command which changes or adds to the data stored on the computer disk.

The irregular parcels outside the 576 standard parcels shown in Fig. 2. are handled by the clerk in a different manner. A special program module called SCAN allows examination of the raw data records of the previously requested township. The clerk can start in any land survey section desired and scan the data stored for the earlier specified variable on the computer record. To continue scanning other adjacent sections, the clerk simply uses the ↑ or ↓ keys on the keyboard. To facilitate changing or entering data, the data is displayed in column one of the CRT screen. This eliminates the need to skip across a record to find the desired data field. After any changes or additions are made, the clerk must update the screen since only then is the data changed in computer storage. After the update is made, the screen will flag changed records with an asterisk to verify to the clerk that changes had actually been made.

A final command (PRNT) issued by the clerk writes the data for the township requested earlier onto a special data file. This allows printing of a hard copy map of the township with the running of another program which is submitted once all data entry or correction work is completed.

All of the previously discussed procedures will be detailed in later sections of this report.

II. GENERAL DESCRIPTION OF THE COMPUTER SYSTEM

The MLMIS CRT software is run on the CDC 3200 computer located in the West Bank Computer Center at the University of Minnesota. A brief description of this machine will aid the user in understanding the steps involved in entering data into the MLMIS data structure.

The 3200 is a medium size digital computer with 32,768 twenty-four bit words of core memory. Attached to the computer is a line printer, a card reader, three magnetic tape drives, four disk drives and ten cathode ray tube display units.

Each disk drive has a removable pack that looks and works like a stack of phonograph records. The pack has ten surfaces, each surface having its own movable read/write head. Since the heads can move rapidly it is possible to locate and read (or write) records anywhere on the disk in a matter of milliseconds. Each disk has a capacity of 8,314,880 characters. The MLMIS CRT software is stored on a disk, as are the data, screen and print files. Before the job can be run the computer operator must mount the appropriate disk pack on a specific disk.

The Cathode Ray Tube (CRT) displays are similar to a television screen, except that the images seen are alphanumeric characters. The CRT has a typewriter-like keyboard with some special keys to move the cursor and to send the screen image to the computer for processing. The keyboard procedure will be discussed more fully in Part III of this manual. Six CRTs are located in Room 140 Blegen, two in Room 25D Blegen, one in Room 93 Blegen and one in Room 1009 Social Science Tower.

The MLMIS CRT software makes use of all of the resources of the 3200, especially the CRTs and the disk drives. The software is written in the FORTRAN programming language with some assembly language routines. The software is extremely machine dependent and will run only at the Univsity of Minnesota West Bank Computer Center.

III. HOW TO OPERATE THE CATHODE RAY TUBE (CRT)

INTRODUCTION

The information in this section is intended to acquaint a data entry clerk with the operating characteristics of the Control Data Corporation (CDC) Visual Display Device #211. The Visual Display Device, normally referred to as a cathode ray tube (CRT), provides the means by which a CRT user may communicate with a computer (and vice-versa) in a "conversation-like" manner. Thus, a CRT user can direct the computer to display specified information on the screen or direct it to do certain types of processing simply by entering instructions on the display screen using a typewriter-like keyboard. The computer system will normally respond to instructions very rapidly, on the order of from one to fifteen seconds. This capacity allows carrying on a "conversation" with the computer system in a very rapid fashion. The subsequent material in this section will provide an overview of the CRT and information on how to use the typewriter-like keyboard.

OVERVIEW OF THE CRT

The CRT (shown in Fig. 5.) consists of two primary parts and a master control. The two primary parts are: (1) a typewriter-like keyboard with 10 special or control keys and, (2) the display screen which is similar to a television screen and which can display 20 lines of 50 characters each. The master control (on/off/intensity control) is located on the right side of the CRT.

The on/off/intensity control is always to be left on. Rotating this knob toward the rear of the CRT cabinet increases the intensity or brilliance of the display image. When finished using the CRT rotate

the knob toward you until the image disappears from the screen. Again, do not turn off the CRT unit.

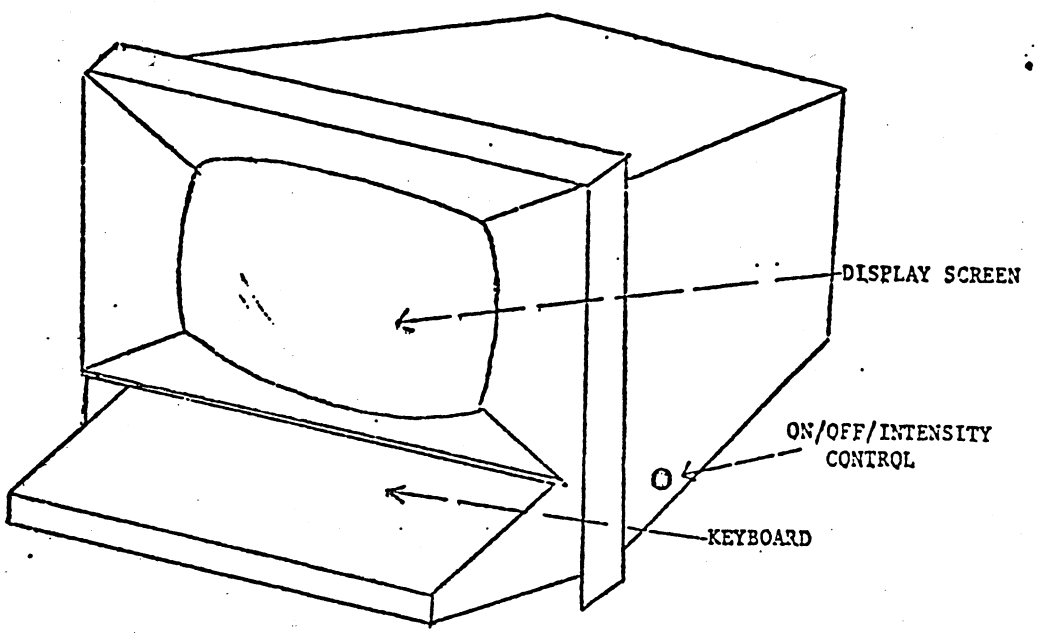


FIG. 5. -- Cathode Ray Tube (CRT)

OVERVIEW OF CRT KEYBOARD

The CRT keyboard (shown in Fig. 6.) is very similar to an electric typewriter keyboard except there are 10 special or control keys (which will be described later). The keyboard is used to enter alphabetic, numeric and special ($/*, etc.) characters on the display screen. The position on the screen at which a character will be entered is indicated by the entry marker (cursor) which is an illuminated dash which sits below the character's position in a line.

EXPLANATION OF CONTROL KEYS

The operation or effect of the control keys will now be explained. Refer to FIG. 6. for the placement of the key in relation to the standard keyboard.

Key Number and Name	Function
1. CLEAR	By depressing the "CLEAR" key the CRT screen is cleared (erased) and the entry marker moves to the upper lefthand corner of the screen.
2. BKSP	The "BACKSPACE" key moves the entry marker one space back without changing the data already entered on the screen.
3. PRINT	In this installation the "PRINT" key is inoperative.
4. RESET	By depressing the "RESET" key the entry marker is moved to the upper lefthand corner of the display screen without affecting the data already entered on the screen.
5. LINE SKIP	By depressing the "LINE SKIP" key the entry marker is moved to the beginning of the next line on the display screen.
6. SEND	The "SEND" key is depressed to communicate to the computer system. The information on the display screen is transmitted to the computer.
7. REPT	The "REPEAT" key is operated in conjunction with another key to enable you to repeat that key's character or function. The "CLEAR", "PRINT", "RESET", "SEND" and "SHIFT" keys are not affected by the "REPEAT" key.

Key Number and Name	Function
8. SKIP	By depressing the "SKIP" key the entry marker is moved one space forward without changing the data already entered on the screen.
9. SHIFT	Continued depression of either "SHIFT" key enables entry of the upper symbol on the two-symbol keys. Operation of the single-symbol keys is not affected by the shift keys; all alphabetic symbols are displayed in upper case form.
10. RETURN	The "RETURN" key moves the entry marker to the beginning of the next line on the display screen in a similar manner as the "LINE SKIP" key.
11. SPACE BAR	Depressing the space bar will move the entry marker one space forward erasing any data on the display screen as it goes forward.

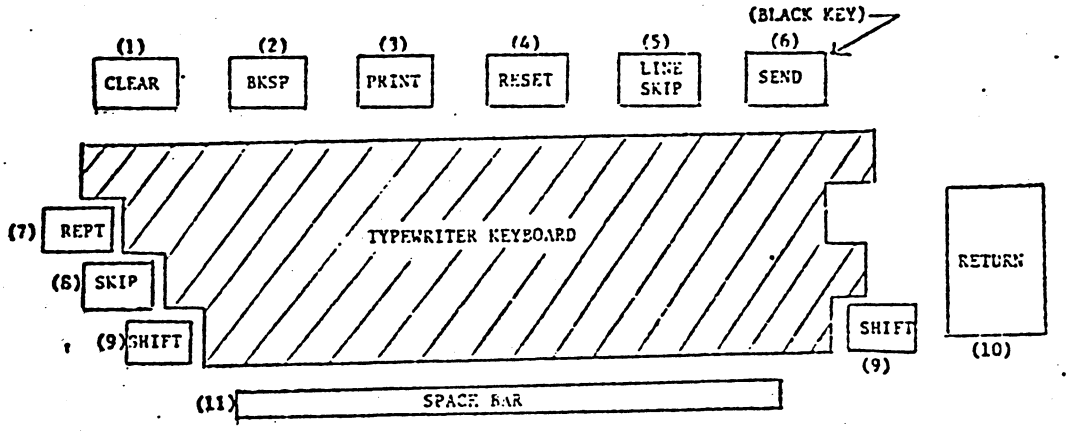


FIG. 6.-- DISPLAY STATION KEYBOARD

ONE WORD OF CAUTION. The space bar and the skip key both position the entry marker/cursor. However, as specified in the above instructions, the space bar will erase any entry on the display screen as it moves forward; the skip key moves the entry marker forward without erasing the contents (if any) on the display screen.

EXAMPLE

For example, to change the third parcel from 55 to 33 if the parcel was on the second line of the display screen:

i.e. 11225544

to

11223344

1. Press the reset key to move the entry marker to the upper left hand corner of the screen.
2. Press the line skip key to move to line 2.
3. Press the skip key (not the space bar as this would erase the present numbers) 4 times to position the entry marker under the first number 5.
4. Press the key representing the number 3 twice.
5. Progress to next step.

IV. PROCEDURE FOR LOADING THE MLMIS CRT-DATA ENTRY PROGRAM

In order to give all 3200 computer users better service, the West Bank Computer Center requires that all CRT users schedule CRT usage time through the secretary in Room 93C Blegen Hall. Since scheduling is done on a first-come-first-served basis, time should be reserved as far in advance as possible. However, the right to schedule CRT time should not be misused. Users should be prompt at starting their CRT runs and should be careful not to run longer than they are scheduled. If the scheduled time will not be used, the West Bank Computer Center should be notified as soon as possible so that another user may be scheduled for that idle time slot. With a little care and common sense this system can continue to be self-regulating.

At present the 3200 is running version 4.2 of Mass Storage Operating System (MSOS) and as such the MLMIS CRT data entry program is run as a batch job. What this means is that while a user is entering data through the CRT's, no other 3200 jobs can be run. This limitation of the operating system creates situations in which the 3200 becomes a very scarce resource. In order to make computer time available to other 3200 users, it is suggested that MLMIS CRT data entry users adequately prepare their data sheets so that a minimum of computer time will result in a maximum of data entered, i.e. head scratching should be done before approaching the CRTs.

The West Bank Computer Center has developed an EXECUTIVE CRT CONTROL SYSTEM which allows more than one CRT program to run at a time. The MLMIS CRT data entry program is one of the programs that can run under the "EXEC".

To load the "EXEC", the user must call the computer operator (373-7598) at the beginning of the scheduled CRT time and ask him to 'put up the "EXEC"'. The operator will then read the control card deck (kept in the computer room) into the card reader and the "EXEC" will start to run. The user can now proceed to the CRT since the program will be running shortly.

Once at the CRT, the user can attempt to log onto the system. To log on, follow the steps listed below.

1. The "EXEC" only recognizes active CRTs, so press the "SEND" key (once). If the "EXEC" is not running yet, nothing will happen. Be patient. Once the "EXEC" is running, it will respond by displaying the log in instruction screen.

2. When the instruction screen appears, type in "LOGIN, XXXXXXXX" and press the "SEND" key. This logs your CRT onto the system under account number XXXXXXXX.

3. The next screen to appear will ask for the name of the program you wish to run. The name assigned to the MLMIS CRT data entry program is "CRTENTRY". Type "CRTENTRY" and press "SEND".

4. The next screen to appear will be the menu of program options (Fig. 7.). By typing in the acronym for the program module the user wishes to execute, the user selects the variable to be dealt with. Acronym meanings are found in Appendix A.

   All commands must be entered left justified on the line beneath the message "ENTER TASK ON NEXT LINE".

   After the user has entered the desired acronym for the module he wishes to execute, he must press the "SEND" key. The computer does not recognize any commands or changes to the CRT screen until the "SEND" key is pressed. The user can refer to Section V for details concerning the module he has selected to use.

5. At the end of scheduled computer time, the user calls the computer operator (373-7598) and asks to have the "EXEC" program terminated. This will free up the system for other users.

6. The card deck for the program that prints MINNMAPS should now be taken to the I/O room and placed in the input tray. This program should be run after every CRT session.

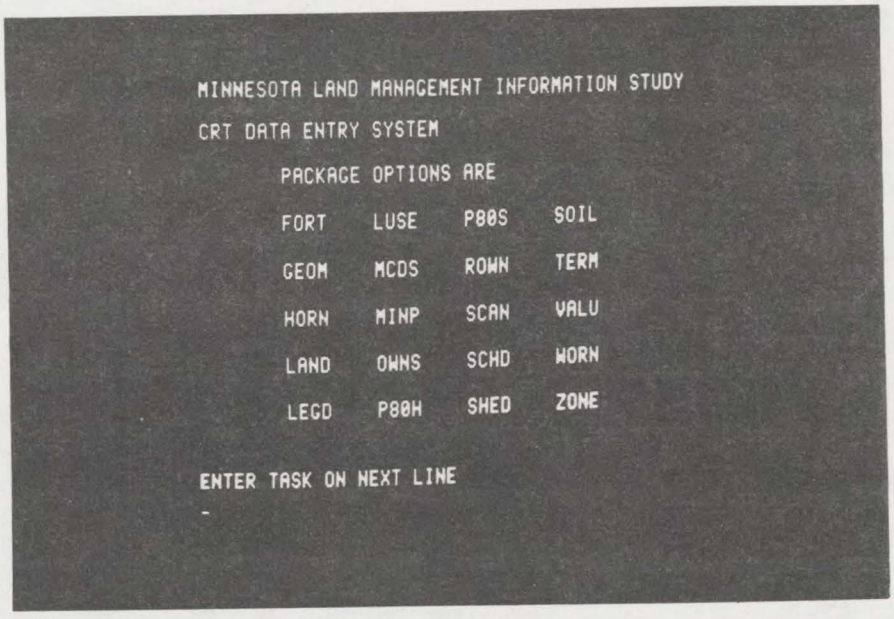


FIG. 7. -- "MENU" OF AVAILABLE PROGRAM OPTIONS.

V. DATA ENTRY ROUTINES

This section details the instructions for entering data into the MLMIS data bank through the CRT data entry system. The assumption is made that the procedure for loading the MLMIS CRT data entry program described in section IV has been followed. Although each data entry routine will be covered, it is helpful to know that all the routines fall in the following two categories:

1. A set of routines for entering one character variables described fully in the description of the land cover (LAND) routine.

2. A set of routines for entering two, three, and four character variables described fully in the description of the geomorphic region (GEOM) routine.

Each of the routines will now be described in detail.

A. LAND COVER

Assuming that the procedure for loading the MLMIS CRT data entry program described in section IV has been followed, the next step is to inform the computer that you want to use the land cover program module. This is done by selecting the acronym "LAND" from the option menu, typing it on the proper line (shown in Fig. 8.) and pressing the "SEND" key. The computer will respond by displaying a blank township land cover outline screen as in Fig. 9.

The next step is to request the computer to read a particular township's land cover data from the disk file. If, for example, you wanted county 31, township 55, range 25W, you would enter "R3105525" as in Fig. 10. (Refer to Appendix B for CRT commands. Notice that since this township is west of the 4th principal meridan its range is assumed to be

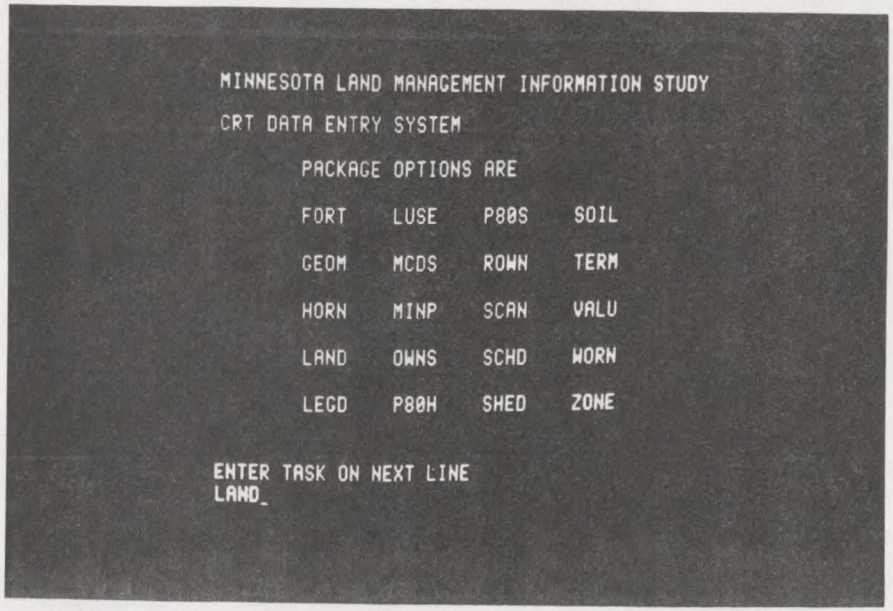


FIG. 8. -- MENU OF ROUTINES

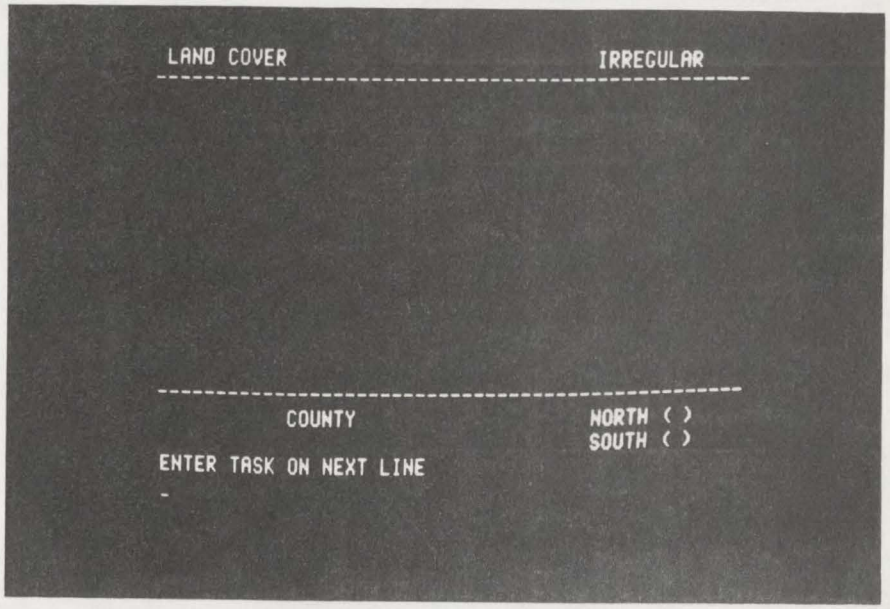


FIG. 9. -- BLANK TOWNSHIP OUTLINE SCREEN

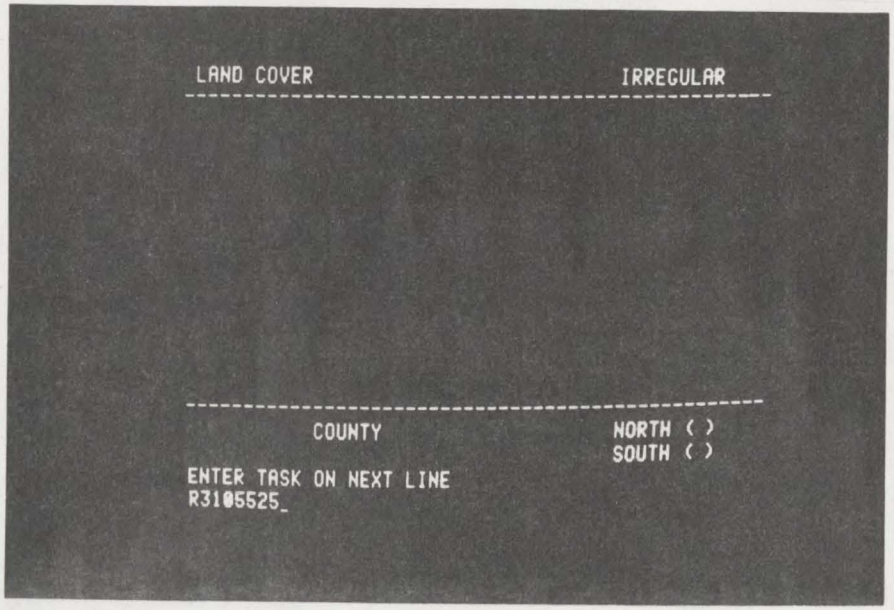


FIG. 10. -- REQUEST BEING MADE FOR A SPECIFIC TOWNSHIP

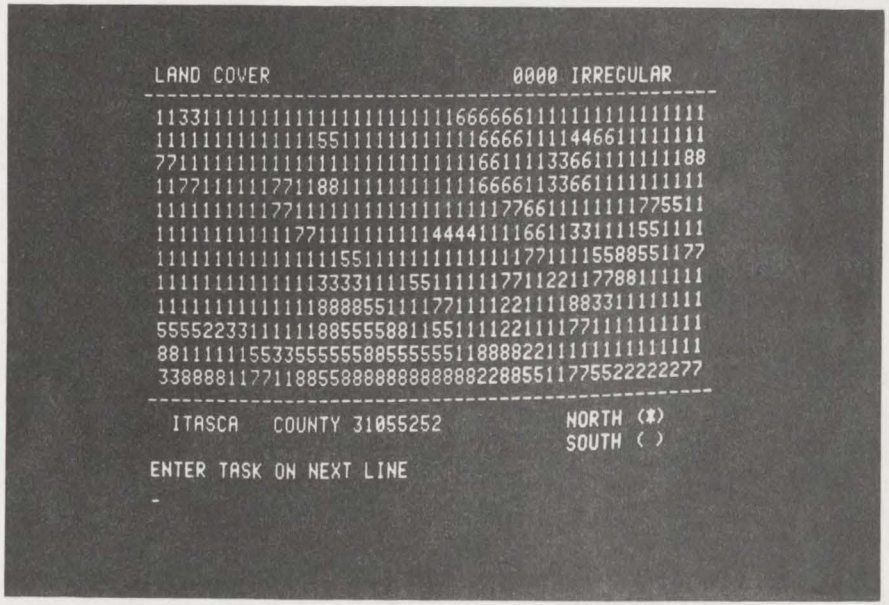


FIG. 11 -- LAND COVER DATA FOR SECTIONS 1-18 OF REQUESTED TOWNSHIP

equal to 2 (west). Only those townships in Cook County east of the meridian need to have the 3rd range character entered as a 1.) Press the "SEND" key. If such a township exists on the file, the computer will find it and display it. If the request was done improperly, an error message will be shown. If the error message appears, retype your request in the form "R3105525".

Fig. 11 shows the land cover data for the north half (sections 1-18) of a township (3105525) in Itasca County, which has no irregular parcels.

By manipulation of the "SKIP" and "LINE SKIP" keys on the CRT keyboard, the screen cursor can be positioned beneath the first character of the forty-acre parcel to be changed (remember, two characters represent a forty acre parcel) and the change can be keyed in. It is also important to remember that the computer will only recognize a change to the CRT screen when it is commanded to do so. In other words, changes can be made to data on the screen, but unless a special update command is issued ("U"), changes will not be made to the data file.

To view the southern half of the township, enter a down arrow ("↓") and press "SEND" (Fig. 12.). The computer will then display sections 19-36 of the township (Fig. 13.).

If the township has irregular parcels (parcels outside the regular 576 cells shown in Fig. 2.), they will not be displayed since the CRT displays only the 576 regular parcels. To enter data for the irregulars the user must execute the SCAN module. This is done by entering the word "SCAN" and pressing "SEND" (Fig. 14.). The computer will respond by asking for the section number which is typed in by the clerk (example shown in Fig. 16. is 05) and press "SEND".

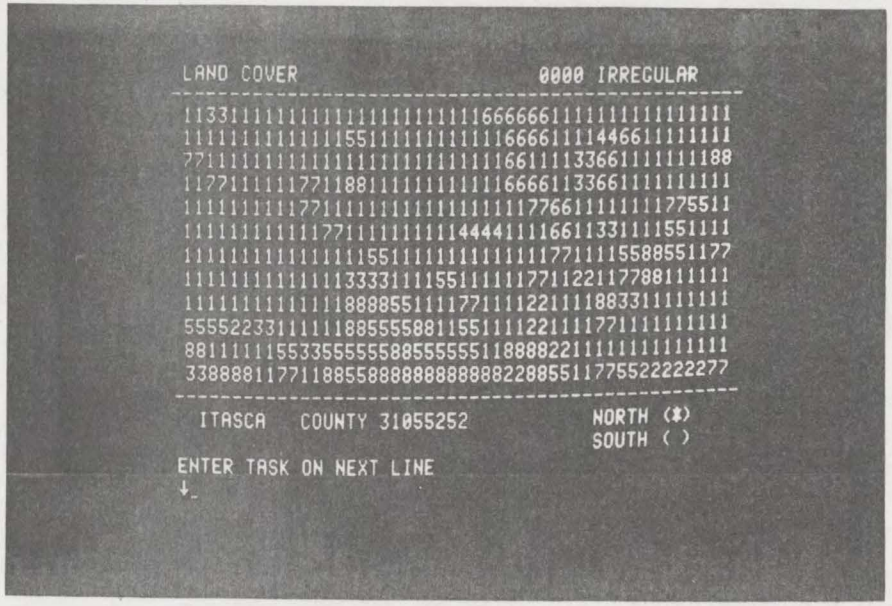


FIG. 12. -- REQUEST TO DISPLAY SECTIONS 19-36 OF THE TOWNSHIP

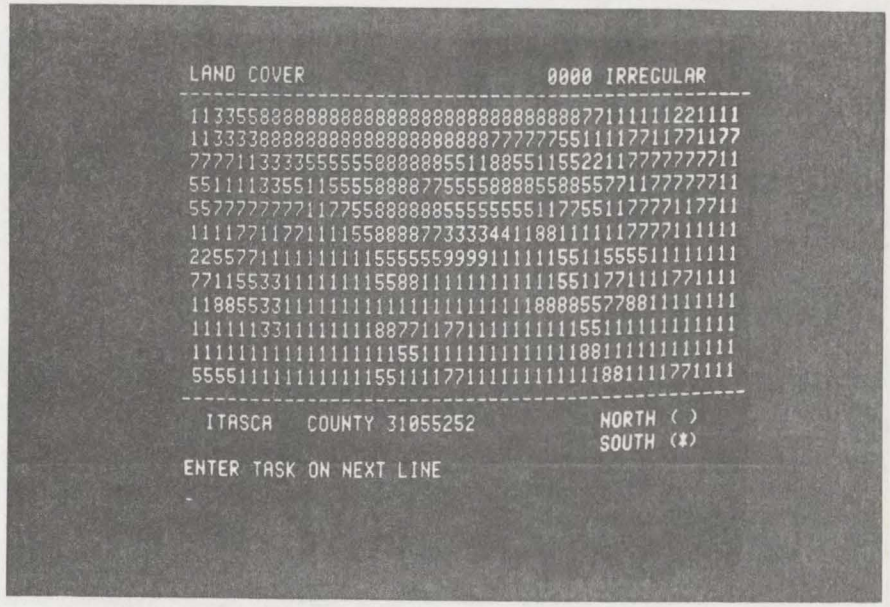


FIG. 13. -- SECTIONS 19-36 DISPLAYED

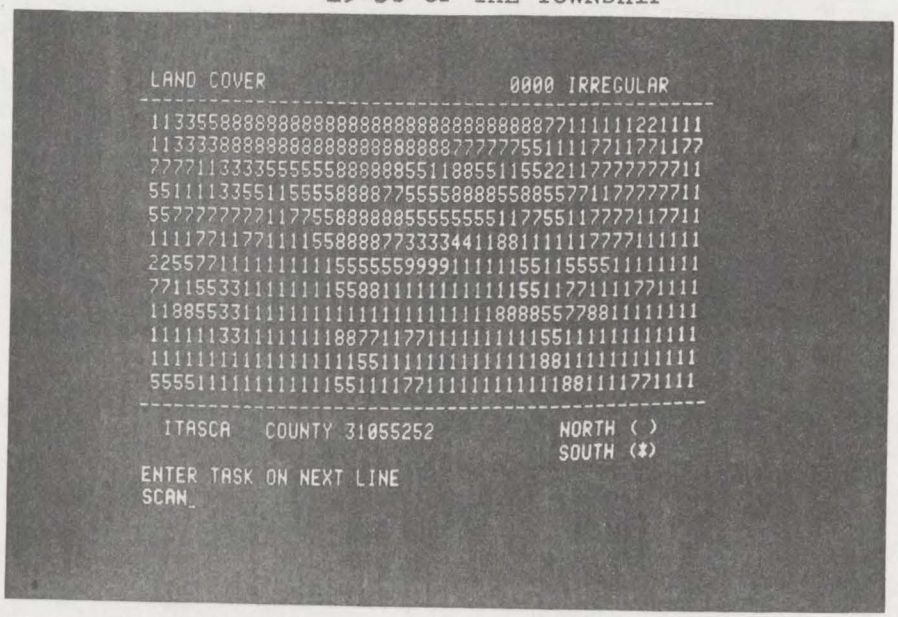


FIG. 14. -- REQUEST TO ENTER THE SCAN ROUTINE

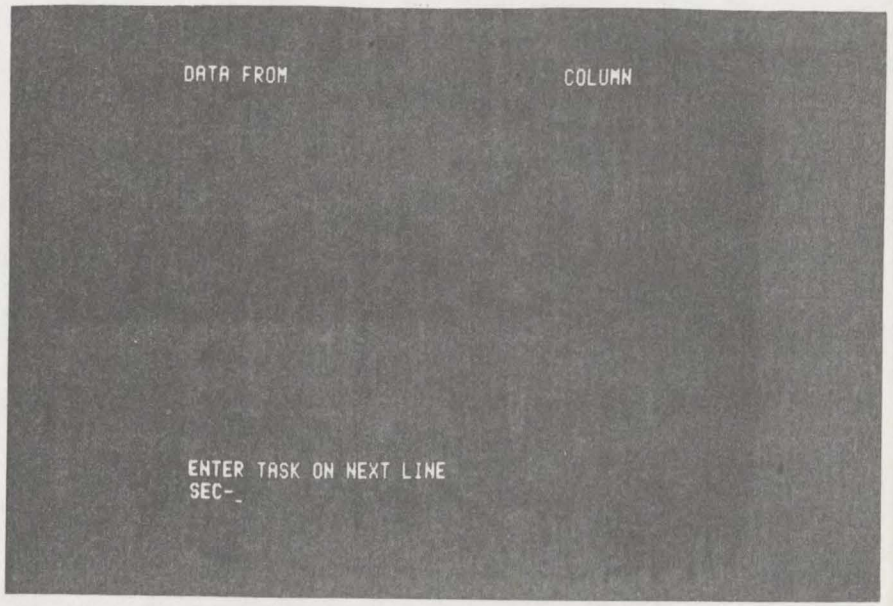


FIG. 15. -- SYSTEM REQUESTS DESIRED SECTION FROM CRT OPERATOR

The computer will find that section of the township and display the column of data in question, in this case column 26, land cover (Fig. 17.). To scroll up or down through the data simply enter up or down arrows ("↑", "↓") and press "SEND" and the computer will respond by scrolling in the direction of the arrow.

To change a parcel's data simply manipulate the "line skip" key until the cursor is beneath the parcel's data cell and key in the change (Fig. 18.). Once all the changes are made for the fifteen parcels on the screen, an update must be executed to apply the changes to the data file (Fig. 19.). As is shown in Fig. 20., updated parcels will be flagged for visual verification.

To return to the land cover routine, enter the word "FINI" and press the "SEND" key.

Once all the updating is complete the user should print a hard copy MINNMAP of the township for future reference and error checking. This is done by entering "PRNT" and pressing "SEND" (Fig. 21.).

When the user wishes to leave the LAND routine, he simply enters the word "FINI" and presses "SEND". The menu screen will appear and he can select another routine or terminate the CRT data entry program. As long as the menu screen is visible the CRT data entry program is still running, i.e., eating up money. The job is terminated by entering the word "TERM" and pressing "SEND". A screen should now appear indicating "END OF JOB". The user can now proceed to the I/O room to submit the program that will print MINNMAPs.

```
DATA FROM                    COLUMN




ENTER TASK ON NEXT LINE
SEC-05_
```

FIG. 16. -- OPERATOR REPLIES WITH SECTION "05"

```
DATA FROM   31055252          COLUMN 0026
1                        SECTION 0511
1                        SECTION 0512
1                        SECTION 0513
5                        SECTION 0514
1                        SECTION 0521
1                        SECTION 0522
1                        SECTION 0523
1                        SECTION 0524
1                        SECTION 0531
1                        SECTION 0532
1                        SECTION 0533
7                        SECTION 0534
1                        SECTION 0541
1                        SECTION 0542
1                        SECTION 0543

ENTER TASK ON NEXT LINE
-
```

FIG. 17. -- LAND COVER DATA FROM COLUMN 26 IN THE DATA FILE IS DISPLAYED IN THE FIRST COLUMN OF THE CRT SCREEN

```
DATA FROM   31055252          COLUMN 0026
1                        SECTION 0511
1                        SECTION 0512
1                        SECTION 0513
9_                       SECTION 0514
1                        SECTION 0521
1                        SECTION 0522
1                        SECTION 0523
1                        SECTION 0524
1                        SECTION 0531
1                        SECTION 0532
1                        SECTION 0533
7                        SECTION 0534
1                        SECTION 0541
1                        SECTION 0542
1                        SECTION 0543

ENTER TASK ON NEXT LINE
```

FIG. 18. -- PARCEL 0514 HAS BEEN CHANGED TO A "9"

```
DATA FROM   31055252          COLUMN 0026
1                        SECTION 0511
1                        SECTION 0512
1                        SECTION 0513
9                        SECTION 0514
1                        SECTION 0521
1                        SECTION 0522
1                        SECTION 0523
1                        SECTION 0524
1                        SECTION 0531
1                        SECTION 0532
1                        SECTION 0533
7                        SECTION 0534
1                        SECTION 0541
1                        SECTION 0542
1                        SECTION 0543

ENTER TASK ON NEXT LINE
U_
```

FIG. 19. -- UPDATE COMMAND IS ISSUED

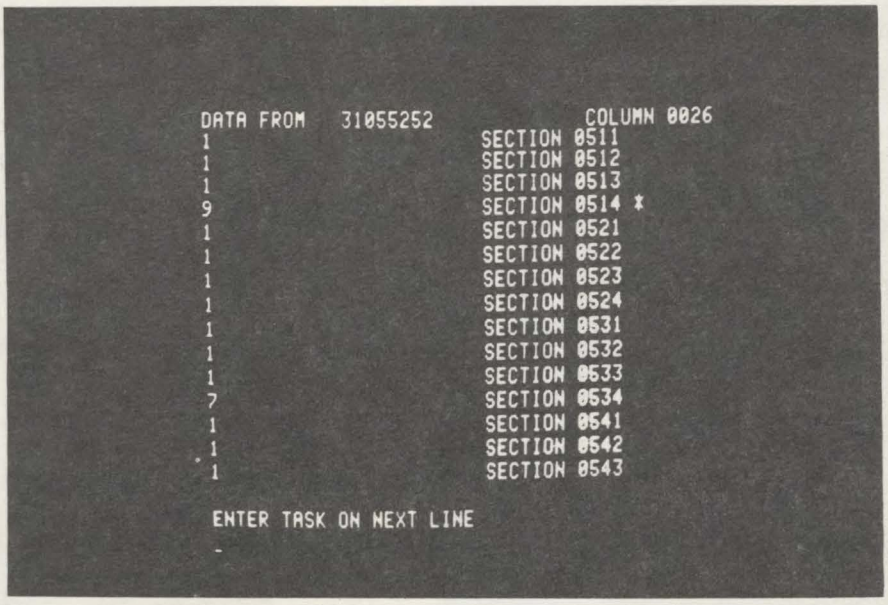


FIG. 20. -- UPDATED PARCEL IS FLAGGED

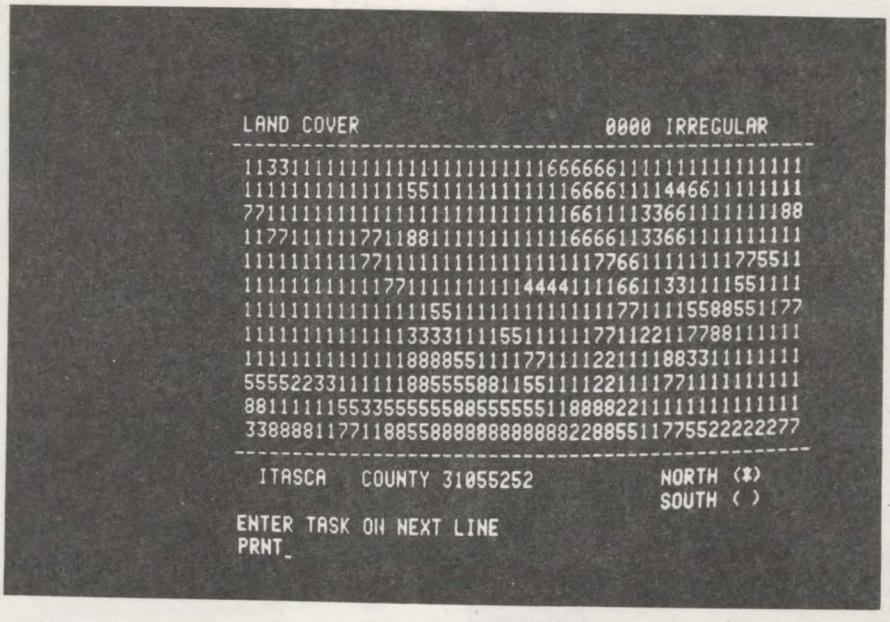


FIG. 21. -- "PRNT" COMMAND IS ISSUED

B. GEOMORPHIC REGIONS

Assuming that the procedure for loading the MLMIS CRT data entry program described in Section IV has been followed, the next step is to inform the computer that you want to use the geomorphic regions program module. This is done by selecting the acronym "GEOM" from the option menu, typing it on the proper line as shown in Fig. 22. and pressing the "SEND" key. The computer will respond by displaying the symbol table generation screen shown in Fig. 23.

Since the CRT township display represents each forty acre parcel as a two character element and the geomorphic regions are coded with three character alpha numeric codes, it is necessary to equate the geomorphic region codes to a two character symbol. Fig. 23. shows the symbol table with directions for entering codes. Simply type in a two character symbol (the more unique the symbols, the more visible is the pattern they create), an equals sign and the geomorphic region code to be represented. Press the "SEND" key. The symbol and region code will be stored in the table as shown in Fig. 24.

To delete an entry from the table enter only the two character symbol on the proper line (left justified on line below "ENTER SYMBOLS ON NEXT LINE" command) and press "SEND". The symbol and its corresponding geomorphic region code will be removed from the symbol table. After all the symbols have been entered for the regions of interest (maximum of 24), type in the word "END" as shown in Fig. 25. Press "SEND". The computer will respond by displaying a blank township geomorphic region outline screen, as in Fig. 26.

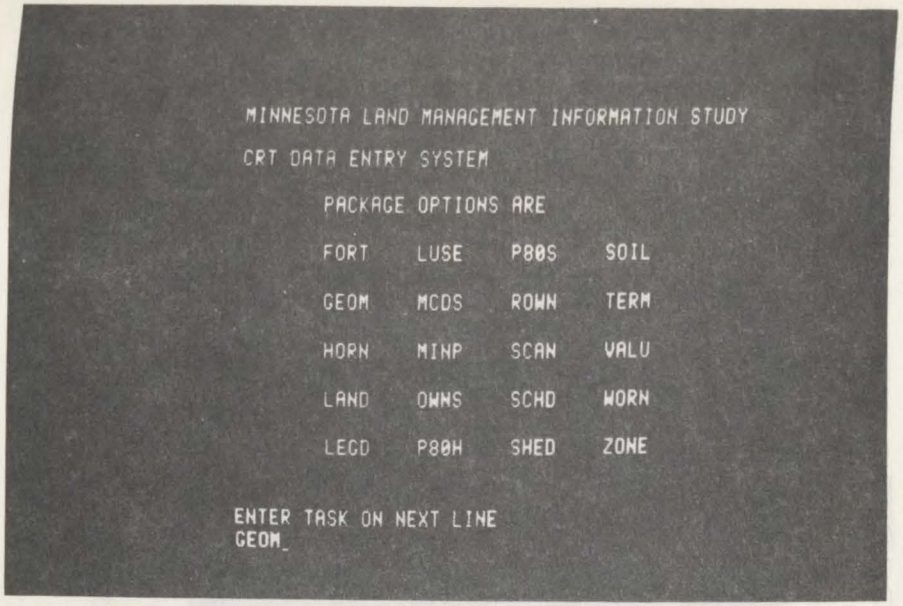


FIG. 22. -- REQUESTING THE ROUTINE GEOM FROM THE ROUTINE MENU

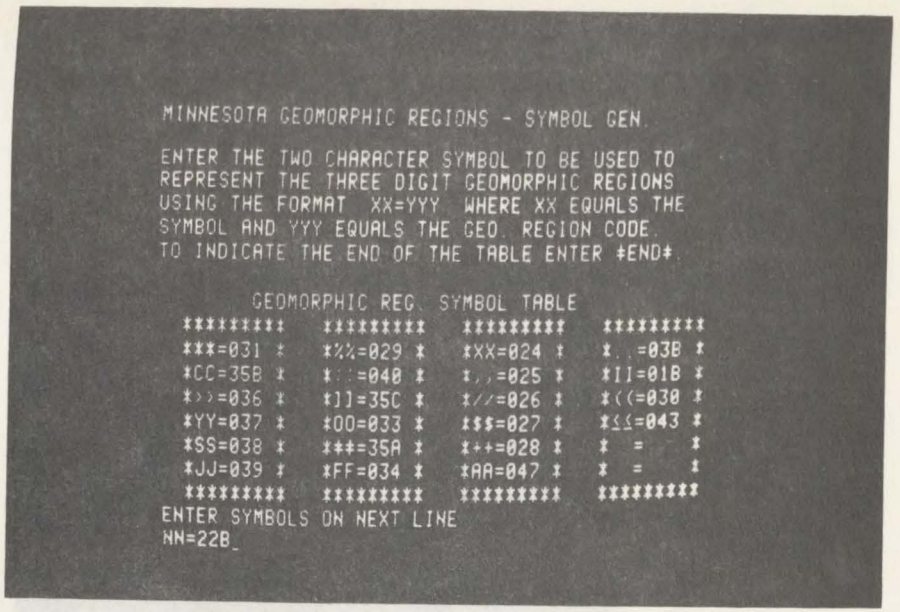


FIG. 23. -- SYMBOL TABLE GENERATION SCREEN WITH FIRST SYMBOL READY FOR ENTRY

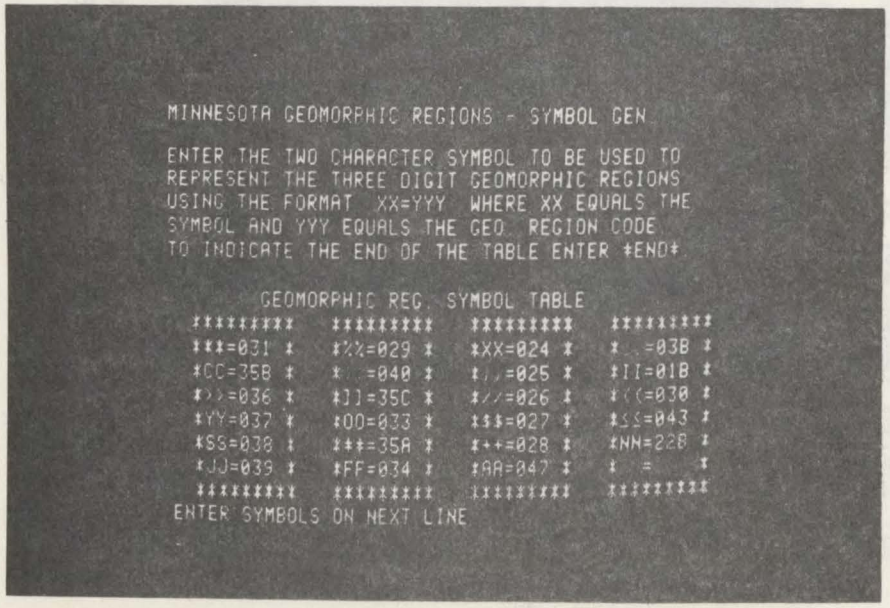


FIG. 24. -- SYMBOL TABLE WITH FIRST ENTRY

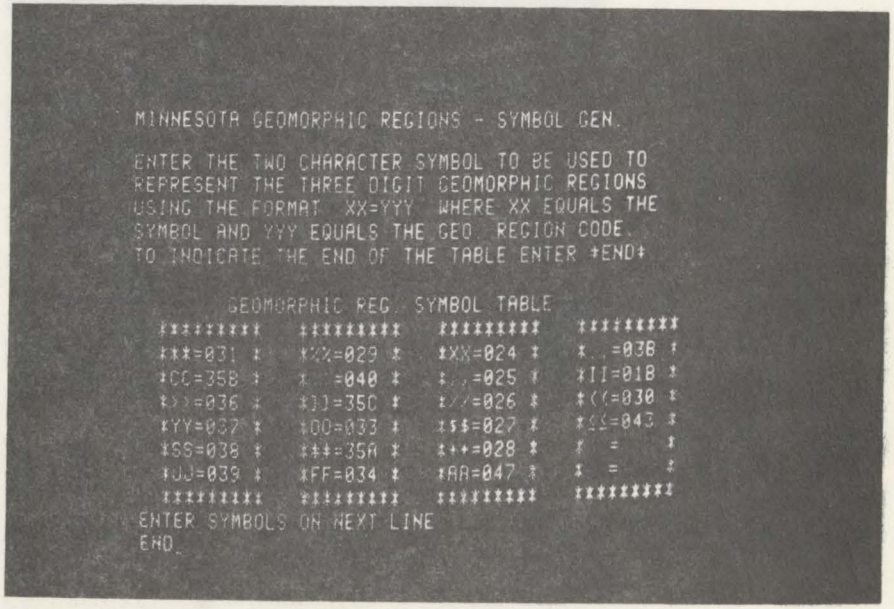


FIG. 25. -- ALL SYMBOLS ARE IN SO END SYMBOL GENERATION

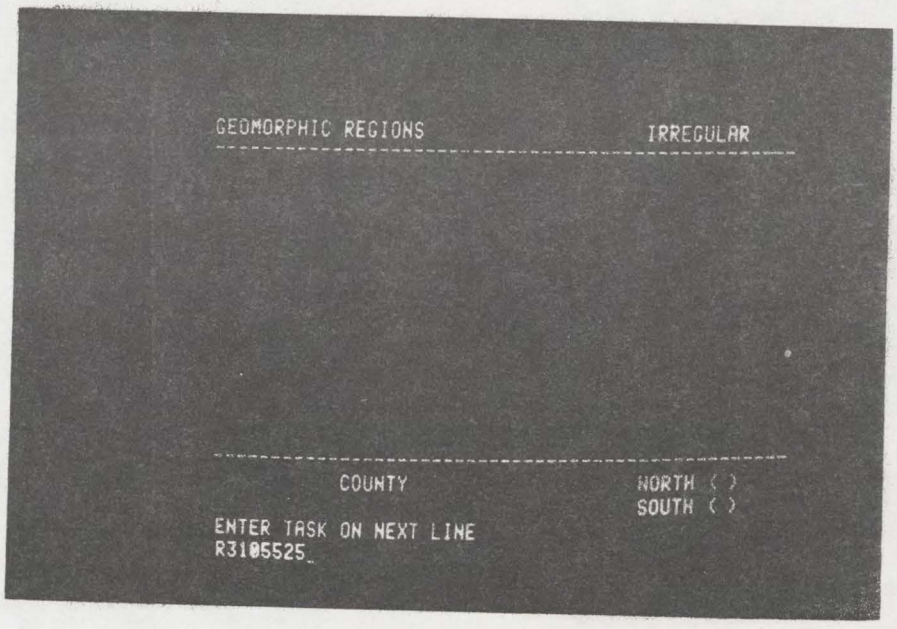


FIG. 26. -- BLANK TOWNSHIP OUTLINE SCREEN

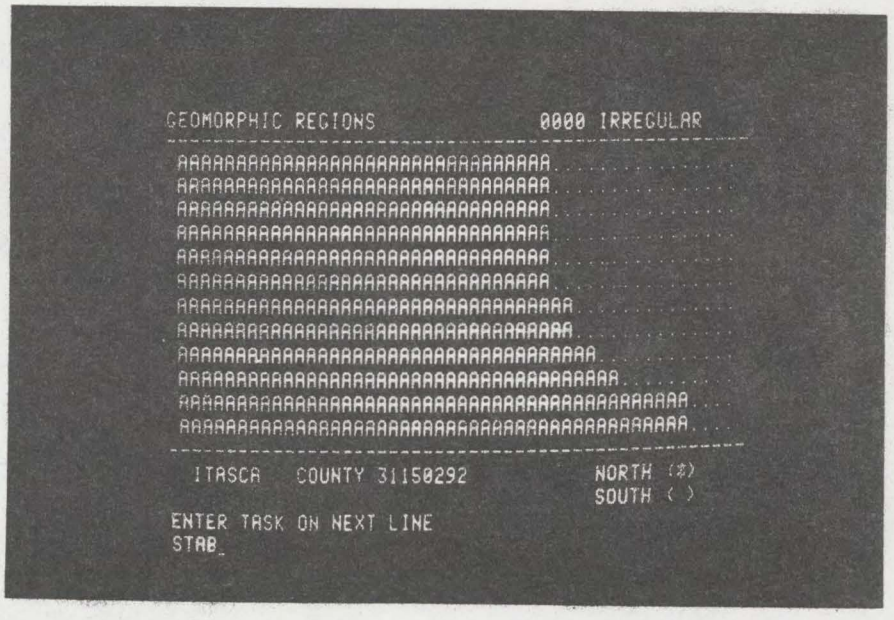


FIG. 27. — A REQUEST (STAB) TO EXAMINE THE SYMBOL TABLE SCREEN

The procedure for requesting a township to be displayed is the same as described in Section A, on Land Cover. If at any time the user wishes to enter new symbols simply enter the word "STAB" (Symbol TABle) on the proper line (Fig. 27.), press "SEND", and the symbol table generation screen will reappear.

If the township requested by the user has a geomorphic region code in it that has not been entered into the symbol table, the left two characters of the predominate code for the county will be displayed. For example, if geomorphic region 025 has not been entered in the symbol table, a forty in geomorphic region 025 will be shown on the screen as 02. It is important that a symbol be entered into the symbol table for each code so that when a MINNMAP is printed the code will be represented. If no symbol exists for geomorphic region 025, a forty with that code will show up on a MINNMAP as a 0. (The left most character.)

For inputting large areas like geomorphic regions, the "FILL" command is a real time saver. It enables the user to fill an entire township, a string of sections or a single section with a value. Refer to Appendix B for a description of the "FILL" command. The "FILL" command only operates on the 576 regular parcels. Irregulars must still be changed using the SCAN routine.

The remaining commands needed to enter geomorphic region data have been described in Section A.

C. SCHOOL DISTRICTS

The procedure for entering school district data is identical to the procedure for entering geomorphic region data. Refer to Section B. and follow the procedure outlined there substituting the word "SCHD" for "GEOM".

D. FOREST TYPE

The procedure for entering forest type data is identical to the procedure for entering land cover data. Refer to Section A. and follow the procedure outlined there, substituting the word "FORT" for "LAND".

E. MINOR CIVIL DIVISIONS

The procedure for entering MCD data is identical to the procedure for entering geomorphic region data. Refer to Section B. and follow the procedure outlined there, substituting the word "MCDS" for "GEOM".

F. LEGISLATIVE DISTRICTS

The procedure for entering legislative district codes is identical to the procedure for entering geomorphic region data. Refer to Section B. and follow the procedure outlined there, substituting the word "LEGD" for "GEOM".

G. SOIL LANDSCAPE

The procedure for entering soil landscape data is very similar to the procedure for entering geomorphic region data except that soils uses a four character rather than a three character code. Users

should therefore be familiar with Section B. of the manual. Refer to Section B. and follow the procedure outlined there substituting the word "SOIL" for "GEOM".

H. WATER ORIENTATION

The procedure for entering water orientation data is identical to the procedure for entering land cover data. Parcels not adjoining water are coded zero. For better pattern visibility on the CRT screen the computer will display all parcels coded zero [0] as periods [.]. If a parcel's code is to be changed to zero [0], either a [0] or a [.] may be entered and the computer will handle the conversion. Refer to Section A. and follow the procedure outlined there, substituting the word "WORN" for "LAND".

I. PROJECT 80 FUTURE STUDY AREAS

The procedure for entering Project 80 future study areas is identical to the procedure for entering land cover data. All forties coded as zero [0] will be displayed as periods [.] for better visibility on the CRT screen. Refer to Section A. and follow the procedure outlined there, substituting the word "P80S" for "LAND".

J. MINERAL POTENTIAL

The procedure for entering mineral potential data is identical to the procedure for entering land cover data. All forties coded as zero [0] will be displayed as periods [.] for better visibility on the CRT screen. Refer to Section A. and follow the procedure outlined there, substituting the word "MINP" for "LAND".

K. HIGHWAY ORIENTATION

The procedure for entering highway orientation data is identical to the procedure for entering land cover data. All forties coded as zero [0] will be displayed as periods [.] for better visibility on the CRT screen. Refer to Section A. and follow the procedure outlined there, substituting the word "HORN" for "LAND".

L. OWNERSHIP

The procedure for entering ownership data is identical to the procedure for entering geomorphic region data. Refer to Section B. and follow the procedure outlined there, substituting the word "OWNS" for "GEOM".

M. RELATIVE OWNERSHIP

The procedure for entering relative ownership data is identical to the procedure for entering land cover data. Refer to Section A. and follow the procedure outlined there, substituting the word "ROWN" for "LAND".

N. CURRENT ZONING

The procedure for entering zoning data is identical to the procedure for entering geomorphic region data. Refer to Section B. and follow the procedure outlined there, substituting the word "ZONE" for "GEOM".

APPENDIX A

MENU OF DATA VARIABLE PROGRAM MODULES

ACRONYM	DESCRIPTION
FORT	Forest Type
GEOM	Geomorphic Regions
HORN	Highway Orientation
LAND	Land Cover
LEGD	Legislative Districts
LUSE	Land Use (D. Brown)
MCDS	Minor Civil Divisions
MINP	Mineral Potential
OWNS	Ownership
P80H	Project 80 Historical Areas
ROWN	Relative Ownership
SCAN	Scan Raw Data
SCHD	School Districts
SHED	Watersheds
SOIL	Soil Landscapes
TERM	Terminate Program
WORN	Water Orientation
ZONE	Current Zoning

APPENDIX B

GENERALIZED DATA ENTRY COMMANDS

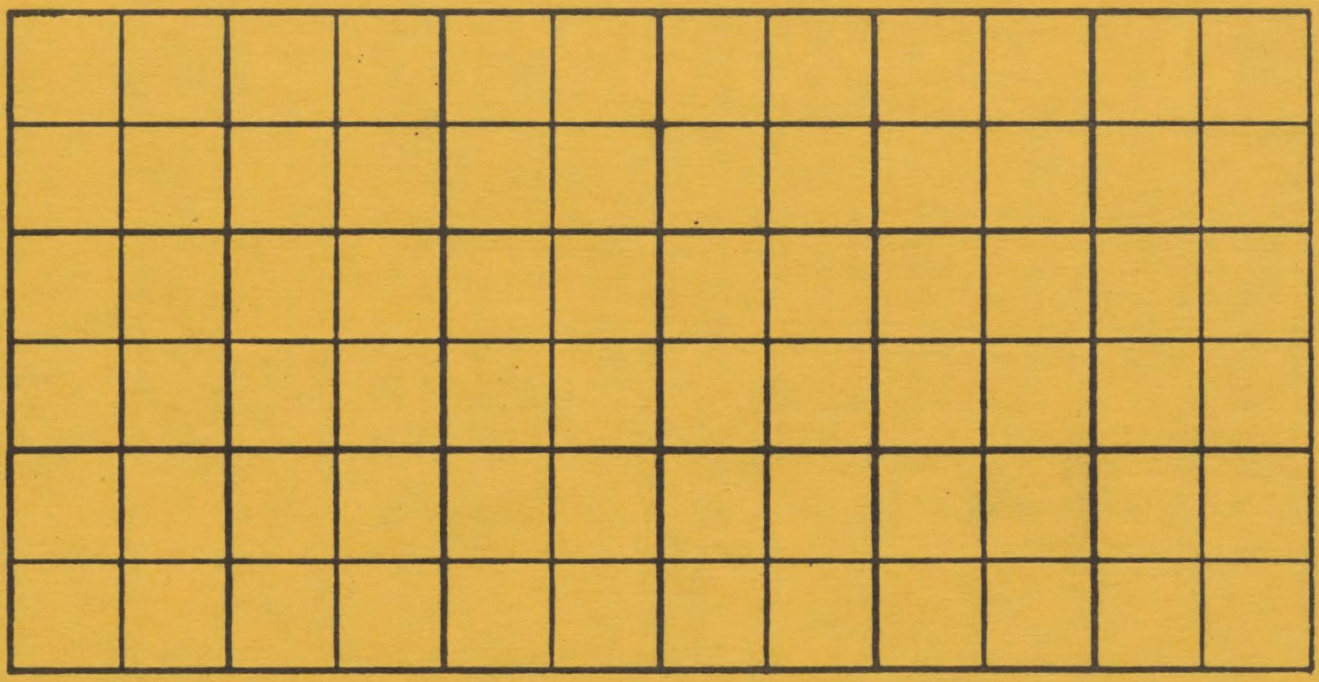
The following commands are entered on the CRT through the typewriter keyboard and are sent to the computer for execution by pressing the "SEND" key.

REQxxyyyzzn (Optional abbreviation-- Rxxyyyzzn)	-- Request display of county xx, township yyy, range zzn (n optional, needed only for east (1). A request must be processed before the following options can be attempted.
FILLxxTOyy	-- Fills sections xx to yy with two character code to be defined.
Optional Formats:	
FILLxx FILL-ALL FxxTOyy Fxx F-ALL	-- After recognizing a FILL command, the computer will display the word "WITH", to which the user's reply is the two character code to be used for filling the previously defined sections. Since a "FILL" only changes the township data in core memory, an update (UPDT) must be done to apply new data to the data file. "FILL" only fills the 576 regular parcels.
UPDT (Optional abbreviation--U)	-- Applies update of CRT screen to the data file.
↓	-- Down arrow displays south half of the township. Scrolls down to following screen when used within SCAN routine.
↑	-- Up arrow displays north half of township. Scrolls up to preceeding screen when used within SCAN routine.
SCAN	-- Allows entry into the SCAN routine to examine the raw data of previously requested township.
PRNT	-- Prints MINNMAP of township displayed on hard copy printer.

FINI	-- Exits from a program module.
TERM	-- Terminates CRT data entry program.

APPENDIX C

SAMPLE TRANSPARENT CRT SCREEN GRID



The above grid is used to more easily locate positions on the CRT screen.