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A USER'S GUIDE TO STRONGMO: VERSION 1.0
OF NCEER'S STRONG-MOTION DATA
ACCESS TOOL FOR PCS AND TERMINALS

by

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Technical Report NCEER-90-0024

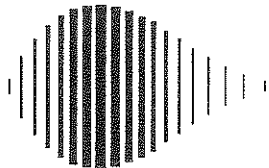
November 15, 1990

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PREFACE

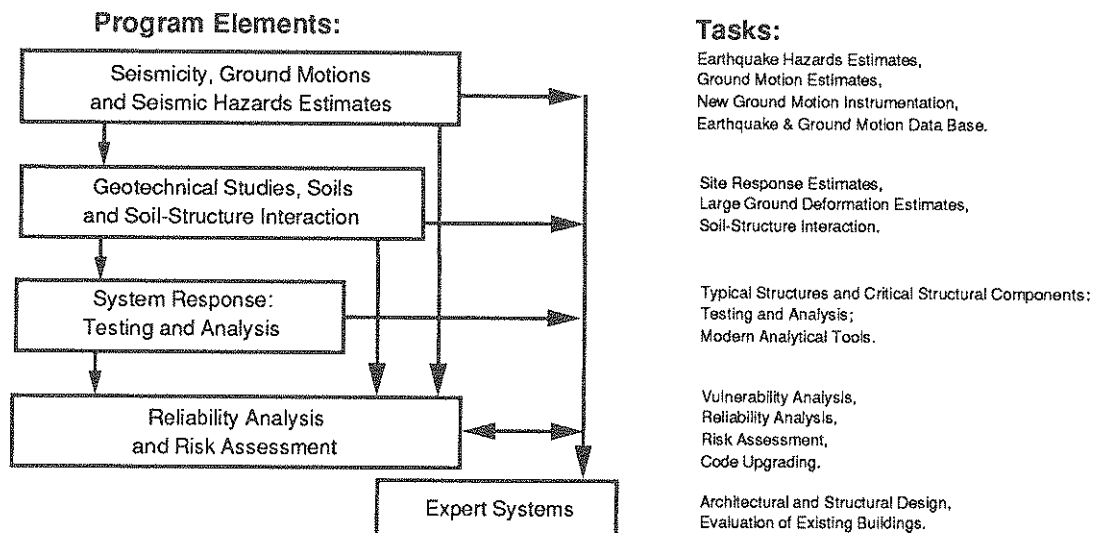
The National Center for Earthquake Engineering Research (NCEER) is devoted to the expansion and dissemination of knowledge about earthquakes, the improvement of earthquake-resistant design, and the implementation of seismic hazard mitigation procedures to minimize loss of lives and property. The emphasis is on structures and lifelines that are found in zones of moderate to high seismicity throughout the United States.

NCEER's research is being carried out in an integrated and coordinated manner following a structured program. The current research program comprises four main areas:

- Existing and New Structures
- Secondary and Protective Systems
- Lifeline Systems
- Disaster Research and Planning

This technical report pertains to Program 1, Existing and New Structures, and more specifically to seismic hazards studies.

The long term goal of research in Existing and New Structures is to develop seismic hazard mitigation procedures through rational probabilistic risk assessment for damage or collapse of structures, mainly existing buildings, in regions of moderate to high seismicity. The work relies on improved definitions of seismicity and site response, experimental and analytical evaluations of systems response, and more accurate assessment of risk factors. This technology will be incorporated in expert systems tools and improved code formats for existing and new structures. Methods of retrofit will also be developed. When this work is completed, it should be possible to characterize and quantify societal impact of seismic risk in various geographical regions and large municipalities. Toward this goal, the program has been divided into five components, as shown in the figure below:



Seismic hazard studies constitute one of the important areas of research in Existing and New Structures. Current research activities include the following:

1. Development of ground motion instrumentation and a strong ground motion data base.
2. Development of seismicity catalogs, and improved seismicity analysis methods and models.
3. Development of improved ground motion data analysis methods, computational methods and ground motion models.
4. Estimation of earthquake hazards.

The ultimate goal of projects concerned with seismic hazard studies is to provide an engineering estimation of seismic hazards and ground motion, initially for the eastern and central United States.

This report addresses the issue of providing researchers with ready access to strong-motion parameters and time-series data through a data base. Strong-motion data are one of the most fundamental input data into the research and practicing of earthquake hazards mitigation. A strong ground motion data base is now operational. It consists of two parts: (1) a relational data base of ground motion and related earthquake parameters; and (2) the actual time series of the ground motions. This report describes how to access the data base via phone/modem or computer link from a PC or terminal at a remote site, and how to use the data base and retrieve parametric data or actual time series ground motions.

ABSTRACT

This user manual introduces Strongmo, the latest data base access tool developed by NCEER researchers at Lamont-Doherty Geological Observatory (Lamont). Through Strongmo, a user can query the NCEER Strong-Motion Data Base described in [1], and retrieve both parameters and time-series data. Strongmo is accessible to users with almost any type of computer. All that is needed is a 2400 baud modem, a communications program (e.g. Kermit), and a personal computer. Strongmo is executed on a Sun computer located at Lamont. The program's display interface is entirely character based; thus catering to the lowest resolution display hardware (i.e., an alphanumeric dumb terminal). Users of other computers with access to the Internet network may also access the data base through Strongmo.

Aside from data base access, Strongmo provides the user with several other functions. These are: (1) a method to contact the staff at Lamont responsible for the data base; (2) access to a bulletin describing the current status of the Lamont/NCEER Digital Strong-Motion Network; and (3) a means with which to obtain raw SSA-1 data uploaded from the Digital Strong-Motion Network.

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SECTION 1

INTRODUCTION

1.1 Background

This report briefly describes Strongmo, the latest program in a series of data base access tools developed by NCEER researchers at Lamont-Doherty Geological Observatory (Lamont). Its principal use is to extract data (both parameters and time-series) from the NCEER Strong-Motion Data Base located at Lamont. The data base and the original data access tool, GeoBase, were documented in an earlier report [1] and will not be described herein. However, it is strongly recommended that the user obtain this report.

GeoBase uses a high resolution graphics screen and was designed for users with mid-sized computers (i.e., Workstations) connected to the Internet network. While many in the research community have such machines, many private firms only possess Personal Computers (PC) with no Internet connection, or if they have a connection, they are using mainframes (e.g., IBM or VAX) with character terminals. This variety of computers left a large gap between people in the research community who could access our data base, and those who could not. For this reason, the tool Strongmo was developed. It allows researchers with a PC and a modem to access strong-motion data over the phone line and for those with alpha-numeric terminals over an Internet connection. Thus, Strongmo, like its more graphically oriented counterpart, GeoBase, provides a service that increases by orders of magnitude the speed and the quantity of digital strong-motion data which earthquake researchers may obtain.

The sub-section below summarizes what can be done with this tool and the basic mechanics behind its construction. Section 2 describes the procedure and the parameters necessary to use Strongmo, both over the phone line and over the Internet. Section 3 describes Strongmo's components and, through a step by step tutorial, how to obtain strong-motion data using it.

1.2 Description

Strongmo is an interactive computer program with a variety of menu driven functions, all of which are related to obtaining strong-motion data from Lamont. The program is executed when a user logs-in, using a public account (user-id: *strongmo*; password: *nceer*), to a Sun computer located at Lamont. That is, a user of Strongmo does not need to obtain a copy of the software, it is run on the computer at Lamont. Strongmo operates using a cursor and character based graphics package to display its information. Thus, any user with a computer, a communications program that can emulate a VT-100 terminal, and a 2400 baud modem or an Internet connection may use it.

Strongmo is a simple interface to use and requires minimal a priori knowledge of its structure. The key features of Strongmo are its windows, multiple-choice menus, contextual help keys, and on-line help windows. Aside from providing access to the NCEER Data Base, Strongmo also has several other helpful utilities, these are: (1) a means with which to contact staff at the Ground Motion Facility of NCEER; (2) a bulletin board for up-to-date information about the Lamont/NCEER Digital Strong-Motion Network; and (3) a raw SSA-1 data retrieval capability (Kinematics format).

Although Strongmo has many options, its primary capability is to formulate queries that will be interpreted by the NCEER Strong-Motion Data Base. A user builds a query using a menu and submits it to the data base for a response. After the data base processes the request, Strongmo provides a means with which to examine its parametric results one page at a time. Due to the crude nature of computer graphics on the majority of alpha-numeric terminals, no facility exists within Strongmo to display the ground motion time-histories. However, both the parametric and/or time-series data can be sent to a remote site automatically or may be obtained directly using anonymous

ftp (file transfer protocol). The automatic sending of data is accomplished through the Internet electronic mail channels or over the phone line using Kermit, a standard communication protocol.

Strongmo was written entirely in the C programming language under the UNIX operating system on a Sun 3 workstation. For its graphics, Strongmo uses the character control package developed by AT&T known as *curses*. For now, only VT-100 type terminals are supported. Many programs will emulate this commonly used character terminal, and if demand requires it, we will support other types of terminals in the future.

Revisions to GeoBase 1.0

In [1] it was mentioned that there existed limitations to the implementation of GeoBase. The most obvious of these was that it only worked on Sun3 workstations. Next in importance was that tables could not be joined with one query. These limitations, and other, were overcome with the development of Strongmo. But, GeoBase remains the only tool with which to access the full complement of databases at Lamont. Therefore, additional features were added to GeoBase. The new release of GeoBase, version 2.0, is available in the same manner as described in [1]. Its principle improvements are that* :

- **Sun4 Version**
A Sun4 version of the executables are bundled with the distributed software.
- **Multiple Table Joins**
Joins may be performed on multiple tables simultaneously. Views that perform joins on the event, record, and trace tables and on the site, record, and trace tables now exist.
- **X Windows Version**
The source code for an X Windows version of the software is available for compilation on UNIX workstations that support X Windows and Berkeley UNIX. Thus, users of non-Sun workstations may use GeoBase.
- **Independence from Database**
The GeoBase application is now completely separated from the underlying data base managers. GeoBase could now work on data in any data base management system.

*The features highlighted above are described in detail in a file called IMPORTANT_NOTICE located in the lamont directory of the software package lamont.tar.Z.

SECTION 2

CONNECTING TO LAMONT

To use Strongmo, a user must connect to a Sun computer at Lamont named “duke”. This may be accomplished in two ways: through the phone lines using a communication program and a modem, or over the Internet network. Strongmo is activated when a user connects with “duke” by logging on to the public *strongmo* account. The password to this account is *nceer*. This Section details what one needs to know to use both of these communications interfaces. Throughout this document, examples of what will be displayed on the computer/terminal’s screen will appear in the Courier font and responses typed by the user will be in *italicized Courier font*. For each of the connection modes described below, the communication program must be emulating a VT-100 type terminal.

2.1 Modem

In order to login to “duke” using a modem, a serial communication program is needed. The program should support the Kermit protocol for data transfer. Furthermore, the modem must be Hayes compatible and have a baud rate of at least 2400 to communicate with “duke”. The parameters that must be set in order for the connection to work are as follows:

Baud Rate:	<i>2400</i>
Parity:	<i>none</i>
Data Bits:	<i>8</i>
Stop Bits:	<i>1</i>
Duplex:	<i>full</i>

The phone number to gain access to Lamont is (914) 359-6004. The details for dialing and setting the above parameters are different for each communication program, and will not be dealt with here. Once connected, the computer will prompt with the following message:

```
Welcome to the L-DGO Network
LDGO>_
```

Type the response *c duke* as shown below:

```
Welcome to the L-DGO Network
LDGO>c duke
```

The computer will follow with a series of messages and the login prompt:

```
Querying Primary Name Server...
Connecting... session1 -- connected to 129.236.010.050

SunOS UNIX (duke)

login: _
```

At this point, to login to “duke”, type in *strongmo* and press <Return>. The prompt *password:* will appear, to which should be typed *nceer*, followed by pressing <Return>. When the password is typed, it will appear as though the computer is not responding, however, it is just not echoing it to the screen. After a few more prompts by the system, the Strongmo program will be running. Proceed to the next section for a detailed description of how to use Strongmo.

2.2 Internet

There are two primary commands that may be used to connect with “duke” over the Internet network; `telnet` and `rlogin`. To use either of the commands, a VT-100 terminal emulation routine (e.g., `vttool` under the SunOS) or a VT-100 terminal is necessary. A description of how to use each of these commands to successfully login to Strongmo is outlined below. However, before executing either command, the terminal emulation routine must already be running.

2.2.1 telnet

Telnet is a command common to many operating systems that interact over the Internet. It uses a standard communications protocol (TELNET) to allow a user at one site to interact with a remote system as though their terminal were directly connected to it. Type in the `telnet` command with the Internet address of “duke” (fully qualified domain name: `duke.ldgo.columbia.edu`) as shown below:

```
# telnet 129.236.10.50
```

where # is the prompt from the local computer. Telnet will prompt with the following message:

```
Trying 129.236.10.50 ...
Connected to duke.
Escape character is '^]'.

SunOS UNIX (duke)
```

Proceed to the login sequence:

```
login:_
```

At this stage, type in the user-id `strongmo` and press <Return>. At the `password:` prompt type in `nceer`, and press <Return>. The session is now in the Strongmo environment. Refer to Section 3 for details on how to use Strongmo.

2.2.2 rlogin

Rlogin is another communications program similar to `telnet`, which also allows a user to connect to a remote system across the Internet. However, `rlogin` is found only on computers that support the BSD version of the UNIX operating system. Unlike `telnet`, `rlogin` does not allow a user to input the Internet address of the host directly. The Internet address must be determined by other means. This is usually done by placing the host’s name along with its address in a special file called `/etc/hosts`. If the entry:

```
duke.ldgo.columbia.edu          129.236.10.50
```

does not already exist in the file, then the system administrator at the site must include it.

With the host name/Internet address resolved, run `rlogin` by typing the following line:

```
# rlogin duke.ldgo.columbia.edu -l strongmo
```

The computer will prompt with `password:` at which time the user types `nceer` and presses <Return>. Refer to Section 3 for details on how to use Strongmo.

SECTION 3

STRONGMO USER'S GUIDE

This section describes how Strongmo works and how a user may interact with the program. This is accomplished in two subsections: one that describes the overall layout and use of the program, and another which details an example of a Strongmo session.

3.1 Strongmo Features

Although entirely character-based, Strongmo incorporates innovative techniques that facilitate understanding of presented information and using the tool. Unlike other dial-up data base tools that use simple character output (i.e., scrolling text intermixed with prompts for input), Strongmo uses windows and menus similar to PC applications. Windows break up the program into easy to understand sections, and menus show all available options. Keyboard control of the cursor and option selection remains consistent throughout the tool. Contextual help windows and highlighted help keys are provided.

3.1.1 Windows and Menus

Strongmo uses many different types of windows for its four primary functions and for its introduction and help texts. The most important window in Strongmo is the Main Menu window, which links all of the others together. All of the windows are displayed on the screen based on choices made from the Main Menu. The Main Menu and all of its subsidiary windows are shown schematically in Figure 3-1; specific examples of each are shown in the tutorial in Section 3.2. Once a user is finished with a window, they may proceed to the next one in the sequence or return back to the main menu.

Most windows occupy the entire screen of the display, but other windows, called sub-windows, may be overlaid on top of one another and occupy only a small portion of the screen. The sub-windows are not displayed in Figure 3-1 for the sake of simplicity. In all instances, when a sub-window is present on the screen, the input from the keyboard is directed towards it. That is, the window visible on the screen in its entirety is the "current window". Sub-windows are used to allow the user to change the limits of the query on a particular field and to present to the user a textual description of the field. Other sub-windows allow the user to choose an option from a menu, as in the data retrieval phase of option two (i.e., when the user must decide how they wish to receive the data) or to respond to an affirming question (i.e., yes or no).

One common type of window that is used by options one, three, and four and the help functions is the Scrolling Text window. This window is used to convey information to the user one line or one page at a time. Other windows allow input of information from the user in a form type layout, such as the Mail Header window. The form layout is based on a screen with blank entries that a user may move the cursor to and type in their response. Each of these windows is explained further in Section 3.2.

Menus are used to show a user what options are available at a given point in the program. Thus, at each step, a user does not need to remember which commands provide what functions. Aside from the menu in the Main Menu window, all other menus are located in option two, 'Inquire into NCEER Data Base'. For instance, the first window in option two, the Query Generation window, is based upon several menus. In this window, the user may select those fields on which to perform a query or a range selection. Menus of option two are described further in Sections 3.2.3, 3.2.4, and 3.2.5.

3.1.2 Keystrokes

All of the cursor manipulation in Strongmo is done with the keyboard, and there are several techniques that decrease the number of keystrokes required to invoke a function. To make selection of options quicker, Strongmo accepts single key input as an acknowledging response to many prompts. For example, pressing <Return> or <Enter>, depending upon the keyboard, will cause a highlighted menu item to be selected or invoked. If a menu contains numeric identifiers for each of its options (e.g., the Main Menu), the user need only enter the number to select an option. This feature saves time since the user does not need to maneuver a cursor.

Some of the menus are more complex and do require movement of the cursor to make a selection. To make cursor movement easier, all menus use the same keys (i.e., U for up, N for down, H for left, and J for right; the arrow keys will also function if the VT-100 terminal emulator supports it).

A two key sequence is needed to perform certain functions. For example, the keystroke to exit from any window is ^K (Control K), and the keystroke to process any requests is ^X. This is to prevent errors when responding to more critical functions.

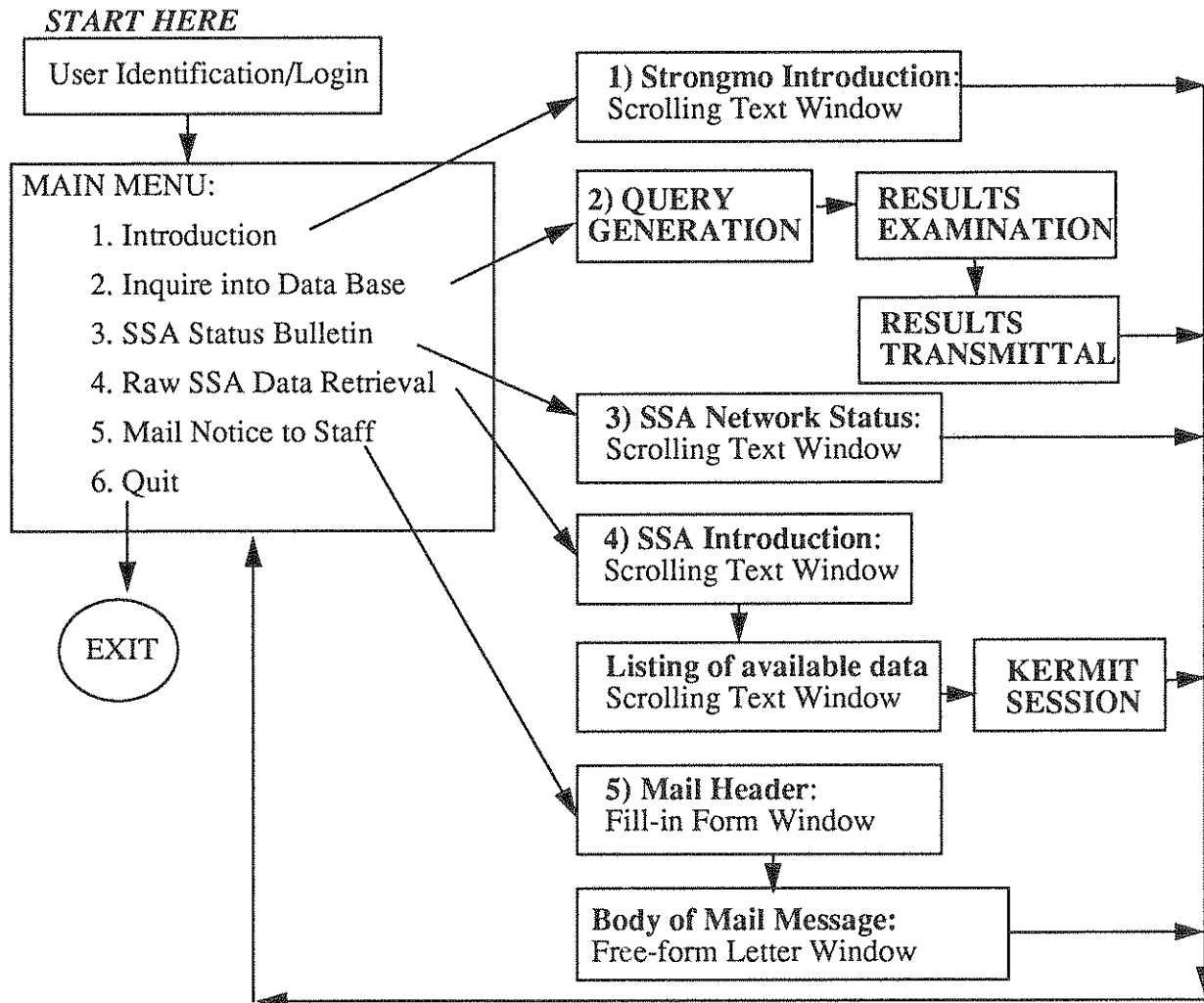


Figure 3-1 A Rough Schematic Diagram of Strongmo's Primary Windows and Their Connections.

Throughout the program when keyboard input is requested, it is being timed for inactivity. Strongmo will prompt the user to hit any key after five minutes of inactivity. If the user does not respond with input after an additional thirty seconds, Strongmo will automatically exit. This feature was designed to minimize the number of inactive processes running on the computer.

3.1.3 Help Features

Strongmo is a self documenting program. That is, a user with no prior knowledge of Strongmo should be able to easily figure out how to use it. This is accomplished through the use of many different help features. First, at each step in the program, the user is given directives as to the next step. For example, upon logging in to "duke" as Strongmo, the user is informed of the terminal type that needs to be emulated. Second, the first option in the main menu presents an introductory page describing the features that are available through Strongmo and how to access them. Third, for each of the windows where the user is not explicitly told what to do, they may press the help key "?" which will display a number of screens of helpful instructions. And lastly, to remind the user what the function of each key is, a highlighted list of keys along with their purpose is shown at the bottom of the screen. Furthermore, the highlighted list of keys is contextual. Only keys which are directly related to the current window are shown.

3.2 Tutorial

The purpose of the tutorial is to explain how to use Strongmo to request, examine, and retrieve strong-motion data. Explanations of Strongmo's other features are very brief, but are included for the sake of completeness. It is helpful to examine Figure 3-1 to understand the order of the tutorial.

3.2.1 Starting Out

After the login procedure described in Section 2 is successful, Strongmo will prompt with its introductory banner:

```
*****  
Welcome to Strongmo, the NCEER Strong Motion Data Facility.  
*****
```

```
You have reached the on-line data search utility and bulletin board  
at Lamont-Doherty. For now, the menu-driven utility only works on a  
vt100 type terminal. Please set your communication program to emulate  
one.
```

```
To EXIT NOW, type ^C
```

```
Please enter name and institution (80 character limit)
```

```
:_
```

At the prompt, type in the requested information and press <Return>. This action will complete Strongmo's login sequence and prompt with the Main Menu window.

3.2.2 Main Menu and Introduction

The Main Menu window is the root of all functions in Strongmo. It is depicted in Figure 3-2 as it should appear on the screen (it may vary in vertical dimension). If the screen does not look like Figure 3-2, there may be a problem with the terminal emulation package or with the communications connection. Two possibilities for the former are that the terminal emulation program might not be configured to a VT-100 type or it is simply not running. If the problem is the connection, try to connect with "duke" a second time.

From the Main Menu all six options listed are available by either typing the numeric value associated with the option or by moving the cursor (the highlighted option) to the desired option and pressing <Return>. To find out more about what each option does, select option number one (labelled 'Introduction').

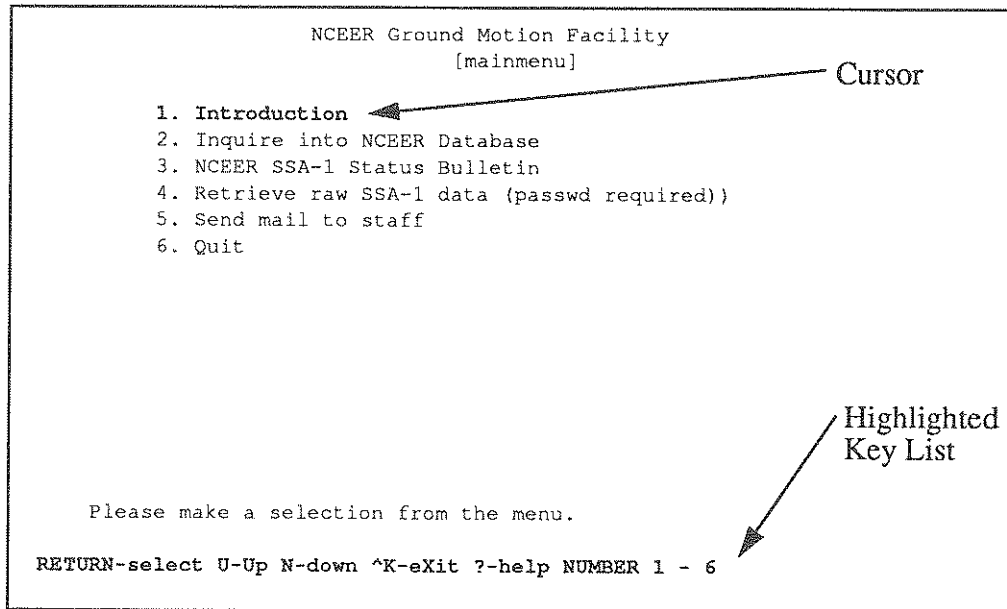


Figure 3-2 Actual Main Menu Window as it is Depicted on the Terminal's Screen. The lowest line of the screen displays a list of highlighted keys that may be used in this window. Note that the cursor is located on option number one.

When option number one is chosen, the list of options will disappear and the Main Menu window will split near the top of the screen. An introductory text will be displayed in the lower portion of the split screen. To read beyond the end of the screen, press the <Return> key, which scrolls the text upward. To exit from the Introduction, at any time type ^K (control K).

To learn how the Main Menu window's keyboard input works, hit the ? key. A scrolling text window, identical to the Introduction window, will be displayed. This new window contains a brief list of instructions for the Main Menu.

3.2.3 Inquiring into the NCEER Data Base: Menu Option 2

Select option two to begin an inquiry into the NCEER Strong-Motion Data Base. Once selected, the Field Selection window is displayed on the screen. Shown in Figure 3-3, this window is the primary window in a group of windows that are used to build a query that can be sent to the data base. This section describes in detail how to use the query generation windows to take an English request (e.g., Get the peak value of acceleration from all horizontal acceleration timeseries for the Saguenay earthquake that were recorded on hard-rock) and convert it into one understandable by the data base. The query generation windows are flexible enough that they provide the user with the ability to tailor a query to their specific needs. See Appendix A for a quick reference list of the steps used to build a query.

The first step to building a query is stating which types of information are needed. This process involves selecting those fields from the data base that are needed. The second step is to state what the limits on the search are. By default, the limits of the query are the entire data base. The limits of the query can be set by modifying the range for each field desired. It is important to note that the limit can be set on any field not just those for which data are desired. Each of these steps is described in detail below.

SELECTING FIELDS:

The Field Selection window comprises four scrolling menus that display the fields from the four data base tables: event, record, trace, and site. From this window, the user can select the fields that will be used to retrieve data. Thus, this window enables a user to build the first part of a query that will be passed on to the data base for resolution. A *selection* (choosing a field for retrieval) is made by maneuvering the cursor with either the keys U, H, J, and N, or the arrow keys to the field-name of interest and pressing <Return>. This action will cause an asterisk (*) to appear to the left of the field-name, signifying that it has been 'selected' for the query. To deselect a field-name, enter the keystroke ^P (control P) while the cursor is highlighting the selected field. The list of the fields for each table can be scrolled, and the number of fields displayed at any moment is dependent upon the vertical resolution of the terminal. To scroll a list of fields, move the cursor to the bottom of the menu and continue moving it down. After the bottom of the menu is reached, each downward movement of the cursor will cause the list to scroll upwards; the converse also holds. Once the end of the list of fields is reached, the entire window will flash or beep, depending upon the terminal, and the scrolling will stop.

NCEER REPORTING FACILITY			
Field Selection window			
Press RETURN to select a field and ctrl-p to unselect			
For boundary choices and description of field:			
press ctrl-b while field is highlighted.			
To get time-series data, 'filename' in the 'trace' table must be selected			
event	record	trace	site
event_year	record_num	filename	site_id
event_month	tape_name	orientation	site_code
event_day	processing_stage	type_of_trace	location
event_hrmn	processing_agncy	type_of_data	operator
event_second	digitizing_agncy	unit_of_data	instrument
event_number	digitizing_type	trace_length	site.state
event_name	archiving_agncy	sm_duration	site.country
country	epicentral_dist	number_of_points	status
state	forward_azimuth	time_step	site_latitude
latitude	back_azimuth	rms_of_data	site_longitude
longitude		peak_value	site_bin_number
depth		time_of_peak	elevation
location_source		high_pass	structure
mag_l		low_pass	geology
mag_l_source		filter_type	start_year
mag_s		sensitivity	start_month
mag_s_source		frequency	start_day
mag_b		damping	end_year
mag_b_source			end_month
^X-Process request U-Up N-down H-left J-right ^K-quit ?-help			

Figure 3-3 The Query Generation window.

Even though the data base is a relational one (i.e., each table is a separate entity), fields from more than one table may be selected for a given query. Or, if the user wishes, fields from only one table may be selected. However, by selecting fields from multiple tables, a join clause is being automatically added to the query. A join is a cartesian product of tables with a condition that only those records directly related to one another are combined. For example, the query that gets all sites which recorded strong ground motions of the Loma Prieta earthquake would join the event and site tables. Strongmo performs joins differently than other relational data base tools. Other tools require that the user must know a priori what the conditions are for a join. In Strongmo, all of the possible join permutations are precomputed and included, thus simplifying the users work. Nonetheless, joins are very compute- and disk-intensive operations and, depending upon the size of the tables being joined, may take several minutes to complete.

DESCRIPTION OF FIELDS:

Although field-names generally identify the data contained within (e.g., state, country, etc.), for some fields it is not clear (e.g., site_id or record_num). Furthermore, the data's format or type might be in question (e.g. how is the country stored, as a string or as an id number?). This problem is alleviated in Strongmo by using textual descriptions and examples that may be viewed. To find out what data a given field contains, move the cursor to the field and type the keystroke ^B (control B). This action will cause a sub-window to be displayed over the Field Selection window. The sub-window presents a textual description of the data in a given field and its format (do this now for the event_name field in the event table).

The sub-window that appears, called the Field Description window, provides a brief summary of the data stored in the event_name field. To find out more about this sub-window, use the help key. The Help window will be overlaid with a summary of the Field Description window. The ^K key-stroke is used to exit from the Help window.

SETTING THE QUERY LIMITS:

By default, when a field is selected for querying, the range of the query is the entire range of values. To initiate a change in the conditions of a query for a given field, while still in the Field Description window, use the ^B keystroke a second time. This will cause yet another sub-window to be overlaid (a sub-sub window). From this new window, the range of the query on the particular field may be changed. For fields of numeric type, a new maximum and minimum value may be entered and for fields that consist of strings of characters, the actual values from the data base may be selected. The window that appears for each type is different.

To change the limits of the query for fields that consist of strings (e.g., the event_name field), the data base is automatically queried for all unique values that may be selected. This may take several seconds. The prompt 'Please wait...Loading Data' will appear at the bottom of the Field Description window. Once the list is compiled, it is displayed in alphabetical order for selection in a new sub-window, called the String Selection window. An example of the String Selection window for the event_name field is shown below in Figure 3-4. The selection of strings is performed in the same manner as the selection of fields (i.e., move the cursor to the string of interest and press <Return>). As with the Field Selection window, selected strings will have an asterisk to their left. If the list of strings is very large, it may be scrolled. Instead of scrolling one line at a time, the String Selection window also allows the user to view strings one page at a time. Type ^F to page forward and ^B to page backward. Type ^X to process the selected strings and exit from the window, or ^K to quit and ignore the selections made.

Note that when the range of a field was changed, whether it was numeric or string, it was not actually selected for retrieval. In building a query, there are times when a field does not need to be selected in order for its range to be queried. For example, design a query to get the location (latitude, longitude, and elevation) and name of all earthquakes with body wave magnitudes greater than seven. The range of the field mag_b would be changed to reflect the query, but the actual mag-

nitudes of the earthquakes are not requested. Therefore, mag_b would not be 'selected' in the Field Selection window. Only the fields latitude, longitude, elevation, and event_name would be selected.

GETTING TIME-SERIES:

If strong-motion time-series are to be retrieved from the data base, the filename field in the trace table must be selected. This field contains a pointer to where the data are stored on a magnetic disk at Lamont.

```
Select
-----
1ST NORTHWEST CALIFORNIA EARTHQUAKE
2ND NORTHWEST CALIFORNIA EARTHQUAKE
ALASKA PENINSULA EARTHQUAKE
ALASKAN SUBDUCTION ZONE EARTHQUAKE
*ANCHORAGE, ALASKA EARTHQUAKE OF JANUARY 1, 1975
ANDKEANOF ISLANDS, ALASKA EARTHQUAKE OF MAY 2, 1971
ARMENIA EARTHQUAKE
BEAR VALLEY EARTHQUAKE
BORREGO MOUNTAIN EARTHQUAKE
BORREGO VALLEY EARTHQUAKE
BUCHAREST, RUMANIA EARTHQUAKE OF MARCH 4, 1977
CAPE MENDOCINO EARTHQUAKE
CENTRAL CALIFORNIA EARTHQUAKE
CENTRAL CALIFORNIA EQ. AFTERSHOCK
COALINGA, CALIF. AFTERSHOCK OF JULY 22, 1983
COALINGA, CALIF. AFTERSHOCK OF JULY 9, 1983
COALINGA, CALIF. AFTERSHOCK OF MAY 9, 1983
COALINGA, CALIF. EARTHQUAKE OF MAY 2, 1983
COYOTE DAM EARTHQUAKE UKIAH, CALIF. OF MARCH 26, 1978
COYOTE LAKE, CALIF. EARTHQUAKE OF AUGUST 6, 1979
DUTCH HARBOR EARTHQUAKE
EL ALAMO, BAJA AFTERSHOCK
EL ALAMO, BAJA CALIFORNIA EARTHQUAKE
EUREKA EARTHQUAKE
FERNDALE, CALIF. EARTHQUAKE OF SEPTEMBER 12, 1971
FERNDALE, CALIFORNIA, EARTHQUAKE
FIJI ISLAND EARTHQUAKE
-----
^X-Process u-Up n-down ^F-page down ^B-page up ^K-ignore changes ?-help
```

Figure 3-4 String Selection Window Shown with Data From the event_name Field. The earthquake named Anchorage, Alaska Earthquake of January 1, 1975 is selected.

SENDING THE QUERY:

Once a query has been constructed by selecting fields of interest and/or changing the range of values on selected fields, it may be submitted to the data base for a response. This is accomplished by pressing the Process Request keystroke, ^X, from the Field Selection window. Once submitted, Strongmo will prompt the user with a small sub-window that contains several messages. The first, will state that the query is being compiled and submitted. The second message is a numeric counter that shows how many records (data base records, not accelerograph records) have been received. The query may be aborted at any time, while the query is running, by typing the abort keystroke, ^C. This action or the end of the query will cause a prompt of a menu window, called the Query Completion menu, that contains three options, they include: 1) examine data; 2) revise last query; and 3) return to main menu. It is important to note that selection of option 1 will cause the query to be reset to the default values. That is, the query cannot be revised after the data has been examined. We are aware of this limitation and it will be fixed in future versions of the software. For now, choose option one and proceed to the next section.

3.2.4 Examining Data

After choosing option number one from the Query Completion menu, a Help window summarizing the Report View window (the results of the data base query are called a report) is displayed. This Help window describes how the Report View window may be used to peruse the data for later retrieval. In particular, it specifies the size limitations for data retrieval over a modem (1 mega-byte). Like the other help windows, press <Return> to page down and see the rest of the message. After the end of the message is read, press <Return> again to be placed into the Report View window.

The Report View window provides the capability to examine the parametric results of the data base query one page at a time. An example of the Report View window is shown in Figure 3-5. The top portion of the window displays the retrieved parameters and the lower portion contains information about the position of the record in the stack. For example, there were 72 data base records retrieved, only the first is displayed in Figure 3-5. To page forward through the stack of records press the n key; to go backwards to the previous page of data press p (for previous). If an attempt is made to page beyond the end of the stack (or the beginning), the screen will flash and a bell will be sounded (if available on the terminal). To exit back to the Main Menu from the Report View window enter the ^K keystroke. Note that this action will cause the report to be lost (i.e., the query will have to be built and submitted again). Proceed to the next section to learn how to retrieve the report and the time-series data.

```
event_year : 1975
event_month : 1
event_day : 1
event_hrmn : 355
event_second : 12.00000
event_number : 1
event_name : ANCHORAGE, ALASKA EARTHQUAKE OF JANUARY 1, 1975
country : USA
state : AK
latitude : 61.90000
longitude : -149.70000
depth : 66.00000
location_source : PDE
mag_l : 0.00000
mag_s : 0.00000
mag_b : 5.90000
filename : /duke/nceer_data/750101.035512/usaak01/750101.035512.001_cor.d
is.225_2702AMU
orientation : 225
type_of_trace : DIS

-----
Record #: 1 / 72      Time-Series Filesize: 31001      Selected: _
^X-Process n-next p-previous enter-select ^P-unselect u-totals ^K-quit
```

Figure 3-5 Report View Window Showing Data from the Anchorage Earthquake of January 1, 1976.

3.2.5 Retrieving Data

After the data has been retrieved from the data base, it must be brought to the local site. That is, it still remains on the computer at Lamont. This section describes how the data can be retrieved both over the phone line and over the Internet.

Some communication programs (e.g., PROCOMM, CROSSTALK) provide a means to capture information displayed on the screen to a file (often referred to as data logging or capture). Although this mechanism will work for parametric data, it does not work for the time-series data since they are not displayed. Furthermore, not all communications programs offer this feature. Therefore, other mechanisms are provided in Strongmo to obtain both the time-series and the parametric data.

There are three embedded ways to retrieve data from Strongmo: 1. through anonymous ftp; 2. electronic mail; and 3. the Kermit serial-communication protocol. Each of these modes provides a different size limitation on the amount of data transmitted. For now, data files retrieved using the Internet ftp command may be very large (up to 10 megabytes). Since data obtained using this method are temporarily stored on a disk at Lamont, the size of the files is limited by the space on the disk. Electronic mail files may be any size since the mail host at Lamont does not have a size limitation on mail. However, this does not mean that any size letter can be received, since intermediate mail hosts may have their own size limitations (typically 100 kilobytes). Since our modem uses a 2400 baud data transmission rate, and to limit the amount of time any given user is on the system, data files retrieved using the Kermit protocol are limited to 1 megabyte. Even at this size, it would take over fifty minutes for a one megabyte file to be received. Thus, it is recommended that the two other methods be used where possible or that the number of time-series retrieved be minimized.

The retrieval of data is initiated in the Report View window. If the filename field was retrieved from the data base, the actual time-series can be retrieved; otherwise only the report of parameters can be obtained. Since only a small number of time-series data can be transmitted over the various communications media, a subset of records may be selected from the stack. To select a given record, press the <Return> key while viewing the record of interest. Notice that an asterisk will appear next to the 'Selected' status field in the lower portion of the window. To deselect a record, like in the Query Selection window, use the ^P keystroke while the selected record is displayed. Since the size of the requested data is important to the transport mechanism used, there is a status field called 'Time-Series Filesize' in the middle of the lower portion of the window. The number to the right of this status field describes the approximate size of the ASCII data file, in bytes, that contains the time-series (the ASCII format of the time-series data is described in Appendix B). To find out the size of a request before it is actually retrieved, press the update key, u. This will prompt with a small sub-window that states the number of files selected, their total combined size (in bytes), and the size of the parametric data (the report). To remove the sub-window and continue with the selection process, press any key.

Once satisfied with the selection of records, or if only the parameters are wanted, the next step is to begin the retrieval of the data. Enter the keystroke ^X to initiate the retrieval request. If no time-series files were selected, a sub-window will appear asking whether the report is wanted. Otherwise, the new sub-window will prompt with the question: 'Do you want the data?'. Below this question is a menu with three options: Yes, No, and Revise. If No is selected, the report is lost and the user is returned to the Main Menu. Revise will allow revision of the list of selected records. Choose Yes to proceed with the transfer of data.

Another sub-window will then be prompted, which asks the question: 'Which do you want?' It has three options describing the data that may be retrieved: 1) the Report; 2) the Time-series data; and 3) both. After selecting an option, the screen will be cleared and a new window will appear. This window requests the mode of transferral. It lists the three modes discussed above and the option to return to the Main Menu.

EMAIL:

If option number one, 'Email', is selected, a prompt that requests a valid electronic mail address appears. After typing in the address and pressing <Return> the data is sent to that address.

FTP:

Choosing option number two, 'Anonymous ftp', causes the data to be transferred to a file in the directory ~ftp/nceer/data/ on our ftp host named "lamont" (Domain name: lamont.lidgo.columbia.edu; Internet address: 129.236.10.30). This data may be obtained at any time by using the anonymous ftp login; the procedure for getting files with ftp is described in section 4.1 of [1]. When this option is selected, a sub-window prompts with a brief message stating the name of the filename in which the data were stored and the time when they will be removed (usually 4AM the next morning). Thus, be sure and retrieve the data before that time.

KERMIT:

Kermit, the third option, prompts with a message to press any key and return to the communication program on the local computer to initiate it to receive the file using the Kermit protocol. After the transfer, Strongmo will ask if it was successful. If the transfer failed for any reason, it may be attempted again by responding no (press n). Strongmo will then ask: 'Do you wish to try again? t/q'. Press t to try again or q to quit and return to the Main Menu.

3.2.6 SSA Status Bulletin: Menu Option 3

NCEER, in conjunction with Lamont, operates a network of digital strong-motion stations in eastern North America. This option displays several pages of up-to-date information describing the status of this network. It uses the same Scrolling Text window as is used by the introduction option. The date of the status bulletin being displayed is shown three lines from the top of the screen. Common to each of the status bulletins is a list of the stations in the network, their location and the type of geology on which they are located (BEDROCK or ALLUVIUM).

3.2.7 Raw SSA Data Retrieval: Menu Option 4

This option is available to other users of Kinematics SSA-1 instruments and allows them to obtain the raw binary data immediately, as they are retrieved from the network. Since the software to read these binary files is proprietary, it requires a user-id and a password. To obtain an id and password to use this option, contact the NCEER Staff at Lamont through the facility in option five of the Main Menu.

3.2.8 Sending Mail to NCEER Staff: Menu Option 5

To contact the NCEER staff at Lamont about the data base, the SSA-1 digital network, Strongmo (we welcome all feedback), or anything else related to strong-motion data, select option number five from the main menu. This option provides a utility for those without the ability to send electronic mail (email). Users at sites that have email available to them may also choose to use this facility.

The first window that appears when option number five is selected is the Mail Header window. This window is different from any yet encountered because it requires full answers to its prompts. It is called a Form window simply because the blank spaces in the form must be filled in. An example of a completed Mail Header window is shown in Figure 3-6. The uppermost line requires a digit to be entered that defines the recipient of the mail. In this example, the two recipients of mail are the authors of this report. To enter the information requested, simply start typing and press <Return> to move down to the next line. Use the ^U keystroke to move the cursor up. The back-space key will delete an entry one character at a time. The form prompts for several pieces of infor-

mation. They include: the user's address; the institution they are affiliated with; the institution's address; and their email address and phone number (there is also enough room for a FAX number to be added). The help key in this window is not ? but ^?, because the question mark may be included as text. When finished entering the responses to the prompts enter the keystroke ^E to continue with the mail function or ^K to exit back to the Main Menu.

Entering ^E will, prompt with the Mail Message window. This is the second part of building a letter for electronic mail. The first window was the return address of the letter. In this window, the message or body of the letter is typed. To enter in the message, just start typing, as characters will be echoed to the screen starting in the upper left hand corner. The cursor will automatically wrap around (move down and to the left) when it gets to the end of a line. Pressing <Return> will also cause the cursor to wrap. While typing, if the bottom of the window is reached and <Return> is pressed, the screen will scroll upwards one line. Thus, the length of the message may be very large, up to 30 kilobytes. When finished with the message, type ^E to send it or ^K to exit back to the Main Menu. If ^E is typed, a quick prompt that the message was sent is echoed to the screen. The prompt will then request that any key be pressed to return to the Main Menu.

3.2.9 Exiting Strongmo: Menu Option 6

There are only two ways to exit Strongmo, and both are accessible from the Main Menu window. They are: the Main Menu menu option number six or the ^K keystroke.

```

                                NCEER Ground Motion Facility
                                [Send mail to staff]

Sendee [1-paulf (Paul Friberg) or 2-cats (Catherine Susch)]
Enter 1 or 2:      2

Sender (about yourself)
Name              : Paul Friberg
Institute         : Lamont-Doherty
Address           : Route 9w, Palisades, New York, 10964
E-mail address   : paulf@lamont.lidgo.columbia.edu
Phone number     : (914) 359-2900 ext 620

^E-continue E-mail ^U-Up <Return>-down ^K-exit to main menu ^?-help
```

Figure 3-6 Mail Header Window. Note That This Window is Already Filled in with Italicized Text.

SECTION 4
REFERENCES

- [1] Friberg, P.A., and K.H. Jacob, "NCEER Strong-Motion Data Base: A User Manual for the GeoBase Release (Version 1.0 for the SUN3)", NCEER Technical Report, NCEER-90-0005, 1990.

APPENDIX A

Quick Reference List

This appendix provides a list of the steps used in building a query, examining data, and retrieving data. It provides a summary of the details described in Sections 3.2.3-5. It assumes the user has already selected option 2 of the Main Menu, and that the Field Selection window is displayed.

1. **SELECT FIELDS:** The first step to building a query is to select those fields for which data are desired. Select any number of fields from the four tables displayed.
 - a. Move the cursor (highlighted field) up, down, left, and right with the U, N, H, and J keys respectively. Arrow keys may also work on some terminals.
 - b. Press RETURN to select a field when it is highlighted by the cursor. Type ^P (Control P) to deselect a selected field.
 - c. Type ^B (Control B) to get a description of the currently highlighted field.
 - d. Select the filename field from the trace table if time-series are desired.
2. **SET LIMITS:** The second step in the query building process is to set the range of the search. By default the entire data base will be searched. The range can be set on any field and any number of fields, not just those selected in step 1. Move the cursor to the desired field and type ^B (Control B) twice.
 - a. **STRINGS:** For fields which contain strings, a scrollable list with all available data are displayed for selection. Move the cursor to the desired data using the U and N keys, and press RETURN to select the data value. To deselect data, type ^P (Control P) while it is highlighted. Type ^X (Control X) to acknowledge the string selections or ^K (Control K) to ignore selections made.
 - b. **NUMBERS:** For fields that hold numeric values, the maximum and minimum values of the search may be changed. The user will be shown the current range and be prompted for new max. and min. values. Type in the new values and press RETURN when finished. Enter the same values if only one is being searched for.
3. **SEND REQUEST:** Type ^X (Control X) from the Field Selection Window to send the Query to the data base .
4. **QUERY COMPLETION:** After the data base processes the query, a prompt will state how many records were found. Examine the data by pressing 1, revise the query by pressing 2, or return to the main menu by pressing 3. It is important to note that once option 1 is selected, the query may not be revised again.
5. **EXAMINE DATA:** First, a textual description of the data viewing process is presented. Press any key to examine the next page of text until the Report View window is presented. Type ^N (Control N) to page forward through the parametric records and ^P (Control P) to move backwards. If the filename field was selected, press RETURN to select the current record for later retrieval. Press U to list the total size of the selected time-series.
6. **RETRIEVE DATA:** Type ^X (Control X) to retrieve the data or ^K (Control K) to exit back to the main menu.
 - a. If no time-series were selected, the prompt will ask: Do you want the Report? Press Y for yes or N for no.
 - b. If time-series were selected, the prompt will ask: Which do you want? Press 1 for the Report, 2 for the time-series, or 3 for both.
 - c. Next choose the transferal medium. Press 1 for electronic mail, 2 for anonymous ftp, or 3 for Kermit.

APPENDIX B

NCEER's ASCII Format for Strong-Motion Data

The NCEER strong-motion ASCII format was designed to accept strong-motion time-series data stored in AH format. It was created to provide a medium for the exchange of time-series between sites where the XDR binary format of AH is not yet available. This ASCII format is generated by using the ah2nceer program. Each ASCII time-series in this format is composed of a 22 line header, each line of which is variable length, followed by any number of lines of data. The header contains three parts, event, site, and record/trace, which have fixed fields to accept parameters from the AH header. Two key fields, *data format* and *number of points*, in the record/trace portion of each header, describe the format and number of data that follow it. Furthermore, since the size of the header is fixed, many header/data pairs may be combined in one file.

An example of a file in the NCEER strong-motion ASCII format is provided below:

```
NCEER ASCII STRONG-MOTION DATA FORMAT
EVENT PARAMETERS:
  DATE:  year=1988 month=11 day=25
  TIME:  hour|minute (24hr)=2346 second= 4.500 time code=UTC
  LOCATION:  latitude= 48.12100 longitude= -71.18600 depth (km)= 28.0
  NAME:  Saguenay earthquake
SITE PARAMETERS:
  LOCATION:  latitude= 47.54960 longitude= -70.32730 elevation (m)= 0.0
  SITE ID:  Site - 20 - , Les Eboulements, PQ
  CODE:  20
RECORD/TRACE PARAMETERS:
  START DATE:  year= 0 month= 0 day= 0
  START TIME:  hour|minute (24hr)=0000 second= 0.000 time code=UTC
  EPICENTRAL DISTANCE:  distance (km)= 90.4 azimuth (deg)=N315.0
  SPECS:  sampling rate (sec)=0.005
          number of points= 4134
          units=CM/SEC/SEC
          type of data=ACCELERATION
          data format=10F8.2 INTERPOLATED
COMPONENT OF MOTION:  azimuth=N270 (HORIZONTAL)
COMMENT:  direction of motion. relative to ground
DATA:
  -1.67  -4.10  -4.59  -5.66  -0.02  4.04  5.16  3.78  1.14  0.50
  -6.33 -10.18 -2.46  7.50  9.25  1.19 -5.34 -2.04 -1.97 -5.62
  -2.24  1.07  3.35  0.94 -1.56 -1.93 -4.71 -2.10  4.81  4.27
  -5.78 -3.14  4.76 -2.10 -5.54  3.22  1.72 -13.88 -10.32  7.11
  .
  .
  .
NCEER ASCII STRONG-MOTION DATA FORMAT
EVENT PARAMETERS:
  more parameters...
DATA:
  more data...
```


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- NCEER-87-0013 "Frequency Response of Secondary Systems Under Seismic Excitation," by J.A. HoLung, J. Cai and Y.K. Lin, 7/31/87, (PB88-134317/AS).
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- NCEER-87-0016 "Pipeline Experiment at Parkfield, California," by J. Isenberg and E. Richardson, 9/15/87, (PB88-163720/AS). This report is available only through NTIS (see address given above).

- NCEER-87-0017 "Digital Simulation of Seismic Ground Motion," by M. Shinozuka, G. Deodatis and T. Harada, 8/31/87, (PB88-155197/AS). This report is available only through NTIS (see address given above).
- NCEER-87-0018 "Practical Considerations for Structural Control: System Uncertainty, System Time Delay and Truncation of Small Control Forces," J.N. Yang and A. Akbarpour, 8/10/87, (PB88-163738/AS).
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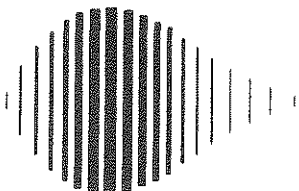
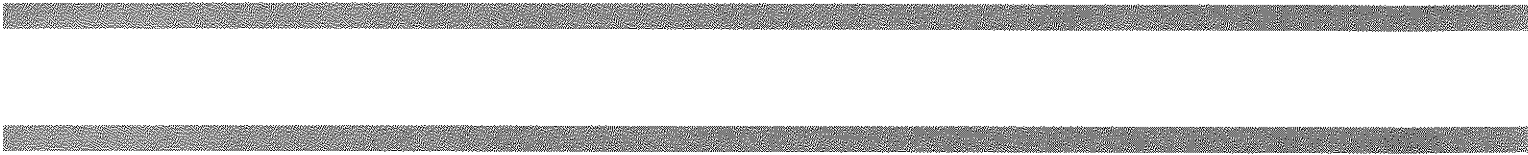
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