NATIONAL WATER INFORMATION SYSTEM USER'S MANUAL

VOLUME 2, CHAPTER 3. AUTOMATED DATA PROCESSING SYSTEM

Compiled by George R. Dempster, Jr.

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ILLUSTRATIONS

NATIONAL WATER INFORMATION SYSTEM USER'S MANUAL
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ABSTRACT

The Automated DAta Processing System (ADAPS) was developed for the processing, storage, and retrieval of water data, and is part of the National Water Information System developed by the U.S. Geological Survey. The National Water Information System is a distributed water data base in which data can be processed over a network of minicomputers at U.S. Geological Survey offices throughout the United States. This system comprises the Automated DAta Processing System, the Ground-Water Site Inventory System, the Quality of Water System, and the Water-Use Data System.

This chapter of the National Water Information System User's Manual describes the automated data processing of continuously recorded water data, which are primarily surface-water data. However, the system allows for processing water-quality and ground-water data.

This manual introduces and describes various components and features of ADAPS, and provides an overview of the data-processing system and a description of the system framework. The components and features included are: (1) data collection and processing, (2) system programs and menus, (3) main menu task selections, (4) interaction with the mainframe computer at U.S. Geological Survey headquarters in Reston, Virginia, (5) control and transfer file descriptions created by ADAPS, and (6) steps for processing station records.

1   INTRODUCTION

The U.S. Geological Survey (USGS) investigates the occurrence, quantity, quality, distribution, and movement of the surface and underground waters that constitute the Nation's water resources. It is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. These hydrologic data are used not only in determining the

adequacy of water supplies, but also in designing dams, bridges, and flood control projects; in allocating irrigation; in locating sources of pollution; in planning for energy development; and in predicting the potential effects of radioactive waste disposal on water supplies.

As part of the Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the storage and retrieval of water data collected through its activities.

The Water Resources Division uses a minicomputer-based distributed information system (DIS) to improve efficiency by providing a high level of local water data processing and computing capability. Each District office (node) of the DIS is linked to a central mainframe computer, and each office communicates electronically with another office and, at times, does work at a remote (distant) location. This linking of computers is accomplished using modern packet switching telecommunications network technology, and forms a private subnetwork of leased telephone lines (Tymnet Corporation*). This nationwide communications network service, called GEONET, supports USGS/Department of the Interior host computing resources and communicating terminals.

The Automated DAta Processing System (ADAPS) is part of a National Water Information System (NWIS), which includes the Quality of Water (QW) System, the Ground Water Site Inventory (GWSI) System, and the Water-Use Data System (SWUDS). All systems that are part of NWIS use DIS resources to process water data.

Locally, ADAPS is operated interactively with batch processing as an option for some programs. The system accepts user input at a local terminal and generally displays output to a terminal screen. The system is available, with limitations, to other Federal agencies and selected cooperators of the Geological Survey who acquire or use water data. Authorization to use the system is obtained from the District Chief for each District (State or States).

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* Use of firm names and trade names in this manual is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

1.1   System Overview

The Automated Data Processing System (ADAPS) consists of a collection of computer programs and files designed to provide a comprehensive system of up-to-date standardized water data processing procedures. In each District where ADAPS is used, there is a designated local administrator and/or data base manager. These people are usually responsible for installation and maintenance of system software and hydrologic data files, as well as performing additional tasks necessary for efficient operation of the system. The system is designed to run interactively with multiple users.

The current implementation of the system uses Prime minicomputers and vendor-supplied software packages such as MIDASPLUS, the enhanced Multiple Indexed Data Access System (MIDAS), and the Command Procedure Language (CPL). With the MIDAS component, data are updated, deleted, and retrieved on the basis of data elements that are specified as key elements. The CPL feature primarily provides for communication between the computer operating system and user-developed programs. The user-developed programs are written using the Fortran77 (F77) programming language. Specific information on each language capability is given in an appropriate vendor-supplied reference guide.

The system operates day-to-day as an online system using magnetic disks. However, as disk space becomes unavailable, data are archived onto offline magnetic disks and/or tapes. The system is large enough to accommodate data-processing capabilities including graphics, various types of application programs, and the routine water data record computations. Assignable asynchronous lines are used by user programs or the spooler to communicate with local terminals, printers, plotters, and other devices. They are supported by an Asynchronous Multi-Line Controller (AMLC). The local administrator or manager configures the lines for the type of equipment that they have available.

The interactive method of processing data in ADAPS allows the user to assemble and set up the information needed to compute streamflow, reservoir, or other types of hydrologic records on a variable time basis. The information or commands are generally entered via the terminal keyboard, and then the user awaits examination of the processed results.

1.2   Purpose and Scope

The purpose of the user's manual is to serve as a reference document and to aid the user in the use of ADAPS programs. The manual is divided into sections that discuss or describe the system framework, the data collection and processing, the menus and associated programs (work tasks), and the mainframe computer files. The user's manual is complemented by Help features for the individual programs. The ADAPS Administrator's Manual (an online document) is primarily for use by the local administrator or manager and by application programming personnel.

The principal components and features described in this manual are (1) data collection and processing, which includes requirements to establish and configure a data collection site for processing, entry, and computation of data, and explanation of system concepts; (2) the system programs and menus, which include a common startup when entering any program in the system; (3) discussions of the main menu task selections, which include data input, primary processing, data display and retrieval, system and local applications, hydrologic and system utilities, documentation, and satellite operations; (4) interaction with the mainframe computer at U.S. Geological Survey Headquarters in Reston, Virginia; (5) control and transfer file descriptions created by ADAPS; (6) steps for processing station records; (7) list of menu options and programs; and (8) retrieval of data from mainframe computer.

1.3   Acknowledgments

The material presented in the manual is based on the work of many hydrologists and computer programmer/system analysts, each of whom has contributed to the current state-of-the-art in computer programming and system development for the automated processing. However, special acknowledgment is given to Neil G. Stuthmann, who was chairman of the ADAPS Work Group and coordinated the efforts of all contributing personnel.

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2   SYSTEM FRAMEWORK

        This section presents a general framework of ADAPS consisting of general system information, a list of software categories and attributes, and generally describes the software directories and files that comprise the system.

2.1   General Information

        The Automated Data Processing System (ADAPS) available on the Prime minicomputers processes, computes, stores, and displays water data. Most ADAPS processing is interactive. However, some applications may submit long-running jobs to the batch environment (Seybold, 1985, p. 14-1 to 14-13). Batching primarily allows processing tasks to execute independently of a terminal. This independence is called a phantom process.

        Most of the data needed by ADAPS programs are supplied interactively. However, some programs accept input from system (external) files. Therefore, the programs require the pathname (data set name) of the input file. Occasionally the user is prompted to supply a pathname (either for input or output), but usually the name need not be known. Most pathnames are stored within a program or in a file, thereby relieving the user of having to keep track of the pathnames.

        Data-base files used and/or maintained by ADAPS are structured as Prime MIDASPLUS (Walsh, 1985) files. The files are managed by Prime system MIDASPLUS utility and user-written software. The MIDASPLUS files allow rapid and efficient retrieval of records on the basis of selected data elements defined as key indexes (elements).

        A multilevel security system is used in ADAPS to restrict access to the data files and to limit the ability of some users to perform certain operations in the system. User classes of ADAPS Data Base Administrator (ADBA), System Administrator (SYST), User (USER), and Cooperator (COOP) have been established, and record-level protection is provided. In addition, Prime Access Control Lists (Seybold, 1985, p. 3-1 to 3-28) are used. Security measures are implemented by the local administrator or manager in consultation with District supervisory personnel, and in some instances, in consultation with Headquarters personnel.

Water data stored in ADAPS result from processing of data collected or recorded at field installations operated by each District. A vast majority of the field data are recorded in digital form on punched paper tapes or recorded by a data collection platform (DCP) and sent to the computer via satellite telemetry. The field data are processed by District personnel following established procedures. The data are reviewed for validity and correctness, and subsequently are published in State basic data reports. Data collection and processing is discussed in detail in Section 3 of this manual.

2.2   Software Categories

Several different categories of software make up the water data-processing system. The major categories are:

- System utility programs
- General-purpose programs
- Command Procedure Language (CPL) programs
- General-application programs
- General-graphics programs
- Vendor-supplied programs (subroutines)

The software in each of the above categories is used for a specific function or purpose. For example, the utility programs are used to initialize, create, update, and maintain the numerous support, processing, and data (time-series) files that make up the District data bank. The general-purpose programs are used to process many different types of water data along with the subsidiary calculations and computations that go into computing and producing a water data record. Most programs use insert statements and common blocks (Prime Computer, Inc., 1983, p. 3-1 to 3-26) to share and communicate data between programs, to provide software flexibility, and to ease software maintenance. The operating system software is called PRIMOS (Seybold, 1985, p. 1-2). The Command Procedure Language (CPL) is a PRIMOS command-level language that provides a programming capability (Landy, 1982). Operating system commands or directives are passed to PRIMOS for execution after they are stored in a CPL file (suffix .CPL). The application programs are used primarily to compute statistical information about the hydrolr ic data. The graphics programs are used for preliminary viewing of the data, for comparison purposes and for report purposes. The system contains both user-written and vendor-supplied programs such as DISSPLA (Integrated Software Systems Corporation, 1984).

2.3   Common Program Attributes

All programs in ADAPS, regardless of their category or who can invoke them, have some common attributes.

1. The system programs, except for the edit/update programs, are designed to be run using most kinds of terminals. The edit/update programs require the use of terminals that support cursor control. Currently, terminals that use American National Standards Institute (ANSI) standards (such as Tab) or terminals with ADM3A cursor control (such as Wyse 50) are supported.

2. The programs can be run using either uppercase or lowercase letters if the terminal supports this feature.

3. The programs in most instances can be exited (break out) due to a problem or emergency and files are not damaged or lost. However, arbitrary breaking out for no reason should be done sparingly. Keying EX in response to any query in any program will exit the user to the operating system (PRIMOS) level.

4. Most data-processing programs are run interactively. However, the long-running jobs are set up interactively and then are run in batch mode. These programs use a preprocessor program to create a control file that is used by a postprocessor program. The control file contains user-supplied and retrieval information and is what enables the postprocessor program to run as a phantom job. If processing is not too lengthy, the user may have the choice to either run interactively or in batch mode.

5. Many ADAPS programs use a common set of programs to handle startup of the individual programs and to handle queries within the individual programs. Use of these common programs standardizes these particular phases of the processing. The startup program opens the files that are necessary to use ADAPS.

6. Some programs use a screen input form for entry of data. The layout of the form is similar for all of those programs that use it. Entry of data to the form is controlled by similar options that control page (screen) and cursor movement.

7. Cooperators and other outside users of the system have limited functional capabilities in use of the system due to the security system. They are granted access to the system principally to display and table data, to retrieve and create their own work files, and to use (run) the application programs.

Therefore, cooperators' selections via the system menus are limited. Update or maintenance activity is not allowed by cooperators or other outside users.

8. Individual terminal screen prompt descriptions are not presented in the manual. These descriptions are replaced by a HELP system within ADAPS.

9. Generic line prompt (i.e., prompts that are repeated from screen to screen) descriptions are not repeated throughout the individual program sections of this manual because most are self-explanatory.

10. An error message section is not included at this time. The errors are usually self-descriptive; the system attempts to trap the error, print a message, and close all the files if the error is fatal.

2.4   Software Directories and Files

The ADAPS software directories and files are stored in a tree-like structure of user file directories (ufd's) on the system disk(s). The user file directories begin immediately below the master file directory (a disk partition) level, which is created and named by the local administrator or manager. All of ADAPS resides under a ufd named WATSTORE (same name as mainframe system - Kilpatrick, 1981). Those directories and files that are unique to ADAPS are located under a sub-UFD named ADAPS. Lower-level directories contain support files, Fortran programs and subroutines source code, CPL programs (files), and executable files (compiled and linked F77 source code).

2.5   Data Directories and Files

Within the WATSTORE directory, there are various files which are necessary to:

1) provide support information about users, data collection sites (stations), instruments, data descriptors, Agency, State, County, etc.,
2) compute and process water data collected as a time series or that are related to the time series,
3) provide user processing information, and

4) provide output files created as a result of an
   analysis or retrieval, or as a result of a
   particular processing operation.

The location of these data files is not fixed. The local
administrator or manager can relocate them in response to changed
needs or for management of disk space. The files associated with
each of the above areas are listed in the following sections of
this manual. A general statement about what each file contains
is also given. Where an abbreviation is commonly used for a file
name, its abbreviation is also given. Most of the ADAPS and
associated files are MIDASPLUS (direct access) files, and usually
there is only one file of each type at a node (District) except
possibly for output files.

2.5.1   Support Files

     The following files are used to provide support information
about the system users and data-collection sites. The files
which are shared by all data-processing systems in NWIS are
called Shared Files. The other files are ADAPS specific.

2.5.1.1   Shared Files

- Site - Contains fixed information about each data-
  collection site such as latitude and longitude.
- Parameter/statistic codes - Contains numeric water-data
  parameter and statistic codes.
- Agency codes - Contains alphanumeric agency codes.
- State and County codes - Contains numeric Federal
  Information Processing Standards (FIPS) codes
  for States and counties.
- Hydrologic units - Contains alphanumeric codes
  representing geographic regions within river
  basins in the United States.
- Terminal - Contains information to define and
  support different terminal types.
- Gpath - Contains pathnames of various data files
  for all of the water data-processing systems.
- Global varia: - Contains variables that are to
  be known by a group of programs rather than
  to only a single program. This file is an
  operating system command level file.
- Help - Contains user information pertaining to program
  prompts or questions, or contains descriptive
  information about a processing step or application.

The DD record contains information consisting of a string of variables. These variables include a water-data parameter code, a statistic code that describes the data, an optional description of the parameter, numerical cross-section and elevation (depth) locations, rounding specifications, and the type of daily-values tables to produce. Associated with each DD record, there is a processor record (optional). The processor record information describes unit-values computations involving the particular DD, which daily-values statistics to compute, and which data validity screening thresholds (low values, high values, etc.) to use. The DD file operation allows other possible DD records to be linked to the original DD record via pointers. The pointers relate to other DD's for possible computation of that DD's data. Up to 9,999 DD records can be created for a data collection site.

2.5.2   Time-series Related Files

The following files are related to the processing of time-series collected data.

- Measurement/crest-stage gage (MS) - Contains discharge or other measurement data.
- Rating/conversion - Contains stage-discharge relation data or other tabular look-up (rating) data.
- Datum corrections (DC) - Contains data to correct changes in gage datum due to settlement or upheaval of the gage or to correct for an instrument being set incorrectly in the field.
- Shift by time (ST) - Contains data to apply the shifting control method of computing water-data records on basis of time.
- Shift by stage (SV) - Contains data to apply the shifting control method of computing water-data records on basis of stage and/or time. These files are also used to make an adjustment to a value prior to or after a table look-up (rating), as might be done for quality of water data. The shift-by-stage procedure is sometimes referred to as using a Vee (V) diagram (Kennedy, 1983).
- Unit values (UV) - Contains data collected at a discrete fixed or varying time interval.
- Daily values (DV) - Contains data observed on a daily or continuous basis and numerically reduced, usually on the basis of unit values.

2.5.3   Processing Files

The following files are used to provide the user with processing information.

- Status - Contains synopsis of satellite processing information.
- Errors - Contains entries of encountered data-processing errors from satellite processing.

2.5.4   Output Files

The following files are used to provide the user with analytical or retrieved hydrologic data. There may be multiple files of each type from different programs.

- Meta - Generic files that are created for subsequent use by other software systems such as graphics systems.
- Applications - Files that contain statistical or other types of information created by application programs, or that contain data furnished by retrieval programs. One proposed file is called the Application Programs Transfer File (APTRAF).
- Temporary - Files that are created as part of normal processing for use by subsequent operations or programs.

3   DATA COLLECTION AND PROCESSING

        To fulfill the U.S. Geological Survey's mission as the
principal Federal water data-collection agency, the Water
Resources Division (WRD) has established a network of stations
throughout the United States from which hydrologic measurements
are collected and analyzed. Various techniques are used at these
sites to record and collect these measurments. These techniques
range in sophistication from the direct observation of gages at
the station to real-time satellite telemetry. All recorded data
are eventually entered into ADAPS where standard processing
software is used to analyze and prepare the data for publication
and archival.

        This section provides a general description of how ADAPS is
configured to receive and process data from WRD stations and what
computational procedures are available in ADAPS to process these
data. Information is also provided on types of variables and
ratings used, datum and shift corrections, and computation of
daily mean values. The section is divided into the following
subsections:

   ● Overview of Data Collection Methods

      A summary of the data collection process. It describes
      the various techniques used to record data at WRD
      stations, move the data to WRD District minicomputers, and
      enter the data into ADAPS.

   ● Configuration of ADAPS Processing Environment

      A description of how to configure the ADAPS processing
      environment. This includes setting up data descriptor/
      statistic codes that are common to all stations whose data
      are to be processed by ADAPS.

   ● Establishment of a Station

      A description of how to establish a station in ADAPS.
      This includes a description of information that must be
      entered into ADAPS for a particular station so that data
      for that station can be processed by ADAPS.

   ● Entry of Recorded Data

      A description of how data are entered into a District
      minicomputer and then into ADAPS.

● Data Computations

   A description of the computational procedures and steps
   used by ADAPS to process the data.

● Dial/Real Variables

   A discussion of the use of dial (integer) and real
   (fractional) variables in ADAPS, and the use of "edited"
   values.

● Rating Types and Dates

   A discussion of the rating types (designations) used in
   ADAPS, and an explanation of the storage and processing of
   rating begin dates.

● Datum and Shift corrections

   Discussions of the application of datum- and shift-by-time
   corrections, and the shift-by-stage corrections.

● Computation of Daily Mean Values

   A description of the trapezoidal method used to compute
   daily mean values.

● Primary Computations

   A discussion of the two kinds of primary computation
   sheets that are available.

● Final Preparation of Records

   A description of the steps taken for final preparation of
   water data records.

3.1   Overview of Data Collection Methods

This section provides a brief overview of the data collection methods used by WRD. Most of these methods are documented in U.S. Geological Survey Water Supply Paper 2175 (Rantz, vol. 1, 1982). The purpose of this section is not to give a detailed account of these methods, but to familiarize the reader with them in preparation for the discussions in the following sections that explain how ADAPS acquires and processes data collected by each of the methods.

There are three methods that WRD uses to collect hydrologic data: (1) human observation, (2) on-site continuous recording, and (3) telemetry.

3.1.1   Human Observation

Human observation is used at some stations that are easily accessible. A person, who usually lives near the station, is paid to visit the station either periodically or when certain hydrologic conditions dictate, and either records in a station log book or sends to the District office by mail, data observed on a visible gage. These values are entered into ADAPS as observer data. This method is normally used in addition to the other two methods and only at sites that are not in remote areas. Its primary purpose is to provide a backup for the on-site recorders and to verify the data collected by these automated recorders; the method is also sometimes the only method used if local conditions prevent efficient operation of a continuous recorder.

3.1.2   On-site Continuous Recording

On-site continuous recording uses sensors and recorders located at the stations to record data automatically. Analog sensors have been developed to sense various types of hydrologic conditions and convert them into a continuous analog signal that can be directly recorded or converted to a digital reading and then recorded. For example, one sensor used to measure the level of water contains a shaft that is rotated by a float as the level of water rises or falls. Thus, this sensor converts the water level into an analog signal, namely, the angular displacement of the shaft from a point of reference. This signal can be recorded

by an analog recorder or converted to a digital reading and recorded either mechanically or electronically. Sensors used to measure other types of hydrologic data usually produce an electronic signal whose voltage varies as the data being measured changes. These signals also can be recorded by an analog device or converted to a digital reading and recorded by a digital recorder.

Automatic recorders record data either on a removable media such as paper strip charts or paper tapes, or in computer memory which can be copied to removable media. The three types of recorders that are in use by WRD are: (1) Analog-Data Recorders (strip-chart recorders), (2) Analog-Digital Recorders (ADR), and (3) electronic recorders.

Analog-Data Recorders record data graphically on a roll of continuously moving graph paper. A pen is used to graph sensed values on the graph paper. The recorder converts an analog signal to a pen displacement. Thus, as values change the pen moves up and down on the graph paper. The rate at which the paper moves determines the resolution in time that the data are recorded. The rate of movement is governed by an external clock that can be set to provide the desired resolution. These types of recorders were used extensively by WRD before WRD began to process data in a more automated manner. They still have a limited use, but because graphically recorded data are difficult to convert into a a medium that can be read by computers, they are primarily being used to provide a backup for digital recorders. Although, as mentioned, it is difficult to convert graphically recorded data into a machine-readable format, it is not impossible. Digitizing devices are available that can perform this task. ADAPS will be able to accept data that have been digitized from the graphically recorded data produced by these recorders as long as the data are converted into ADR card format (Hutchison, 1977) in the Prime.

Analog-Digital Recorders convert analog signals to digital values and record these values on a paper tape. This type of recorder replaced the Analog-Data Recorder as the primary recorder at most WRD stations, and currently the most commonly used recorder at WRD stations. The interval at which this recorder punches values on a paper tape is also determined by an external timer that can be set so that punches are made at desired fixed time intervals.

Electronic recorders are microprocessor-based recorders that convert analog signals to digital values and record these values in computer memory. This type of recorder contains a real-time

real-time clock and can be programmed to acquire data at any desired interval. The data are removed from the recorder by means of a portable device that can be connected to the recorder to extract the recorded data from the computer memory and store it on a removable media such as cassette tapes.

All of these devices record hydrologic data on media that are physically located at the station. Thus, periodic trips, usually every 30-60 days, are made by WRD personnel to retrieve the data from the stations and to bring it back to WRD offices. Since different media are used by these devices to record the data, different methods of entering these data into ADAPS are required. These methods are explained in subsequent sections that explain how data recorded by each of these devices are entered into ADAPS.

3.1.3   Satellite Telemetry

The third method used by WRD to collect data is by the use of satellite telemetry systems. The purpose of these systems is to collect near real-time water data. The telemetry systems allow data to be sensed and recorded automatically at WRD stations and to be transferred automatically from the stations to WRD computers. The Water Resources Division operates a nation-wide network of stations from which data are automatically collected by means of the U.S. Department of Commerce National Qceanic and Atmospheric Administration's (NOAA) Geostationary Operational Earth Satellite (GOES) Data Collection System. This system has three major components: (1) devices called Data Collection Platforms (DCP's) that are located at stations to collect data and transmit the data to a satellite, (2) geosta-tionary satellites to relay the transmissions from the DCP's back to ground-receive sites, and (3) receive sites to receive the relayed tranmissions. A receive site is called a Direct Readout Ground Station (DRGS). WRD currently operates four DRGS's, each of which receives data for each WRD region. Each DRGS is directly connected to a District minicomputer. These mini-computers receive data transmitted by DCP's in real-time and distribute the data to their owners using WRD's Distributed Information System (DIS). ADAPS contains a complete subsystem called SAtellite Telemetry INput (SATIN) to receive, distribute, and process data received from the DRGS's.

3.2   Configuration of Processing Environment

The entry and processing of recorded data from the many
different field sensing devices into ADAPS requires information
to define the data transfer link. Each different sensing device
has its own requirements for moving data from its storage medium
into the data base for further processing. The information
needed for each type of data transfer is contained in the Node
Configuration File and is updated or maintained using the Node
File updating program. This maintenance is performed only by the
local administrator or manager. The node update program is docu-
mented in the ADAPS Administrator's Manual (an online document).

An ADR 16-channel paper tape is translated using a 16-
channel paper tape translator such as the ASCII Mitron or the
Envirolabs 311. Processing in ADAPS requires information that
defines the characteristics of each translator and its communi-
cations link to the minicomputer.

The processing programs for Satellite Telemetry Input
(SATIN) data require information that describes how the automated
program is to operate. The automated program runs continuously
24 hours a day, 7 days a week, receiving SATIN data, decoding,
processing, and storing it into ADAPS files; the programs also
perform automatic file maintenance, scheduled operations (hourly,
daily, and weekly), and alert functions. Information stored in
the Node Configuration File for these operations consists of
general SATIN information, scheduled operations information, the
Direct Readout Ground Station (DRGS) information, including DRGS
line information, the demodulator (demod) information, and the
backup site information.

3.3   Establishment of a Station

The establishment of a station in ADAPS for processing
hydrologic field data varies with each type of field collection
equipment used, although the same general procedure is followed.
First, the site information is entered into the Site File before
anything else is done. Next, an Instrument File entry is created
(usually in conjunction with a DD record) based upon the type of
data-sensing equipment located at the site. This information
defines how to decode the information from the instrument into an
ADAPS readable format. It defines each type of data collected
(sensed) by the instrument, the order in which it is recorded,
and points to the data descriptor (DD) record (number) that is

associated with the data when the DD record is created. The DD record points to a corresponding processor record, which contains information on how to compute the unit and daily values from the input data and, if requested, compute another DD's data using the computed input data and, if needed, one other auxiliary DD's data. The DD record(s) for an instrument can be created either by using the DD updating program, or during the creation of the instrument record. The latter is recommended for most applications as the DD updating program is mainly intended for the creation of independent DD records for special use. The DD record is also used to point to the shifts, datums, and rating tables needed for computation. Figure 1 shows the relation of the instrument, data descriptor (DD), processor, and data (unit and daily) records for a site with a one-channel (single parameter) instrument (an example is a site with a stage only recorder). Note that the records are linked to provide the information necessary for data processing. For sites with multiple-channel (more than one parameter) instruments, the instrument record points to multiple DD records (one for each channel or parameter recorded), which in turn point to multiple processor records (one for each DD record). Each DD record then points to its associated unit- and daily-values records.

3.3.1   Analog Digital Recorder (ADR)

An instrument record must be entered in order to process data collected by an ADR paper-tape recorder. The entry of an ADR instrument record is accomplished via the instrument updating program, explained in the ADAPS Administrator's Manual, by selecting an ADR instrument type option when queried for an instrument type. The user is queried for information needed to process ADR recorder data (processor record) such as number of punches per day, punch value screening thresholds, channel identifiers and other instrument information as mentioned above.

NOTE: The auxiliary gage information must be entered into the files prior to entering information for the base gage for slope-discharge stations. Also, for velocity-meter stations, the velocity-meter information must be entered into the files prior to entering gage information.

EXAMPLE STATION WITH SINGLE CHANNEL INSTRUMENT

IN = Instrument Record - Process Input Parameter
DD = Data Descriptor Record (number in parentheses is a parameter code)
PR = Processor Record - Process Output Parameter
UV = Unit-Values Record
DV = Daily-Values Record

```
      ┌─────────────┐
      │     IN      │                    Note:
      │ (Has thresholds                  To process digital
      │ to screen/test                   tapes and satellite
      │ field-recorded                   transmitted data.
      │ values)     │                    IN, DD, and PR
      └──────┬──────┘                    records are required.
             │
             │◄──────── One input parameter for instrument
             ▼
      ┌─────────────┐        ┌─────────────┐
      │     DD      │───────►│     DD      │    Note: DD's
      │ Example is for       │ Example is for   point to
      │ stage (65)  │        │ discharge (60)   other records.
      └──────┬──────┘        └──────┬──────┘
             │                      │
             ▼                      ▼
      ┌─────────────┐        ┌─────────────┐
      │     PR      │        │     PR      │    Note: PR
      │ (Has UV computa-     │ (Has UV computa- records not
      │ tion options and     │ tion options and always
      │ thresholds to        │ thresholds to screen/ required.
      │ screen/test com-     │ test computed
      │ purted stage values) │ discharge values)
      └─────────────┘        └─────────────┘
           │                      │
        ┌─────┐    ┌─────┐
        │ UV  │◄──►│ DV  │
        │data │    │data │
        └─────┘    └─────┘
```

Figure 1.- Relation of instrument, data descriptor,
           processor, and data records.

3.3.2   Satellite Transmission (Input)

An instrument record must be entered (see Administrator's Manual), in order to process data for DCP transmissions. The entry of a DCP instrument record is done via the instrument updating program by selecting the DCP instrument-type option when queried for an instrument type. The user is queried for information needed to process DCP transmissions (Processor record) such as DCP identifier, transmission time, transmission channels, transmission interval, alert information, information describing the format of each channel's information, and other instrument information as mentioned above.

3.3.3   Observer Data

Observer data are entered using the unit or daily values updating programs. The DD record information, which describes the data descriptor/statistic code of observer data, is entered via the DD updating program (DD-EDIT). No instrument record is required for this type of data entry. A processor record may or may not be required, depending upon how the data will be used.

3.3.4   Other Instrumentation

Not available.

3.4   Entry of Recorded Data

To be processed, recorded data must first be transferred to a District's minicomputer file and stored in the District's ADAPS file(s). Recorded data can then be processed by ADAPS to compute various kinds of water data records. The following sections briefly describe how data collected by the various data collection methods are transferred to or are processed by a District's minicomputer and entered into ADAPS.

If data are collected by another method not discussed in this manual, they can be processed by ADAPS if converted to the ADR Cards format. This format is discussed in Volume 5 of the WATSTORE User's Guide (Hutchison, 1977).

3.4.1   Analog Digital Recorder

Analog digital recorders provide continuous records of water data. The records are computed from field data, mainly measurement notes and 16-channel paper tapes. The recorder punches a series of holes in the tape at preselected time intervals, such as every 5, 10, 15, 30, or 60 minutes. The punched values represent a water parameter such as stage, temperature, etc.

3.4.1.1   Transfer of Data to Minicomputer

The 16-channel paper-tape data are translated for transfer to the minicomputer using different types of translator equipment obtained from various manufacturers. The equipment is usually connected to the computer under the control of a program that is run from a terminal. There are programs in ADAPS to control Mitron, Envirolab, and Leopold-Stevens translators. The records that are translated are stored in temporary files for later editing. Presently, ADAPS allows no more than 1,440 values per day and 20,000 values per tape to be processed for storage.

3.4.1.2   Entry of Data into ADAPS

The data in the temporary file(s) are edited before entering the ADAPS Unit Values File. Figure 2 depicts the paper tape or ADR cards input operation.

```
┌────────────────┬─────────┐      ┌──────────────────┐
│ PAPER-TAPE     │ ADR     │◄─────│ NODE             │
│ PROCESSING     │ CARDS   │      │ CONFIGURATION    │
│                │         │      │ FILE             │
└────────────────┴─────────┘      └──────────────────┘
           │
           ▼
     ┌──────────────┐
     │ TEMPORARY    │
     │ UNEDITED     │
     │ UNIT FILE    │
     └──────────────┘
           │
           ▼
     ┌──────────────┐            ┌──────────────────┐
     │ DISPLAY      │       ┌────│ INSTRUMENT FILE  │
     ├──────────────┤       │    └──────────────────┘
     │ EDIT-VERIFY  │       │
     ├──────────────┤       │    ┌──────────────────┐
     │ APPLY        │◄──────┼────│ DATA DESCRIPTOR  │
     │ TIME         │       │    │ FILE             │
     │ CORRECTIONS  │       │    └──────────────────┘
     ├──────────────┤       │
     │ SCREEN DATA  │       └────│ PROCESSOR FILE   │
     └──────────────┘            └──────────────────┘

     ┌──────────────┐
     │ EDITED       │
     │ UNIT FILE    │
     └──────────────┘
```

Figure 2.- Paper-tape and ADR card-input operation.

Tape or card values are transferred to the minicomputer into a temporary file, where they are displayed and edited for correct- ness and for resolution of timing difficulties. The values are also screened for potentially erroneous values by comparing them to user prescribed low- and high-threshold values, and to rate- of-change per unit time values. The edited values are then entered into the Unit Values File. The need for review and editing of data is discussed in different sections of the manual.

3.4.2   Satellite Transmission (Input)

      Data collection platforms (DCP's) also provide continuous records of water data via satellite telemetry in (near) real time. This section briefly describes the flow of data from the receive sites (DRGS) to the computer processing system.

3.4.2.1   Flow of Data from DRGS to SATIN

      Water data collected by means of satellites are dispatched via the DIS network to the proper node(s) and entered into ADAPS automatically by a subsystem called SATIN (Satellite Telemetry Input). When initiated, this subsystem runs continuously as a phantom, constantly acquiring and processing satellite data. SATIN can be initiated at any site from within ADAPS. It runs in two modes: (1) HOST and (2) REMOTE. The HOST mode is used by those Districts that operate Direct Readout Ground Stations (DRGS's); the REMOTE mode is used by all other Districts. In the HOST mode, SATIN connects to a DRGS, acquires data in (near) real-time, distributes remote data to their proper remote node using the DIS network, and processes local data. In the REMOTE mode, SATIN receives data via the DIS network and processes the data. Figure 3 shows the flow of satellite data from a DRGS to being processed by SATIN and distributed to host and remote sites.

Figure 3.- Distribution of DRGS data to SATIN Host and
          Remote sites.

3.4.2.2   Flow of Data as Processed by SATIN

       In either HOST or REMOTE mode, SATIN processes local data
identically. Figure 4 shows the flow of data when processed by
SATIN. The data are edited, screened, and stored in a similar
manner as data from other sources only in near real-time and
without human intervention. Also, any designated computations,
such as streamflow computations, are performed automatically in
near real-time. One additional processing feature performed by
SATIN is analyzing incoming data and generating alerts when
certain conditions are detected. These alerts are sent as
messages to as many as three data manager personnel and also are
sent as electronic mail.

3.4.3   Observer Data

       Observer data can be entered into ADAPS directly by using an
appropriate interactive program that queries for the time the
data were observed and the data values.

3.4.4   Other Instrumentation

       Not available.

3.4.5   Review and Edit of Data

       Once recorded or other data are entered into ADAPS file(s),
the data should be reviewed and edited for correctness and
validity prior to further computation and processing. This is
done as part of the quality assurance effort for a station during
record processing. Digital tapes should be reviewed for continu-
ity with previous tape, and the data should be reviewed for
faulty punches and be corrected where necessary.

```
            ┌──────────────┐
            │    DRGS      │
            │   OR DIS     │
            └──────┬───────┘
                   │
                   ▼
            ┌──────────────┐
            │    SATIN      │
            │  (HOST OR     │
            │  REMOTE)      │
            └──────┬───────┘
                   │
          LOCAL  │  DATA
                   │
                   ▼
            ┌──────────────┐                    ┌──────────────────┐
            │   DECODE     │                    │ INSTRUMENT FILE  │
            │ TRANSMISSION │◄───┐               └──────────────────┘
            ├──────────────┤    │
            │ MERGE INTO   │    │
            │ UNIT-VALUES  │    └───────────────┌──────────────────┐
            │ FILE         │                    │ DATA DESCRIPTOR  │
            └──────┬───────┘                    │ FILE             │
                   │                            └──────────────────┘
                   ▼
            ┌──────────────┐
            │   EDITED     │
            │  UNIT FILE   │
            └──────┬───────┘
                   │
                   ▼
            ┌──────────────┐                    ┌──────────────────┐
            │COMPUTE RECORDS│◄──────────────────│ PROCESSOR FILE   │
            │ (REAL-TIME)  │                    └──────────────────┘
            ├──────────────┤
            │ SCREEN DATA  │◄───┐               ┌──────────────────┐
            ├──────────────┤    └───────────────│ RATING, SHIFT,   │
            │ ISSUE ALERTS │                    │ AND DATUM FILES  │
            └──┬───────┬───┘                    └──────────────────┘
               │       │
               ▼       ▼
        ┌────────┐  ┌────────┐
        │ DAILY- │  │COMPUTED│
        │ VALUES │  │ UNIT   │
        │ FILE   │  │ FILE   │
        └────────┘  └────────┘
```

Figure 4.- Flow of data processed by SATIN.

The ADAPS system provides use of user-specified test values
and thresholds as an aid in accomplishing proper data editing.
The tests include time adjustments and various exceedence limits
for individual and rate-of-change values (herein called verifi-
cation tests).   These tests are described later in individual
"editing" program sections.

3.5   Data Computations

Data computations are primary functions of ADAPS.   This
section discusses the information needed to perform computations,
and presents the steps involved in each of the computation
methods.

3.5.1   Introduction

After the original data are entered into the minicomputer,
edited, and stored in the Unit Values File, the computational
routines all follow a similar pattern when computing output
values of water data such as stage, discharge, pH, and
conductivity.   Prior to computing output values, general
information needed to process data at a site must be entered.
This information is stored in the Instrument (IN), Data
Descriptor (DD), and Processor (PR) files.   Rating table(s),
datum corrections, and shift values are also processed and stored
in the minicomputer.   Data values are screened for potentially
erroneous or unusual values by comparing them to user-prescribed
low- and high-threshold values, and to rate-of-change per unit
time values.   New ratings, if necessary, are entered and may be
put in use at any time.   Datum corrections and shifts (if
applicable) are determined and put into effect at specified
times.   Figure 5 shows the record processing operation that is
used for all methods of inputting data.

3.5.2   Computation Methods

The following sections briefly discuss each computation
method and outline the computation steps for each of the
available methods.   The main difference among some of the
computation methods is where in the process the shifts are
applied.   For some methods, such as for discharges, the shift
corrections (adjustments) are applied to the input (stage) value
before applying the rating or equation, while other methods
process data by applying the shift after the application of a
rating or equation.   Occasionally, data are converted from a gage
datum (i.e., as recorded) to a base datum for output.   An example
is conversion of recorded stage (water level) to height above or

below the National Geodetic Vertical Datum (NGVD) of 1929. ADAPS
allows for this conversion to be made.

The basis or details of the computation methods are
described in U.S. Geological Survey Water-Supply Paper 2175
(Rantz, vol. 2, 1982).

Figure 5.- Record-processing operation.

In the following discussions of computational steps, values are referred to as "input-edited," "input-computed," and "output-computed." This terminology is used for distinctness and clarity because in ADAPS it is possible to manipulate values on input and output with or without conversions, corrections, or adjustments being applied. Figure 5 shows input-edited and output-computed values as edited and computed unit values file(s), respectively. The initial conversion (Dial/Real) of recorded data, derivation of input-edited unit values, rating types used in ADAPS, application of datum and shift corrections, computations of daily mean values, and primary computations are discussed in succeeding sections of the manual.

3.5.2.1   Conversion Table or Equation

This method of computation processes any input data descriptor/statistic code combination but is used primarily for the processing of water-quality monitor data (pH, conductivity, gage height only or water-surface elevations, etc.), using a rating or conversion table or an equation. Shift corrections are applied after processing the input values using the rating or equation. The computational steps are:

● Read input-edited values from Unit Values File.

● Apply input rating or equation, if it exists, to convert units to real numbers. Normally, the input units should not be converted.

● Add base datum, if it exists.

● Add datum corrections, if necessary.

● Obtain output-computed value using rating table or equation.

● Apply shift corrections, if they exist and the parameter/DD is not for gage height data.

● Screen output-computed values.

● Stu ， output-computed values in the Unit Values File, if specified.

● Store output-computed values in the Daily Values File, if specified.

3.5.2.2   Accumulative Differences

This method of computation is used to process any input data descriptor/statistic code combination where differences of accumulative output values are required, such as rainfall. The unit values stored are the computed incremental differences. The computational steps are:

● Read accumulative input-edited values from the Unit Values File.

● Apply input rating or equation, if it exists, to convert input units to real numbers--optional.

● Add base datum, if it exists.

● Add datum corrections, if necessary.

● Obtain intermediate output-computed value using rating table or equation.

● Compute difference from previous value. This difference is the final output-computed value for that time increment.

● Screen output-computed values.

● Store output-computed values in the Unit Values File, if specified.

● Store output-computed values in the Daily Values File, if specified.

3.5.2.3   Stage-Discharge

This method of computation is the standard stage-discharge method using a rating curve or equation. Shift corrections are applied to the input values <u>before</u> processing them through the rating or equation. The computational steps are:

- Read input-edited gage height values from the Unit Values File.

- Apply input rating or equation, if it exists, to convert gage height units to real or engineering units (feet).

- Add base datum, if it exists.

- Add datum corrections, if necessary. The input values are now called input-computed unit values.

- Apply shift corrections, if necessary.

- Apply rating or equation to obtain output-computed values (discharges).

- Screen input-computed values (gage heights).

- Screen output-computed values (discharges).

- Store input-computed values in the Unit Values File, if specified (gage heights).

- Store input-computed values in the Daily Values File, if specified (gage heights).

- Store output-computed values in the Unit Values File, if specified (discharges).

- Store output-computed values in the Daily Values File, if specified (discharges).

3.5.2.4   <u>Slope-Discharge</u>

This method of computation processes a base stage-input value in conjunction with an auxiliary stage-input value. The output discharge is adjusted based on the slope (fall) which is computed as the difference between the base and auxiliary values. Note that the auxiliary gage information must be entered to the Instrument/Data Descriptor files before entering the base gage information. The computational steps are:

- Read input-edited values from the Unit Values File (base and auxiliary).

- Apply input rating or equation, if it exists, to convert base and auxiliary values to real or engineering units (feet).

- Add base datum (base and auxiliary), if it exists.

- Add datum corrections (base and auxiliary), if necessary. The input base and auxiliary values are now called input-computed values.

- Calculate the measured fall by: (1) subtracting the downstream gage height (base/auxiliary) from the upstream gage height (auxiliary/base), and (2) to this difference add the difference in datum between the base and auxiliary gage (SDD), if any exists.

- Obtain rating fall from rating table (set to 1.0, if it does not exist).

- Calculate the fall ratio by dividing the measured fall by the rating fall.

- Obtain discharge ratio from rating table (set to square root of fall ratio, if it does not exist).

- Add shift correction to base value, if necessary.

- Obtain discharge from rating table using base value.

- Calculate the final discharge by multiplying the rating discharge by the discharge ratio; this is the output-computed value (discharge).

● Screen input-computed values (base and auxiliary gage heights).

● Screen output-computed values (discharges).

● Store input-computed values in the Unit Values File, if specified (base and auxiliary).

● Store input-computed values in the Daily Values File, if specified (base and auxiliary).

● Store output-computed values in the Unit Values File, if specified (discharges).

● Store output-computed values in the Daily Values File, if specified (discharges).

3.5.2.5   Velocity/Deflection Meter

This method computes values of discharge using values from a stage recorder (base) and either a velocity meter or a deflection meter (auxiliary). The discharge is computed from the mean cross-sectional velocity of the stream based on a deflection or velocity meter and the cross sectional area based on the stage value. Note that the deflection/velocity meter information must be entered into the Instrument/Data Descriptor files before entering the gage (stage) information. The computational steps are:

● Read input-edited values from the Unit Values File (stage or base values, and deflection/velocity meter or auxiliary values).

● Apply input rating or equation, if it exists, to convert base and auxiliary values to real or engineering units.

● Add base datum (stage and deflection/velocity meter value), if it exists.

● Add datum corrections (stage and deflection/velocity meter value), if necessary. The input base is now called the input-computed base values.

● Apply shift correction (stage and deflection/velocity meter value), if necessary.

- Obtain channel cross-sectional area from a rating table using a stage value (stage-area relation).

- Obtain stage-velocity factor from rating table using a stage value (stage-velocity factor relation). If the rating does not exist, the stage-velocity factor is set to one.

- Obtain velocity from rating table using a deflection/velocity meter value (deflection/velocity meter-mean velocity relation). If the rating does not exist, the program assumes the input-auxiliary values are in real units of velocity.

- Calculate the mean cross-sectional velocity by multiplying the velocity (auxiliary) from above by the stage-velocity factor. The values for the mean cross-sectional velocity are now called the input-computed auxiliary values.

- Calculate discharge by multiplying the area by the mean cross-sectional velocity; this discharge is the output-computed value.

- Screen input-computed values (stage-velocity values).

- Screen output-computed values (discharge values).

- Store input-computed values in the Unit Values File, if specified (stage-base and velocity-auxiliary values).

- Store input-computed values in the Daily Values File, if specified (stage and velocity).

- Store output-computed values in the Unit Values File, if specified (discharge).

- Store output-computed values in the Daily Values File, if specified (discharge).

3.6   Dial/Real Variables

        This section discusses the use of dial readings and real
variables, and explains the conversion of these kinds of input
data during processing and storage in ADAPS files.

3.6.1   Introduction

        Many different types of instruments are installed in the
field to collect water data.   The data recorded by these
instruments become input to ADAPS.   The instruments record the
data in one of two formats: (1) dial (DIAL) readings, which are
integer (whole) numbers, and (2) real (REAL) values, which are
fractional (contain a decimal point) numbers.   The input data are
initially processed (translated if paper tape) in strings of data
usually as dial readings representing parameters (variables) such
as stream stages, water temperatures, ground-water levels, etc.

3.6.2   Input Data Conversion

        Depending upon the type of data collected and the computa-
tion method involved, the data are converted from DIAL readings
to REAL numbers, or they remain unchanged (DIAL to DIAL or REAL
to REAL), as is the case for satellite transmitted data, which
are REAL.   The usual reason to convert from DIAL to REAL is to
obtain engineering units (i.e., feet for stages, degrees for
temperatures) for further use in the computation process.   It is
obvious that all manipulations in the process should be done with
consistent units to obtain meaningful and correct results.   If
the data are not initially converted to engineering units, they
are usually converted later in the process, as is often done with
water-quality monitor data.   There may be times when the data are
not initially converted; it may be desirable to process the data
in the original (raw) form because the computatation process
makes more sense to convert later, or for some other reason such
as review of the raw data.

        In ADAPS it is important to understand how input-edited unit
values are derived.   They are derived as shown below.

Process	The raw values in	Store
recorded (raw) ===>	temporary file are ===>	input-edited
original	time corrected and	unit values
values into	verified (edited)	in the unit-values
temporary file.	via ADAPS programs.	MIDAS files

NOTE: Temporary files are saved for archival.
        (See Sec. 15 of the Administrator's Manual)

The input-edited values are those used by the ADAPS programs that edit and display unit values after translation if paper tapes are involved. This initial process of handling the recorded data is shown in Figure 2.

During primary processing or satellite data processing, the input-edited values are converted (DIAL to REAL) to engineering units or they are not converted (DIAL to DIAL or REAL to REAL). The conversion to engineering units in the early processing is accomplished by use of a Type 0 (Zero) rating. (See sec. 3.7.2.) In the case of a slope or deflection/velocity meter station, a Type 20 rating is used to convert the auxiliary gage data, in addition to use of a Type 0 for the base gage. The values produced by use of either a Type 0 or Type 20 rating are called input-computed unit values. During the processing, these values will have the base datum from the PR file and any datum corrections added if applicable. In ADAPS, the user is prompted to supply the format (DIAL or REAL) of this data, which is used in conjunction with whatever computation method is selected. Note that for a slope station, this means that with a Type 0 rating, when creating the Processor File entry for the base gage stage, the question of which format the input data are to be displayed on the Primary sheet (discussed in sec. 3.10) must be answered with REAL. With use of a Type 20 rating, while creating the auxiliary Processor File entry, the question of input data format display on the Primary sheet must also be answered with REAL. If the data are not converted by the use of the Type 0 (or 20) rating, they are still called input-computed and retain the same format (data type) as the input-edited value except that they have the datum corrections (if any) added. The above-mentioned process is shown below.

Process input-edited unit values (usually in DIAL units).	Use Type 0 rating for conversion ===> of DIAL to REAL (simple stage-discharge station, or base gage if a slope or deflection/velocity station).	Apply base ===> datum and datum corrections in REAL units	Obtain input-computed unit values (usually in REAL values); optionally stored in unit-values file(s).
Process input-edited unit values (usually in DIAL units).	Use Type 20 rating (auxiliary gage or ===> data if a slope or deflection/velocity station, respectively).	Apply base ===> datum and datum corrections in REAL units	Obtain input-computed unit values (usually in REAL values); optionally stored in unit-values file(s).

Two recommendations about DIAL/REAL variables and primary processing (described in sec. 8.6) are as follows:

1. If the incoming unit values are in dial units and you wish to enter datum corrections in feet, you must enter a Type 0 (conversion of input) rating, not a Type 1 (standard) rating. (See sec. 3.7.) The Type 0 rating can be used to multiply the unit values by 0.01 before processing begins. Datum and base datum corrections must now be entered in feet. During primary processing, you <u>must</u> answer the query "What type of numbers do you want to display your input as on the primary sheet, dial or real" as REAL.

2. If you wish to enter the datum corrections as dial units and display the unit values as dial units on the primary sheet, <u>do not</u> use a Type 0 (conversion of input) rating to multiply by 0.01. Do this operation using a Type 1 (standard) rating whereby the rating look-up is applied after the datum and base datum corrections have been applied. When doing primary processing, answer the query, "What type of numbers do you want to display on the primary sheet, dial or real" as DIAL.

3.7   Rating Types and Dates

This section discusses the use of ratings in computations, summarizes the rating types, and explains the handling of rating dates during data processing.

3.7.1   Introduction

There are a number of different computational methods used in ADAPS to process water data. A general presentation of the steps involved in the different computation methods is presented in section 3.5 of the manual. Because there are different computation methods used, different relationships between different pairs of parameters (ratings) are used. These ratings provide the core means to compute final water data parameter values for computer storage, publication, and hydrologic analysis.

3.7.2   Summary of Rating Types

The types of ratings used in ADAPS and a brief description of each rating type are given below. The description gives a rating "name" and indicates the computation method(s) in which the rating is normally used.

Rating Type	Description
0 (Zero)	Conversion of input rating. Used to convert input-edited values. Conversion of data values is discussed in the previous section of the manual. An example is to convert dial readings to engineering units such as feet. May be used in all computation methods, including accumulative differences (rainfall) and conversion or equation methods (i.e., water-quality monitors).
1	Standard rating. Used in stage-discharge and stage-reservoir contents computation methods. May be used in other methods.
2	Stage-fall rating. Used in the slope-discharge computation method.

Rating Type	Description
3	Fall-ratio/discharge-ratio rating. Used in the slope-discharge computation method.
4	Stage-area rating. The area is the stream cross-sectional area. Used in the velocity/ deflection meter discharge computation method.
5	Stage-velocity correction factor rating. Used in the velocity/deflection meter computation method.
6	Deflection-velocity rating. The deflection is usually in degrees. Used in the velocity/ deflection meter computation method.
20	Conversion of auxiliary-input rating. Used to convert auxiliary input-edited values. An example is to convert dial readings to engineering units such as feet. Used in the slope-discharge and velocity/deflection computation methods. May be used in other computation methods.

NOTE: The velocity/deflection method in ADAPS includes the processing of other kinds of data where velocity index is a parameter such as an acoustic-velocity meter site.

Rating types 1-6 are usually stored as x and y (pairs of data points) type ratings, but can be an equation (discussed below). Types 0 and 20 are usually stored as an equation, but can be stored as an x and y type. Expansion of the x and y type ratings is accomplished either linearly or logarithmically. The equation type computes a new output value for each input value. The equation has the following form:

$$Y = A + BX^C$$

where Y = the output parameter value (dependent variable),

A, B, and C = constants, and

X = the input parameter value (independent variable).

Many rating curves defined by descriptor points, such as stage-discharge ratings, are plotted on logarithmic paper. Often the rating curve is composed of two or more segments that have a slight curvature or plot as a straight line. Many curves typically look like an S-shaped curve. The various segments of the rating curve can often be made to be straight lines by subtracting a constant value, called a rating offset, from the input values (stage) within that particular segment's range of values. The rating offset is a value that represents the point (stage) of zero flow or an effective zero-flow input value (stage) determined by extrapolation from the particular rating segment to the input axis (stage). Different offsets may be used for different segments of the rating curve. Use of offsets and methods to determine them are described in Kennedy (1984, p. 5-10).

NOTE: There are certain constraints to using offsets in ADAPS. (See sec. 8.1, Update/Display Rating Tables (RT_EDIT).)

In ADAPS, the user tells the system which rating type(s) is to be used in processing particular data. The rating type is stored in the Rating/Conversion File along with the actual input-output values. The equation constants are also stored in the Rating/Conversion File. At processing time, the proper rating types are selected based on the computation method to be used.

3.7.3   Explanation of Rating Dates

Ratings are usually identified (numbered) chronologically by dates of use. The approximate date of the change from one rating to another is usually apparent from the dates of measurements that define each rating, and the date of the event that most likely caused the change. With the shifting-control method, the starting date of a rating is not critical and sometimes it can be moved to a convenient date, such as the start of a water year.

In ADAPS, when creating or updating the Rating/Conversion File for a station/Data Descriptor (DD) combination, a starting date and time is supplied for each rating that is to be used. Each rating has to have a rating type and an alphanumeric identifier, both supplied by the user. Note that ending dates are not asked for nor entered. A single rating type (0, 1, 20, etc.) can have more than one defined rating as long as the identifiers for each rating are different. For each rating, multiple starting dates and times (up to 10) can be entered. At computation (processing) time, for each station/DD combination,

ADAPS sorts the ratings into ascending order by rating type, date, and time. Therefore, during processing the use of station ratings is by type (0, 1, 2, 3, 4, 5, 6, 20), and within type by date (month, day, year) and time (hours and minutes). These sorted dates and times form a "stack" of starting dates and times for individual ratings of a particular type. ADAPS programs subsequently process the stack to extract or determine the starting time of the ratings for each rating type. As processing proceeds forward in time, ADAPS programs automatically switch to a different rating based upon the chronology of the dates and times for each rating type. This automatic switching from rating to rating alleviates the need to store ending dates.

Presently in ADAPS, an ending date is not automatically determined nor printed. A listing can be obtained which presents the rating types, ID's, and starting dates and times in chronological order.

3.8   Datum and Shift Corrections

        A brief description of the rules governing the application
of datum and shift corrections to recorded or processed data is
presented in this section. As mentioned earlier, datum and shift
corrections are stored in separate files. For shifts, there is
one file for shifts by time and another for shifts by stage.
Note that shifts by stage are also referred to as variable
shifts.

        In the following discussions, the rules may indicate that no
datum or shift corrections are applied for a particular period of
time. During these periods, the record computation programs
continue to operate and to store data.

3.8.1   Datum and Shift-by-Time Corrections

        This section discusses the datum- and shift-by-time
corrections, the storage of values and times, proration of
values, the entry of null periods, and the hierarchy of shift
corrections.

3.8.1.1   Introduction

        Datum and shift corrections are applied by time or stage to
recorded water data parameter readings to compensate for
erroneous recording (datum) or for changes in control conditions
(shift) at the gaging site. These corrections are usually
applied for short durations of time. Time-based corrections are
discussed in this section and stage corrections are discussed in
section 3.8.2.

3.8.1.2   File Values and Times

Certain identification fields (such as agency, site ID, data-descriptor ID) are associated with each record in the datum and shift files. Following these fields in the files, the data values and times are stored in pairs. Each datum or shift has an explicit time stored with it.

During the record-processing operation (Figure 5), a datum and/or shift value is calculated based on proration (see below) for each of the edited unit values (such as gage heights), but these calculated datum and shift values are not permanently saved. The values are calculated or recalculated each time the processing operation is performed.

3.8.1.3   Proration Between Values

Proration of datum and shift corrections between values is done as an unweighted linear calculation between the individual user-supplied time values and data values for particular site/data descriptor (DD) combinations. This proration process also occurs automatically across water-year boundaries. The last value in the previous water year and the first value of the current water year are used for this proration across the boundary. If there are no entries in the previous water-year's file, the shift or datum-correction values from the previous water year are not applied, and the shift or datum correction begins at the time and with the value available in the current water year.

Note: User-invoked primary record-processing computations cannot proceed across a water year boundary; they must be performed on a water-year basis due to the primary sheet setup and printing limitations. The satellite processing system (SATIN), however, can cross the water-year boundary during its automatic processing.

If there is a zero (0) value in the file, the proration is from a previous value to the 0 and then to another value forward in time. This occurs when a zero value is entered (a) explicitly to the file(s) by a user, (b) as calculated by the proration process, or (c) on either side of a predetermined null datum or shift correction period. A null period is a period when no values are stored in the file(s). These null periods can be entered by the user, and are discussed in the next section.

3.8.1.4   Create Null Period in File(s)

Once a datum and/or shift file contains values, there may be a reason to create a null time period within the file.   One reason is to control the proration process.   The computation programs treat the null periods as though there are no entries available for that time period, and no corrections or shifts are applied.

If two contiguous time values in the datum or shift-correction files have datum or shift-correction values that are equal to zero (0), times between the two specified times are considered a null period.   No datum and/or shift corrections are applied to recorded or processed values during the null period. For example, in order to create a null period from the middle of the 1984 water year until the start of the 1985 water year, a zero value is entered in the datum or shift file with an associated time in the middle of the 1984 water year.   Another zero value is entered at the beginning of the 1985 water year for the same site/data descriptor combination.   In this case, no shift corrections are applied for the last half of the 1984 water year.

There is a proration between values in a file.   To avoid inaccuracies in data caused by incorrect proration from actual values and the zero values on either side of a null period, give the zero value a corresponding time that falls within the collection or storage interval for that record (e.g., 5-minute interval, 15-minute interval, 1-hour interval).   At the present time, the edit programs allow time entries to the minute.

Note also that the final value encountered in a file is applied from its corresponding time forward.   This means that the second zero value (which, in the above example, was placed at the beginning of the 1985 water year) is read and its value is carried forward using a zero shift for the following time periods.   This application of a zero shift or datum correction continues until another shut-off point (date and time) or until another actual value is encountered in the file.

3.8.1.5   Hierarchy of Shift Corrections

If there is both a shift-by-stage value (next section) and a shift-by-time value available for a given time period, the shift-by-stage value takes precedence and is used. The two shifts are not added together. There is a check for both types of shifts, and the shift by stage is automatically used in the processing when encountered. Otherwise, shift-by-time values are used.

Null periods may be created within the shift-by-stage file for further control of the shifts. During these null periods (bounded by zero-value control points), shifts by time (the other file) are applied if they are available.

3.8.2   Variable Shift Corrections

This section describes the entry and storage of variable shift corrections, and discusses the use of variable shift corrections with both time and stage.

3.8.2.1   Introduction

The application of variable shift corrections is done differently than for datum and shift-by-time corrections. These latter corrections are computed strictly on the basis of time. The general rules for applying datum and shift corrections with time are covered in the previous section. Compared to only a time basis, the variable shift corrections are computed and distributed on the basis of both stage and time.

For the application of variable shifts, data are entered to the Shift-by-Stage File in pairs (gage height and shift correc-tion) called shift-diagram descriptor points. The descriptor points are entered into the file as a set of three points along with an accompanying time. The three descriptor points define the variation of shift correction with gage height (or other input variable) at the specified time. Multiple entries of the three pairs may be made to define the stage-shift variation over time. The time associated with a set of descriptor points is often the mean time (sometimes weighted) computed for a discharge measurement made at a station, but also m̲_ ̲ʊe the time of a significant hydrologic event such as a hydrograph rise or recession. Specific information for entering datum and shift-correction data to the ADAPS files is discussed later in the manual. Shift corrections are either computed manually or by using the Shift Analysis program, which is also described later in the manual.

3.8.2.2   Discussion of Variable Shift Corrections

In general, the shift corrections represent corrections to input-computed gage heights (gage heights after time and/or datum corrections are applied) in engineering units, so that correct discharges (or other values) are obtained using the rating table in effect at the time. The rating table is a tabular matrix or computerized representation of the stage-discharge (or any paired variables) relation for a station. The shift corrections usually vary with the stage (gage height) due to the occurrence of extreme runoff events, effects of man, and/or varying hydraulic factors that change with stream depth.

As mentioned above, the three pairs of data (shift-descriptor points) define the variation of shift with stage (gage height) at a particular point in time (data are time-tagged). If the shift-descriptor points are plotted on a graph, depending upon the shape formed by connecting the three points with lines, a shape like a flat V (Vee) may be formed; therefore the plot is sometimes referred to as a Vee diagram (Kennedy, 1983). If multiple sets of data are plotted on the same graph, each having a time associated with it, a graphical representation of the application of shift by stage is seen. Figure 6 graphically illustrates the computerized shift by stage and time variation used in ADAPS. Note that ADAPS uses a constant shift above and below the stage-shift curves, rather than extrapolating in the implied direction beyond the Vee curve end points. Also note that interpolation with respect to stage and time is performed in two steps, as follows. First, interpolation with respect to time is performed between corresponding descriptor points at adjacent time. This yields an intermediate interpolated V-diagram. The variation of the shift by stage (and time) applied over periods of time is the basis for the shifting-control method of streamflow computation.

ADAPS does not have a percentage shift-by-recorded value option, as may be required to process a water-quality monitor record. However, this operation can be duplicated by using the variable shift corrections program. Three pairs of values for the particular parameter and corresponding percentage values are entered into ADAPS. The set of values (three pairs) is entered at a particular point in time (data are time-tagged). Additional sets can be entered at designated times so that processing can proceed based on the ranges of values prorated through time. These input values should cover the range of recorded values. An example of variable shift using a percentage is given later in the manual. (See sec. 8.4.10.)

Date	Time	PAIR 1		PAIR 2		PAIR 3	
		Gage Height	Shift	Gage Height	Shift	Gage Height	Shiftt
Oct 1	1200	1.40	-0.15	1.90	-0.10	2.10	-0.05
Oct 6	1200	1.15	-0.10	1.90	0	2.10	0

Curve 1 = Oct 1, 1200 hours
       2 = Oct 2, 1200 hours
       3 = Oct 3, 1200 hours
       4 = Oct 4, 1200 hours
       5 = Oct 5, 1200 hours
       6 = Oct 6, 1200 hours

Figure 6.- Shift by stage and time.

3.9   Computation of Daily Mean Values

ADAPS uses the trapezoidal method for computing daily mean
values for all parameters such as discharge or temperature. This
method is used instead of the point-intercept or increment-mean
methods (Rantz, 1982), which have both been used in the past.

The trapezoidal method is a mathematical integration (from
Calculus) of the hydrograph. Mathematical integration gives the
most accurate value of the mean parameter value, and the more
points (instantaneous values) that are used in the subdivision or
definition of the hydrograph, the more closely the subdivision
will resemble integration. Figure 7 shows how the trapezoidal
method is used to compute a daily mean value. ADAPS allows for
the storage of irregularly or evenly spaced data in time in the
Unit Values File. The processing proceeds as if all the data are
irregularly spaced. If values do not exist at the day boundaries
(previous day and current day midnights), they will be
interpolated from available data if the criteria are met. For a
missing midnight value to be interpolated, the time between the
readings adjacent to midnight must not meet or exceed the daily-
values computation abort interval. The daily-values computation
abort interval is a variable set by the user and stored in the
respective input base-gage processor record and/or auxiliary-gage
processor record in the Processor File.

O = Observed (or recorded) data point.
X = Interpolated (midnight) data point.

$$\text{Subarea } 1{:}2 = \frac{v1 + v2}{2} * dt1, \qquad \text{Subarea } 2{:}3 = \frac{v2 + v3}{2} * dt2,$$

OR

$$\text{Subarea } (n) : (n + 1) = \frac{v(n) + v(n+1)}{2} * dt(n).$$

Total area (under curve) = Summation of all subareas for the day.

Total elapsed time = Summation of all dt's; i.e., time in one day (86,400 seconds).

$$\text{Daily mean value} = \frac{\text{Total Area}}{\text{Total Elapsed Time}}$$
(86,400 seconds)

Figure 7.- Computation of daily mean value.

3.10   Primary Computations

If digital data in some form or another (e.g., from digital recorder, satellite transmitted data) are available, then input-edited unit values, information regarding datum corrections and shift adjustments, and rating tables or equations are entered into ADAPS. After this is accomplished, ADAPS programs are run to perform a Primary Computation (Kennedy, 1983). Generally, the primary computation combines all of the above information to compute a time series for a daily-values parameter/statistic (e.g., mean, maximum, minimum, total) combination. It is assumed that the data are combined and computed using consistent and proper units. The final values produced by a Primary Computation are called output-computed unit values. These values are time weighted to compute the daily mean or are searched to find the maximum and minimum, or are processed to obtain the particular results required for the particular parameters.

The printed output or listing from the Primary Computation on paper or terminal screen is called the Primary Computation sheet. The primary sheet displays the data on two halves of the sheet. In the case of a stage-discharge station, gage heights (input-computed values) and discharges (maximum, minimum, means, etc.) are displayed. In ADAPS, the Data Base Administrator has the option to select one of two kinds of Primary Computation sheets. One option produces the Standard (new) primary sheet, and the other produces the Historic primary sheet. The Historic sheet is similar to the primary sheet obtained from the WATSTORE System (Hutchison, 1977) on the mainframe computer at Headquarters. For stage-discharge stations, the Standard (new) sheet displays data on both sides of the sheet in engineering units, while the Historic displays the left side in engineering units and the right side displays input-edited dial readings. This is generally true for other computation methods, except for water-quality monitor and rainfall data, where both sides of the sheet for both kinds of primaries are usually displayed in engineering units.

There is a great deal of flexibility in ADAPS; it is possible to get DIAL readings and REAL numbers on either or both sides of the primary sheet. The Data Base Administrator must control the processing (set up the station and answer program prompts correctly) so that a proper (or desired) primary sheet is produced for the particular type of data. Because it is important to understand what is occurring, more discussion about processing with DIAL and REAL variables in relation to primary computations is presented. Some definitions used herein are given below.

Variable 1 - This is the input-edited unit values (as discussed in an earlier section). They are used by the ADAPS unit values editing and tabling programs.

Variable 2 - This is the input-computed unit values (as discussed in an earlier section).

Variable 3 - This is the output-computed unit values (as discussed earlier).

In general, when producing the new Standard primaries, variable 2 (input-computed) type data appear on the left-hand side of the primary sheet. The data are printed in accordance with whatever format (DIAL or REAL) they are stored in (usually REAL). The data that appear on the right-hand side of the primary sheet are variable 3 (output-computed) type data. These values are printed according to whatever format is stored in the Data Descriptor (DD) File; or if the DD information is missing, whatever format is stored in the Parameter Code File. This format control holds for Standard primaries for water-quality monitor, rainfall, stream discharge, and reservoir contents record computations. For ground-water well sites, there is only one type of primary sheet produced, the Historic sheet, where data on both sides of the sheet are in engineering units (real numbers). Most Historic primary sheets display variable 3 (output-computed) values as real numbers, while the format of the datum corrections and shift adjustments is governed by the format of variable 2 (input-computed). If variable 2 is in DIAL readings, and the processing information chosen from the DD entry is to display variable 2 data as DIAL, then the datum corrections are displayed as DIAL readings.

If processing, review, or data presentation requirements change, the form and/or data presented on the primary sheet may change.

The steps to process records to perform Primary Computations are included in ADAPS as menu options. Most of these options are found in the main PR Menu Option discussed later in the manual.

3.11   Final Preparation of Records

This section briefly summarizes the need for quality control in the processing of water data, final flagging of data for transfer to the mainframe national file(s), and preparation of the State data (annual) report.

3.11.1   Quality Control

In ADAPS, quality control of the processing of water data requires that a thorough review process be used during and after the computations. Data should constantly be monitored for validity. Discharge measurements, or other basic measurements, ratings, etc., should be reviewed for their mathematics, if applicable. The primary computation sheet should be used in quality checks of the original and computed data, and in further analysis of the stage-discharge relation (rating). Daily values can be plotted for comparisons with adjacent streams, and studies can be made for periods of estimated record due to ice effect, no gage-height (stage) record, or backwater from various sources.

3.11.2   Flagging of Records

Final preparation of records also consists of annually flagging the unit and daily values as FINAL after District review and approval. The data are uploaded quarterly to the Daily Values File on the mainframe computer at Headquarters when provisionally collected and processed, and after the data are complete.

When the data are final, the unit and daily values record status flags are set from PROVISIONAL to FINAL. The unit values flags are set for each day of unit values stored, and the daily values flag is set for an entire water year. If the flag for the daily values record is set to FINAL, the flags for the days of unit values in that water year are also set to FINAL. No editing or recomputation is allowed on data flagged as FINAL. In order to reallow editing or recomputation, the flags must be reset to PROVISIONAL.

In the case of recomputing data previously flagged as FINAL, the flags for all DD's involved in the recomputation must be set to PROVISIONAL. For example, if discharge is marked PROVISIONAL but its computed gage height record (if stored) is FINAL, the gage height record flag must be reset to PROVISIONAL in order to recompute discharge.

The daily-values data, both provisional and final, are routinely uploaded to the mainframe computer at Headquarters. When a water year of daily values is created or edited in ADAPS, it is automatically flagged for uploading unless a NEVER UPLOAD flag has been set. Programs are run about every 3 months (quarterly) to generate a card-image file of provisional and final daily-values water-year data that are flagged as NEEDS TO BE UPLOADED. The flags for these years are then changed to mean that the data are UPLOADED. The card-image file is then forwarded to the mainframe computer for processing by the WATSTORE daily-values input program. (See sec. 16.5.)

3.11.3   State Data Reports

After the computations of the streamflow records for a water year are completed, the records are prepared for publication in State data reports (Novak, 1985). These reports consist of an introductory text, streamflow and reservoir station records, tabulations of data at partial-record stations and at miscellaneous sites, and an index. Many pages of the report are partially or completely computer generated. The station description appears in the upper half of the page, and the daily table and footnotes (if required) appear in the lower half.

Many Districts use word processors or desktop publishing equipment and software to produce the computer-generated report pages. In this procedure, tabular data from ADAPS are merged with the descriptive information stored in the word processor or microcomputer memory. In other instances, the descriptive information is, or may be stored as, a minicomputer file. With the merging of information, a computer-generated page becomes final camera-ready copy. The camera-ready printouts may or may not be oversize. If they are oversize, they are later reduced when prep__ing the State data report.

4   ADAPS PROGRAMS AND COMOUTPUT FILES

     This section introduces the ADAPS programs and comoutput
files. The comoutput files contain the results of a terminal
session when using ADAPS.

4.1   Programs

     The ADAPS programs (and files) provide for accomplishing the
varied and necessary tasks required to operate a nationwide
computerized water data-processing system. The system is invoked
by keying the word ADAPS. The status of ADAPS programs is not
static, and they change when operational needs change.

     The succeeding sections of the manual present instructions
and information for using the startup, query, and computational
programs to accomplish the water data-processing work tasks.
These tasks are selected via ADAPS main and submenus or by giving
a program name. Discussions of the menus and programs are
presented in subsequent sections of the manual, each functionally
related group of work tasks grouped together in separate sections
and subsections. Most programs use the startup routine
(discussed in sec. 5.2) to display the common User File entries
such as last used agency code, site identifier, and data
descriptor number. Displayed entries may vary, depending upon
which program is being run. Once a task is completed, a program
can be exited or another task can be selected.

     Several programs that perform similar update (add, insert,
change, save, and delete data) and display tasks use similar
input forms to accomplish these functions. This form is
displayed on the screen, and uses single letter alphabetic
options to control page (screen) and cursor movement, and to put
the program into an "action" mode. The options are chosen to
locate the desired form page, to position the cursor to the spot
on the form where data entry is to begin, and to instigate an
action. Use of the form standardizes the data entry for those
programs that do similar tasks.

     Currently, the ADAPS programs that process unit-values data
are limited to handling 1,440 values per day (1-minute
intervals). In the following sections, other limits or maximums
are given where appropriate.

4.2   Comoutput Files

      Saving or documenting a terminal session is often useful. If
errors arise or if information is entered incorrectly, the
session information can be reviewed and possible problems solved.
In ADAPS, each user's terminal session is saved automatically in
a comoutput (COMO) file. The process of creating a COMO file is
described below.

      When the word ADAPS is keyed at the terminal, a CPL program
named ADAPS.CPL is automatically invoked. This CPL program is
stored in the directory

      WATSTORE>ADAPS>REV85.1>CMDNCO.

The program automatically obtains the user's login identifier
(name, i.e., JJJONES) and opens a COMO File that has the pathname

      WATSTORE>ADAPS>REV85.1>COMOS>name.ADAPS.COMO

where "name" is the user's login identifier. The CPL program
automatically closes the COMO file when the user leaves ADAPS.

      With each new session, the CPL program replaces the old COMO
file with a new file. Therefore, the file contains only the
results of the latest terminal session. When finished in ADAPS,
the user can attach to the "COMOS" directory (see above) and then
spool the COMO file to the terminal screen or printer. This file
is especially useful to the ADAPS Administrator if a problem
developed while running ADAPS. In this situation, it is
important to notify the Administrator and/or rename the COMO file
before reentering ADAPS. This will save the COMO file containing
the problem, while allowing the user to begin another ADAPS
session.

      As users become familiar with ADAPS, this feature may be
discontinued; particularly if the directory becomes too large due
to many users of the system, or due to long sessions (all day).

5   ADAPS STARTUP AND QUERY ROUTINES

          This section explains the ADAPS startup routine and
describes each of the available options. Explanations are
presented for each of the query options.

5.1   Introduction

          All ADAPS programs use a common set of routines to provide
an orderly and consistent method for startup of the system
programs and for handling queries. This feature gives the
programs a uniformity of processing. Every program initially
calls the startup routine and then uses a common set of routines
to handle the individual program-user queries. Since the
capabilities that these routines provide are common to all
programs, they are documented below and are not described again
in the program-specific sections discussed later in the manual.

5.2   Startup Routines

          All ADAPS programs call a startup routine that performs
several functions. When an ADAPS program is initially invoked,
the startup routine queries the user for certain information that
relates to the specific program that is to be run. Data obtained
by this action must be retained in a User File for that user. The
startup operation also opens all of the needed MIDASPLUS files.
If the ADAPS program is to run later using a batch postprocessor
program (an option in some programs), the startup routine also
creates the initial records for a Control File for use by the
postprocessor program. At times, there may be a need to edit the
records in the control file manually. Therefore, the Control
File records are described in Attachment A at the end of the
manual. In addition, a general-purpose transfer file (herein
called APTRAF) may be created by certain application post-
processor programs; these records are described in Attachment B
at the end of the manual.

          Upon subsequent entries into ADAPS, the startup routine
retrieves and displays user choices from previous ADAPS
invocations. The user makes any desired changes and continues
with the processing in the routine. The information displayed
varies from program to program, depending upon the needs of the
individual program. An example of a complete user information
display from the startup routine follows:

```
                        ADAPS TEST SITE
                      STARTUP TEST PROGRAM
DATE: 05-07-1986     USER JDOE                    TIME: 08:55:19
****************************************************************
CURRENT USER INFORMATION
PA - FILE PATH       - <PART>JDOE>NWIS
OT - OUTPUT TO       - OUTPUT TO A FILE
OT - BATCH OUTPUT    - OUTPUT TO A FILE
OF - OUTPUT FILE     - O.UV_TABLE.020.19880405.1323  <-- (See below)
OF - OUTPUT FILE     - OUTPUT TO USER-SUPPLIED FILE NAME
PL - PLOTS TO        - PLOTS TO A META FILE
PO - PLOT FILE       - PLOT.DEFAULT
TR - TAPE READER     - MITRON
-----------------------------------------------------------------
DB - DATA BASE       - ADAPS TEST DATA BASE
AG - AGENCY          - USGS    GEOLOGICAL SURVEY
ST - STATION(S)      - 12345678   TEST STATION
DA - DATA TYPE       - UNIT VALUES
DD - DATA DESCR      - INSTANTANEOUS GAGE HEIGHT IN FEET
IN - INSTRUMENT      - ADR #1 TEST FOR ADAPS
SC - STATISTIC       - 00003 MEAN
YR - PERIOD          - 1985 TO 1986 Water Years
DT - DATES           - 05-05-1986 TO 05-05-1986
BA - JOB MODE        - BATCH MODE USING A TEMPORARY CONTROL FILE
BQ - BATCH QUEUE     - NIGHT1
BF - ERROR FILE      - ERROR.DEFAULT
****************************************************************
Enter: PA,OT,OF,PL,PO,TR,DB,AG,ST,DA,DD,IN,SC,YR,DT,BA,BQ,BF to
       edit field or [CR] to continue:
```

A brief discussion of each of the options (two letters) and user information items shown in this example is given in succeeding sections of the manual. Each section is titled with the option, followed by the information item as shown in the example. Remember that this display is not shown in its entirety in every program.

5.2.1   PA - FILE PATH Option

This option queries for the pathname of the directory where the user's output and temporary work files are to be placed. The pathname must be less than 96 characters long (to allow room for a file name to be appended). The user must have DALURW access rights (Seybold, 1985, p. 3-3) to this directory.

5.2.2   OT - OUTPUT TO Option

This option queries for the output destination of a particular program's printed output. Choices are output to the user's terminal, a file, or a printer. The printers available may be attached to the user's terminal or the system. A list of the printers available on a user's GEONET (District) node is displayed.

5.2.3   OF - OUTPUT FILE Option

This option queries for the name of the file in which to place printed output if output to a file is selected via the OT option. The default is to place it in the named FILE PATH directory (see example in sec. 5.2) that is part of the ADAPS startup. In ADAPS, an output file name is automatically generated with each invocation of a program. The form of the generated name is given below.

EXECUTION_CODE.PROGRAM_ID.USER_NUMBER.YYYYMMDD.HHMM

where EXECUTION_CODE = 0 for output, E for error file;
            PROGRAM_ID = the name of the main F77 program
                         being executed;
          USER_NUMBER = an operating system assigned
                         user number;
             YYYYMMDD = execution date consisting of year;
                         month, and day,
                  HHMM = execution time of day in hours and
                         minutes.

The name can be changed to any name the user wants, but you have to change it each time you invoke a program. The stored file name is overwritten (updated) with each new invocation of a program.

5.2.4   PL - PLOTS TO Option

This option queries for the desired program graphics output destination. Choices are output to the terminal, a DISSPLA meta file, or a plotter. The available plotters may be attached to the user's terminal or they may be on an assignable AMLC line. A list of the plotters available on the user's GEONET node is displayed.

5.2.5   PO - PLOT FILE Option

This option queries for the name of the meta file in which to place plot output if output to a meta file is selected via the PL option. The default is to place it in the named PO - PLOT FILE directory that is part of the ADAPS startup (see example).

5.2.6   TR - TAPE READER Option

This option queries for the desired type of digital tape reader. A list of readers available on the user's GEONET node is displayed if more than one reader is available.

5.2.7   DB - DATA BASE Option

This option queries for the name of the desired data base. Most systems will have only one data base, but the capability is available to have several. For example, the New England District could have a separate data base for each State. A list of data bases is displayed if more than one is available.

5.2.8   AG - AGENCY Option

This option queries for the desired agency code. A list of available agency codes is displayed if the option is selected. Note that the existence of an agency in the list does not necessarily indicate the presence of data for that agency in the files.

5.2.9   ST - STATION(S) Option

This option queries for a single station identification number, or the name of an existing station/data descriptor group, or allows the user to build new groups and/or edit existing groups. Depending upon which program is to be run, groups may not be allowed.

5.2.10   DA - DATA TYPE option

This option queries for the data type. Valid data types are unit and daily values, and measurements. The data type is needed for plotting and other purposes.

5.2.11   DD - DATA DESCRIPTOR Option

This option displays a list of available data descriptors for the selected station. If more than one is available, then one must be selected. If only one is available it is selected automatically.

5.2.12   IN - INSTRUMENT Option

This option queries for an instrument. A list of available instruments for the selected station is displayed if more than one is available.

5.2.13   SC - STATISTIC Option

This option queries for a daily values statistic code. A list of available statistic codes is displayed if it is selected to do so.

5.2.14   YR - PERIOD Option

This option queries for either a single year or a beginning and ending year that defines a computational or retrieval period. It also queries the user, if the program options allow, for a begin month with which to start the annual period. If a begin month of zero (0) or blank is selected, the years are standard water years. If any other month is selected (including 10), the years are years beginning with the month and year combination. For example, if begin month is 0, year 1985 is the 1985 Water Year. If begin month is 10, year 1985 is the start of the 1986 water year (i.e., year beginning October 1985).

5.2.15   DT - DATES Option

     This option queries for either a single date (month, day,
year) or a beginning and ending date that defines a computational
or retrieval period, depending upon the program.

5.2.16   BA - JOB MODE Option

     This option queries for the job execution mode of programs
that allow either interactive or batch processing. Interactive
mode is actually the execution of a phantom process (Seybold,
1985, p. 9-2) by the program, which pauses the user's terminal
until the phantom logs out. Therefore, interactive mode should
only be used for short jobs. Selection of batch mode causes the
program to be submitted to a user-selected batch queue for
execution. If batch mode is selected, the user is queried for a
queue name. A list of queue names available on the user's GEONET
node is displayed. When this option (BA) is selected, the
startup routine builds a control file containing data obtained
from the user and/ or data retrieved from the User File. This
control file will ultimately provide needed data to the program
that will run in the batch environment.

5.2.17   BQ - BATCH QUEUE Option

     This option allows the modification of the user-selected
batch queue.

5.2.18   BF - ERROR FILE Option

     This option queries for the name of the file in which to
place error reports generated by the batch mode program(s). The
default is to place them in the named BF - ERROR FILE directory
that is part of the ADAPS startup (see example).

5.3   Query Routines

        User interaction in ADAPS programs is handled by a set of
query routines that use common commands. Since these commands
are common to all queries, they are usually not repeated when the
prompts are displayed. In addition to the answer to a prompt,
most queries can be answered with the following partial or full
word.

        For HELP: HE, HEL, or HELP.
        For OOPS: OO, OOP, or OOPS.
        For QUIT: QU or QUIT.
        For EXIT: EX or EXIT.

Each of these answers (the associated routine), and an additional
command to execute a PRIMOS command from within an ADAPS program,
are discussed below.

5.3.1   HELP Routine

        The HELP answer displays a short message giving further
information about appropriate responses to queries. If no help
is available for the query, the message "Sorry, no help
available" is displayed.

5.3.2   OOPS Routine

        The OOPS answer, in many cases, returns the user to either
the previous query, or to some other query that was previously
displayed, thus allowing the user to reanswer a prompt if there
is an erroneous response. If backing up from the current query
is not possible, the message "Sorry, OOPS is not available" is
displayed.

5.3.3   QUIT Routine

        The QUIT answer immediately ends program execution, possibly
leaving edited data unsaved, and returns the user to the menu
that invoked the program.

5.3.4   EXIT Routine

     The EXIT answer immediately ends program execution, possibly
leaving edited data unsaved, and returns the user to PRIMOS
level.

5.3.5   Execute a PRIMOS Command Routine

     An additional query routine provides for execution of a
PRIMOS command from within an ADAPS program. The command is
formed by an exclamation point and a space (!) followed by the
PRIMOS command and its options (up to 160 characters long).
Entry of "! Command," where Command is the PRIMOS command and any
of its options, causes the command to execute. When the command
invocation is complete, the query routine redisplays the prompt
for an answer.

     PRIMOS commands are executed in one of two ways: (1) "safe"
commands, those which will not cause ADAPS to abnormally
terminate (crash), are executed immediately as interactive
commands; and (2) other commands are executed by PRIMOS phantom
processes with the output captured in a comoutput (COMO) file.
The contents of the COMO file are displayed after the phantom
logs out. The current "safe" commands are:

               LD
               STAT
               MESSAGE (or M)
               DELETE
               TYPE
               JOB
               ASSIGN (or AS)
               UNASSIGN (or UN)
               EMACS

NOTE: If you use EMACS and then execute another PRIMOS command
from within EMACS, you may cause ADAPS to end abnormally.

6   ADAPS MENUS AND PROGRAMS

     This section describes the generalized ADAPS menu system and
associated programs. The system is generalized in that once in
ADAPS, the user can perform work tasks either by (1) following a
group of two-letter main menu options and associated selections,
or (2) by entering the name of the main program that drives or
performs the desired task. This section covers the main menu-
associated submenu and program selection operations, and use of
the menus to get directly to a desired task. In addition, the
functional categories of tasks that are accessible from the menus
are listed, as well as the section in the manual where that
functional category is described.

     The steps for processing station records are presented in
Attachment C of the manual. The processing steps primarily
involve the use of the "data input," "primary processing," and
"data display" operations described in succeeding sections.

6.1   Introduction

     The water data-processing system is primarily menu-driven.
The menus are invoked interactively, are easy to use, and they
offer appropriate options by which to process water data.

     The ADAPS menus consist of a main menu and associated
submenus. The main menu has options for selecting a desired work
category. Each option (category) has submenu options for
selecting specific work tasks. Once a specific submenu option is
selected and a program is invoked, further options in menu or
question form are displayed. These later options are from
individual task-specific processing programs. The processing
proceeds interactively, and, in some instances, may be completed
later as a phantom job (no terminal communication required) in
batch mode.

     The menus are accessible simply by entering the word ADAPS
if the word is stored as a PRIMOS command (Calvillo, 1985) in a
command partition. If the word is not stored as a command, then
enter R WATSTORE>ADAPS>REV85.1>CMDNCO>ADAPS. In the main menu,
the user selects one of several two-letter alphabetic options,
and in the submenus, the user selects 1- or 2-digit numeric
options. The main and submenus are interconnected so that the
user can move from submenu to submenu or from submenu to main
menu, etc., rather than having to return to the main menu and

proceeding from there. Once a data-processing step has been
completed, control usually returns to the menu, and the user can
select another option. Menu options that provide for movement
within the menus and for exiting from the menu are clearly
indicated.

A particular submenu option may be repeated in another
menu as a convenience feature; an example is the option to
produce a daily-values table. Repeating the option in different
menus saves the user from having to move from the current menu to
another in order to obtain a table, thereby saving time while
doing a particular task.

Another feature allows the user to select tasks by enter-
ing the name of the program, rather than invoking the program via
the submenu option. The program name is keyed in from the main
menu or from any of the submenus; even from a submenu that the
desired option does not appear in. A list of all program names
and a brief description of each program/function is displayed by
keying "PGM" followed by a <CR>.

An online description for each main menu's or program's
options and functions is displayed by entering either "DOC nn",
where nn is the 1- or 2-character menu option, or by entering
"DOC xxxx" where xxxx is the program name.

The system allows you to proceed directly to the desired
processing task without having to wait for the menus to display
and then make a selection. This is accomplished by keying
"ADAPS" followed by either the desired main menu and submenu
options (each separated by a blank), or by the program name. For
example, to go directly to the primary processing program from
PRIMOS, you could key in either "ADAPS PR 10" or "ADAPS PRIMARY"
(assuming that the primary processing program is PR submenu
option 10). You also can go directly to the primary processing
submenu by keying "ADAPS PR". You also can stop after the PR.
An additional feature, invoked by keying "-NM" for No Menus (an
example is "ADAPS PR 10 -NM" or even "ADAPS -NM"), suppresses the
displays of the menu(s) and puts you directly into the desired
data-processing program with its own menus or questions.

After you are familiar with the menus and with routine processing, use of the above features speeds up the processing. These features also can be used in a user's abbreviation file (Seybold, 1985, p. 4-5) to save time for accomplishing such repetitive tasks as translating paper tapes. The abbreviation file will contain the statement "ADAPS PR 10 -NM" or "ADAPS TP_READ -NM".

All users do not see all menu options displayed on their terminal screens. ADAPS has four levels of user access: System Administrator (SYST), ADAPS Data Base Administrator (ADBA), User (USER), and Cooperator (COOP). SYST-level users see all options. ADBA-level users see all options except for those related to such PRIMOS functions as MIDAS file creation and maintenance, and starting and stopping the Satellite processing phantom. USER-level users see options related to records processing and data retrieval. COOP-level users only see options for retrieval of data.

Capabilities are provided to allow District ADAPS System Administrators to change the ADAPS access levels (SYST, ADBA, USER, or COOP) of the ADAPS programs, thereby tailoring the ADAPS system to a particular District's needs. If Districts change the access levels, the numbering of submenu options may differ from District to District, and possibly from user access level to user access level within a District. Adding programs to the ADAPS menu system and the user-access files are discussed in the ADAPS Administrator's Manual.

Since the task selections (submenus) under the main menu may vary from District to District, they are not presented here. The emphasis in this manual is to refer to the different work tasks by main computer program name, rather than by two-letter main menu and numeric submenu options. Therefore, in the following sections, descriptions of the ADAPS programs (submenu options) are presented by functional category. Attachment D of this manual contains the default ADAPS menu and submenus arrangement.

NOTE: Many programs create control files, output files, and error files in the user's origin directory; it is up to the user to manage (keep or delete) these files.

6.2   Functional Categories

Sections 7 through 16 of this manual contain documentation for the various ADAPS programs arranged by functional category. All access-level programs, except SYST and ADBA, are presented in this manual; SYST and ADBA access-level programs are described in the ADAPS Administrator's Manual. The functional category and a brief description of each is given below.

```
FUNCTIONAL
   CATEGORY              DESCRIPTION                      SECTION

DATA INPUT ------------Enter data into the system .......... 7
PRIMARY PROCESSING --- Primary processing of data .......... 8
DATA DISPLAY --------- Display and print of DV/UV data ..... 9
DATA RETRIEVAL ------- Retrieve and write ADAPS data .......10
APPLICATIONS --------- Application programs ................11
HYDROLOGIC UTILITIES - Primary processing support ..........12
SYSTEM UTILITIES ----- Miscellaneous functions ............13
DOCUMENTATION -------- Display and print documentation .....14
SATELLITE OPERATIONS - Processing satellite relay data .....15
SUPPORT FUNCTIONS ---- Updating support files, setting
                          flags, and uploading ..............16
```

Program names, a task description, and a task description section reference are given within the discussion of each section. Note that either the program name given or a numeric submenu option can be entered to select or perform a particular task.

7   DATA INPUT

     This section presents the programs that are used to input
water data into ADAPS unit- and daily-values files and
Measurement File.

          PROGRAM
          NAME   TASK DESCRIPTION   SECTION

          TP_READ ----- Translate new data 7.1
          CD_READ ----- Process ADR card-image data 7.2
          TP_EDIT ----- Edit and store translated data 7.3
          UV_STORE ---- Process unit-values card-image data ... 7.4
          MS_EDIT ----- Update/display measurements 7.5
          DV_STORE ---- Process daily-values card-image data .. 7.6
          DRFILES ----- Review/delete digital tape
                        temporary files 7.7
          STD_STOR ---- Process WRD standard input data 7.8
          UV_ENTER ---- Unit-values entry/edit 7.9

     These programs provide for the initial input of data by
translating digital recorder paper tapes and processing card-
image data stored on disk in several different formats. The data
can subsequently be edited for correctness and stored for further
processing. Also, discharge measurements (and gage inspection
data) can be entered, updated, and displayed.

7.1   Translate New Data

     The TP_READ program is used to translate new data. If the
common User File entries of agency, site identifier, or
instrument identification are missing, the user is queried for
the appropriate values. Next, a list of the files located in the
temporary directory is shown, and a request is made to take
appropriate action.

     The user is queried for the start and end dates and times of
the record to be translated from digital tapes. Up to 20,000
punch values can be translated from one tape. During the trans-
lation, the tape reader will stop on a punch value of zero. A
number of default missing values may be inserted or processing
can be terminated. At the end of each translation, the user has
the option to: translate another tape, switch to the display of
User File entries to change sites, or exit the program.

7.2   Process ADR Card-Image Data

The CD_READ program is used to translate ADR card-image (80-column) unit-values data into a temporary ADAPS file. These ADR card images must be of the same format as the input records created by the Amdahl WATSTORE Program H595 (Hutchinson and others, 1977, vol. 5, chap. I, sec. B). The ADAPS temporary file of this translated ADR card-image data can then be time-checked, screened/verified, and stored in the ADAPS Unit-Values File by using the TP_EDIT program, explained in section 7.3. Once the "card-image" data have been stored in the ADAPS Unit-Values File, the data can be used to process/compute records (PRIMARY).

7.2.1   Program Operation

Begin the program by entering the program name, CD_READ, or by using the default menu option PR 2. The startup program then prompts or displays the site information consisting of: agency, station number, and instrument number. The user must have already entered an Instrument and a Data Descriptor (DD) record for this site.

After verifying or changing the startup information, a query follows to supply the complete or partial pathname of the file that contains the ADR card-image data. Up to 20,000 values that come from card-image input can be processed. This means up to 833 days of hourly values (24 readings per day) or 69 days of 5-minute values (288 readings per day) can be processed.

Before the ADR card-image data are stored in an ADAPS temporary file, the station number in the card-image field is checked against what the user has entered in the startup menu. If the station numbers are different, the user can override what is in the card field with the station number selected in the startup menu. Next, the ADR "tape" translation instructions are displayed. At this time the user can override the following instructions:

Readings per Day
Starting Tape Date and Time
Ending Tape Date and Ti.
Ending Watch Date and Time

The user will also have a chance to edit this information when running TP_EDIT, the tape editing program.

Next, the ADR card-formatted file is copied to a temporary file with a file name of

DR.xxxxxxxx.iiii.yymmdd

where xxxxxxxx = the site identification number,
         iiii = the instrument number, and
       yymmdd = the starting tape year, month
                and day.

Once the ADR temporary card file is created, the user can process another card file or exit from the program. To store the temporary file data in the ADAPS Unit-Values File, the user must perform the time check and verification of the data using the TP_EDIT program or option PR 3, explained in section 7.3. The format of the input ADR card images is described in the next section (7.2.2).

7.2.2   Format of the Input ADR Card Images:

        The following format is a duplication of the information
found in Volume 5 of the WATSTORE manuals and also contains notes
on how ADAPS interprets the fields on the input card-image
records created by the Amdahl WATSTORE Program H595. The first
card identifies the record in the same manner as the translation
block identifies a regular digital recorder record. The
identification (card columns 1-44) is coded as follows:

              Station Number   rrrxxxxxxxx
                                (character positions 1-11)

           where rrr = Number of readings per day per item;
                       a 3-digit number 024, 048, 096, 240,
                       or 288. If the readings per day are
                       over 3 digits, i.e., 1440, you can
                       code any 3-digit number in this
                       field; however, you must remember to
                       override this value before you edit
                       and store these data into ADAPS.
                       You will have a chance to do this in
                       two places: (1) before you store
                       the card images in the ADAPS
                       temporary file, or (2) during the
                       interactive execution of TP_EDIT.

           xxxxxxxx = Station number. Least significant 8
                       digits of the standard 15-digit
                       station iaentification number. If
                       the downstream order number is used,
                       the standard 8-digit number will
                       fill this space. If latitude and
                       longitude are used for station
                       identification, then the 8 digits
                       used are the lower 2 digits of
                       degrees of longitude, 2 digits of
                       minutes of longitude, 2 digits of
                       seconds of longitude, and the 2
                       digits of sequence number. This
                       abbreviated number is use·' for
                       convenience only.

        The ADAPS CD_READ program allows the user to override the
station number in this card field when entering the data into the
ADAPS temporary file.

Starting Tape Time   iyymmddtttt
                       (character positions 12-22)

where   i = Number of items per punch interval;
             a 1-digit number. Use zero for QW-
             monitor 10-item data. For QW-
             monitor data with 1-9 items use
             actual number of items punched per
             interval.

             For multiple-item gate-opening data,
             this value is the first digit (tens
             digit) of a 2-digit number. ADAPS
             ignores this field and gets the
             necessary information for the number
             of channels on the QW monitor record
             from the ADAPS Instrument record.

        yy = Calendar year, last 2 digits.

        mm = Calendar month, 2 digits.

        dd = Day of month, 2 digits.

      tttt = Time of day (24-hour time) of first
             punch on tape (tape time), 4 digits.
             Use local standard time even when
             time is advanced 1 hour in the
             summer months.

Ending Tape Time   gyymmddtttt
                     (character positions 23-33)

where g is,

0 = Stage record on a separate digital recorder tape.

1 = Auxiliary record for slope station, or deflection record on a separate digital recorder tape.

2 = For slope stations, this record is for the base gage not followed by a corresponding record for the auxiliary gage, or stage and deflection record as sets of readings on the same digital recorder tape with the stage record the first of the two items.

3 = Stage and deflection record as sets of readings on the same digital recorder tape with the deflection record the first of the two items.

4 = Digital monitor record.

ADAPS ignores this field and gets the necessary information from the ADAPS Instrument record(s).

The remaining letters have the same meaning as above except date and time are as indicated by the last punch on the 16-channel tape.

Ending Watch Time   hyymmddtttt
                      (character positions 34-44)

        where h is the second digit (units digit) of a
2-digit number indicating the number of items on
the paper tape for multiple-gate opening data.
ADAPS ignores this field and gets the necessary
information from the ADAPS Instrument record.

        The time is the watch time at the time of the
last punch. If the tape is removed between
punches, the ending watch time is equal to the
ending tape time, plus or minus the difference
between watch time and recorder clock time.

        The remaining letters have the same meaning as
above except date and time are the watch time
when the record ends.

Columns 73-80 contain the card sequence number and are
ignored by ADAPS.

    The remaining cards consist of 18 fields of 4 digits each,
and a sequence number in columns 73-80. Any blank data fields
are interpreted as missing punches. The user will have a chance
to edit the missing punch fields when performing the next
processing step, TP_EDIT. The sequence number may be used to
identify the cards, though ADAPS ignores columns 73-80 when
reading the data.

7.3   Edit and Store Translated Data

The TP_EDIT program is used to edit, screen, and store translated unit-values data. Editing tests available are described.

7.3.1   Introduction

The temporary files created by use of either program described in the previous two sections are processed by this program. Once the startup routine is completed, the user can view, edit, time correct, verify, print the data, and store the data in the Unit Values File for further processing. Up to 20,000 values, including time corrections, can be processed in the edit/store operation.

There are nine options available in the program. A list of these options is as follows:

    1 - Time-adjust test.
    2 - Verification test.
    3 - Edit punch values.
    4 - Print punch values.
    5 - Create ADR cards.
    6 - Store unit values.
    7 - Restart program.
   98 - Exit to ADAPS main menu level.
   99 - Exit to PRIMOS level.

Brief descriptions of the first seven options are presented in the following sections in the order listed above.

7.3.2   Time-Adjust Test

This option is used to compute the date-time tag for the last value in the input data set and to compare it to the ending watch time entered when the data were translated. If the two times are different, the recorded times are corrected to ensure that timing of the data values is correct.

Time corrections can be done in either of two ways. The first is called a standard time correction, and the second is the historical time correction. Each is discussed separately.

The standard time correction uses the actual elapsed watch time of the record and the number of values contained in the record. This method computes the real elapsed time per data value, and corrects the date-time tags stored with each data value. No data values are added or deleted from the record. Use of this method does not affect the original recorded values, therefore the user can readily recompute if it is necessary to do so.

The historical time correction adds or removes data values from the record to maintain a fixed time interval between readings and still have the data record end at the correct date and time. This method is used in the mainframe computer data-processing system (WATSTORE).

7.3.3   Verification Test

The verification test option is used to check the data record for extreme, unusual, and error conditions. The testing process presently tests three cases and uses verification thresholds that are stored in the Instrument File. An additional "stuck instrument" test is planned, and is not available in this release. Stored test threshold values are displayed and may be changed prior to the actual testing. Values that fail the threshold tests are flagged and can be highlighted during the editing process. The cases and the type of failure conditions that may cause a value to be flagged are given below. An abbreviation for the condition is shown in parenthesis after the condition. The abbreviation may appear (vertically) in some of the screen displays.

1. For a single reading:

   - Very high value (VHI).
   - High value (HI).
   - Low value (LO).
   - Very low value (VLO).

2. For the difference from the previous reading:

   - Test difference (DIF).

3. For the rate of change from the previous
   to the current reading:

● Very rapid increase (VRI).
● Rapid increase (RI).
● Rapid decrease (RD).
● Very rapid decrease (VRD).

Note that for items 2 and 3, test values must be stored (in Instrument File) in the proper units for the kind of data being tested. For item 2, the test difference is units per reading or per punch.

7.3.4   Edit Punch Values

This option is used to add, change, or delete punch data values. The option is useful for viewing the data and changes should be made with discretion.

The edit option displays 15 sets of values with the current set that is being edited centered on the screen. A set of values consists of the readings for all of the channels (sensors) for a given date and time. Editing is performed by entering a single option character followed by a carriage return (shown as <CR> or [CR]), or just a carriage return. If required by the selected option, the user enters the necessary startup information. The available options, their meanings, and the subsequent actions taken by each of them are given below:

<CR>	- Next screen	- Displays the next 15 sets.
P	- Previous screen	- Displays the previous 15 sets.
T	- Top of file	- Displays the first 15 sets.
B	- Bottom of file	- Displays the last 15 sets.
G	- Go to set	- Displays the selected set centered.
C	- Change punch	- Replaces the selected reading with the user-supplied value.
I	- Insert punch	- Inserts a user-supplied value.
D	- Delete punch	- Deletes the selected value.
K	- Change digit	- Replaces a selected digit in a range of values with a user-supplied digit.
A	- Add constant	- Adds constant (+ or -) to a set of values.
R	- Set highlight	- Highlights values that exceed screening thresholds.
N	- Next highlight	- Centers next highlighted value in editing screen.
Z	- Done editing	- Exits this option.

7.3.5   Print Punch Values

     This option is used to print a table of punch-data values,
the times, and the verification test results for selected data
values.

7.3.6   Create ADR Cards

     This option is used to write the unit-values data to a file
in ADR card-image (80 columns) format (see Section 7.2) suitable
for transfer to the mainframe computer or to other minicomputers.

7.3.7   Store Unit Values

     This option is used to store the data values and their times
in the Unit Values File. Data cannot be stored unless they have
first been time-adjusted and verified. If the unit data are
reprocessed and flagged as FINAL (see sec. 3.11.1), then they
cannot be overwritten.

7.3.8   Restart Program

     This option is used to return the user to the initial
startup level. This allows for making changes in startup options
to process another digital tape without having to restart the
program from scratch.

7.4   Process Unit Values Card-Image Data

The UV_STORE program is used to store unit-values data obtained from the mainframe system in the ADAPS Unit Values File. The data are processed in an 80-column card-image format. This section explains the options and how the program runs.

Information on how to obtain unit-values card-image data is given in Attachment E of this manual.

7.4.1   Introduction

The unit values for a day constitute a record in the Unit-Values File. The data may have been retrieved from the mainframe computer at Headquarters in card-image form. The program also allows for processing unit-values data that have been recorded by a recording device such as a digital punch recorder and processed externally (as on a personal computer); these data are formed into a card-image file that is the same as one obtained from the mainframe computer. The retrieved or formed data must be formatted as WATSTORE (Hutchison, 1977) type-2 and type-B 80-column card data. The type-2 card (record) contains the station identifier (ID), parameter code, and statistic code. The type-B card contains the unit-values dates, times of first reading on the card, number of readings per day (rpd), and data (six values per card). The program runs even if other types of WATSTORE cards (e.g., Z, H, N) are encountered in the retrieved file. The program processes multiple stations and parameter codes.

The agency code is defaulted to USGS in the program. However, the agency code is replaced by the agency code from a type-Z card (record) if the type-Z, H, N, (station header) cards are retrieved along with the type-2 and B cards from the mainframe computer. Descriptions of these types of cards are presented in Sections 10.1.3 and 10.2.3.

7.4.2   Program Operation

     This interactive program (option) goes through the startup
routine and prompts for the input unit-values card file name.
This is the name of the input file on the minicomputer that
contains the type-2 and type-B card data retrieved from the
mainframe computer or formed otherwise. A display of three
program options with suboptions are presented, and the user can
change any or all of the options. The options and suboptions are
discussed below.

● Option 1 is the ADD/MERGE/REPLACE option.

     ADD ONLY NEW DAYS: This option only adds a day if it is not
     currently in the Unit-Values File.

     ADD/REPLACE EXISTING DAYS: This option adds days that do not
     currently exist in the Unit-Values File, and replaces
     existing days with the available data from the card-image
     file.

     ADD/REPLACE EXISTING DAYS, MERGE FIRST AND LAST DAYS: This
     option is the default, adds days that do not currently
     exist in the Unit-Values File, and replaces days that do
     exist with the available data from the card-image file,
     except for the two cases involving the first and last day of
     card data input. For the first day of card data for a
     station/parameter code combination, all data in the Unit-
     Values File are kept that occur before the first time of the
     data in the card file. For the last day of card data for a
     station/parameter code combination, all data in the Unit-
     Values File are kept that occur after the last time of the
     data in the card file. Therefore, the first and last day's
     data are merged if both exist.

     ADD/MERGE EXISTING DAYS, NEW VALUES OVERRIDE OLD: This
     option adds days that do not currently exist in the Unit-
     Values File, and merges the available data in the card-image
     file with the existing unit-values data. For any duplicate
     times, new values from the card file will overwrite the
     existing values in the Unit-Values File.

     ADD/MERGE EXISTING DAYS, OLD VALUES OVERRIDE NEW: This
     option adds days that do not currently exist in the Unit-
     Values File, and merges the available data from the card-
     image file with the existing unit-values data. For any

duplicate times, the old (existing) values in the Unit-Values File take precedence over any new values from the card file.

● Option 2 is the TYPE OF UNIT VALUES option. The user must select the type of data being transferred and then processed for storage in the Unit-Values File. The two choices are:

Edited Unit Values: This option is the <u>default</u>. These data are from a recording device such as digital recorder punched data that are already edited, i.e., already have time corrections applied.

Computed Unit Values: These data have been previously computed or processed such as discharge, rain-fall, and in some instances stages (with or without decimal points, depending on whether they are dial or real values). See NOTE after Option 4 at the end of this section.

● Option 3 is the UNIT VALUES FLAG option. The flag may be appended to each and every unit value. The flag primarily indicates the source of the unit values or where it originated. The flags are listed below.

NONE - This option is the <u>default</u>. No flag is appended to the new unit values.

VALUE EDITED BY USGS PERSONNEL - Values that were edited or created manually.

FIELD OBSERVATIONS - Values observed in the field.

ADR - Data recorded by 16-channel paper tape recorders.

DCP - Data transmitted by DCP through satellite relay operations.

ELECTRONIC DATA LOGGER - Data recorded by data loggers, such as CR-21.

● Option 4 is the DATA CONVERSION option. The user has the choice to set to no conversion, or to multiply each UV by 100 (i.e., to convert REAL units back to DIAL readings).

If there is a change in the input station ID or parameter code during processing, the program pauses and prompts for a new data descriptor (DD) selection; therefore, there must be DD's for all data that are to be processed. After the DD selection is made, the program continues to process the card data. During processing, the program displays the station and parameter.

When card processing is finished, the program summarizes the processing by listing counts (tallies) of total cards (records) processed and unit-values records written to the Unit-Values File on the minicomputer. A count of records not written to the file is also given. If any errors are encountered during processing, an entry is made to an error file; the user is queried on whether or not to view the error file. This error file resides in the user's origin directory, and the file name is displayed to the user.

NOTE: If using the unit-values card data to compute other records in ADAPS (i.e., unit stage to compute discharge), select the data type (option 2) as edited. If converting the units back to the integer dial readings (multiplies data by 100), select option 4. This, along with two other aspects of ADAPS Unit Values handling, are important considerations. If adding data to a DD previously set up with a processor record and any rating and datum records, subsequent computations using your new UV data entered by cards will use these support data. Unit values computations of gage height to compute discharge use the following process (as outlined in sec. 3.5.2.3, Stage Discharge):

Edited UV's   ----> converted to feet if type 0 rating found
+ base datum correction stored in the gage height DD/processor
  record
+ datum correction
= computed UV

If your UV cards have the base datum and datum corrections already applied (as is the case if the cards came from the Prime Rev84.1 ADR System), take appropriate action via the datum correction record for this DD. Consider the following example: Your UV cards have a base datum of -0.02 feet and a datum of -0.01 feet applied for the period of record in question. In ADAPS you have already set up (1) an existing DD, (2) a processor record with a base datum correction of -0.02 feet, (3) a type 0 rating to convert DIAL reading to feet by multiplying the data by 0.01, and (4) datum corrections prorating during the time period.

To merge this UV card data into your existing edited UV file for this DD, do the following:

1. Load the UV card images in as type Edited (Option 2)
    and convert the REAL units back to DIAL units using
    Option 4 - multiply values by 100.

2. Go into your datum correction file for that DD and
    water year and stop the proration of the datum
    corrections just prior (1 minute) to the first reading
    of your UV card data.

3. Create a constant value datum correction during the UV
    card data time period to "add back" the base datum
    correction of +0.02 feet.

4. Turn the datum correction proration "back on" using
    the appropriate values for a time 1 minute after the
    last reading of the UV card data.

7.5   Update/Display Measurements

The MS_EDIT program allows the user to update and display measurements. Gaging station inspection data are also processed using this program.

7.5.1   Introduction

This program allows the user to enter, update, delete, list, and retrieve/print discharge measurement data, crest-stage gage (CSG) inspection data, and gaging station inspection data. Once discharge measurement data are stored for a surface-water site, this data can be utilized by the shift-analysis program to perform a preliminary stage-discharge rating shift analysis.

The program has menu options that appear on the screen. The available options are:

    0 - Change setup specifications.
    1 - Enter measurement/inspection data.
    2 - Update measurement/inspection data.
    3 - Delete measurement/inspection data.
    4 - List measurement/inspection data.
    5 - Retrieve/print measurement/inspection data.

Each of these options is described in the following sections of the manual.

7.5.2   Change Setup Specifications

This option restarts the program and allows the user to change information such as station ID, pathnames, and output medium.

7.5.3   Enter Measurement/Inspection Data

This option allows the user to enter new discharg' measurement data, CSG inspection data, or gaging station inspection data for a surface-water site. A list of variables that can be entered are as follows:

1 - The most recent measurement number/data entered is displayed if any measurements have been previously stored for the current station. Enter either the new measurement number to be stored, C for a CSG inspection, G for a gage inspection, or <CR> to return to the program menu level. A valid measurement number can range from 1 to 99997, and can have a single uppercase letter (A to Z) at the end. For example, 12, 456A, and 99995Z are all valid measurement numbers. Note that for a single station, exact duplicate numbers are not allowed. Therefore, 10A and 10B are considered different measurement numbers by the program. If a duplicate measurement number is accidentally entered, an error message appears.

2 - Enter the measurement/inspection date as MM/DD/YY (month/day/year). For a single station, only one entry of CSG or gaging station inspection data can be stored for a given date. However, there is no limit to the number of discharge measurements that can be stored for the same date. If a duplicate CSG or gaging station inspection date is accidentally entered, an error message appears.

3 - If known, enter the starting time the measurement was made as HHMM (hours and minutes). This value is used in conjunction with change in time of gage height (item 19 listed below) in some programs to plot time of measurement.

4 - Enter the field party (one or two people) using initials as Initials/Initials. For each person's initials, enter up to three letters. Blanks are acceptable for one person's initials. For two people, enter the first set of initials, a slash (/), then the second set of initials. Note that a slash is the only acceptable delimiter when entering two separate initials.

Enter all remaining discharge measurement data (variables 5-25 and 29 below). If entering a gaging station inspection, only those variables marked with an asterisk (*) are stored. If entering a CSG inspection, enter variables 26-29. In order to skip a specific variable, press the carriage return in response to the prompt. In order to enter a zero (0) value for certain variables (8, 9, 10, 11, 15, 18, 21, 22, 26, 27), a zero must actually be entered before pressing the carriage return.

Variables (continued)

```
        5 - Channel width (ft).
        6 - Cross-sectional area (sq ft).
        7 - Mean velocity (ft/sec).
    *   8 - Inside gage height (ft).
    *   9 - Outside gage height (ft).
       10 - First discharge (cfs).
       11 - Second (adjusted) discharge (cfs).
       12 - First discharge description code.
       13 - Second discharge description code.
       14 - Current rating in use.
       15 - Percent difference from current rating.
       16 - Applied shift adjustment (ft).
       17 - Number of sections measured.
       18 - Change (ft) in gage height (stage).
       19 - Change (hours) in gage height (stage).
       20 - Measurement rated as excellent (E),
            good (G), fair (F), or poor (P).
    *  21 - Air temperature (degrees).
    *  22 - Water temperature (degrees).
       23 - Base flow code (1 = No, 2 = Yes).
    *  24 - Control condition code.
       25 - Measurement type code.
       26 - Upstream CSG reading (-888 = No mark) (ft).
       27 - Downstream CSG reading (-888 = No mark) (ft).
       28 - Staff or reference point reading (ft).
       29 - Remarks (0-100 characters).
```

When new CSG data (variables 26-29) are entered to the file, the upstream and downstream pin elevations that are currently stored in the Site File are stored along with the input CSG inspection data for later use.

Table 1 is a list of minimum, maximum, and missing values used for measurement/inspection data.

Table 1.--Minimum, maximum, and missing measurement/inspection
         file values

VARIABLE	MINIMUM	MAXIMUM	MISSING
* 1	1	99997	Blank
2	01/01	12/31	Blank
3	0000	2400	Blank
4	--	--	Blank
5	0	99999	0
6	0	99999	0
7	0	99	0
8	-99.99	99.99	-999
9	-99.99	99.99	-999
10	-99999	999999	-999
11	-99999	999999	-999
12	0	8	0
13	0	8	0
14	1	99.9	0
15	-999	999	999
16	-99.99	-99.99	0
17	0	999	0
18	-99.99	99.99	-999
19	0	24	0
20	--	--	Blank
21	-99	150	-999
22	-99	150	-999
23	1	2	Blank
24	0	7	0
25	0	10	0
26	-888	99.99	-999
27	-888	99.99	-999
28	0	99.99	-999
29	--	--	Blank

* Letters A-Z allowed after measurement numbers; also single
  letters C or G are allowed to be entered.

     Once all appropriate data are entered, the user can correct
any error by entering the variable number to be updated. See the
following restrictions concerning updating discharge measurement
numbers and CSG inspection or gaging station inspection dates.
Entering the number 99 returns the user to the program menu
level.

7.5.4   Update Measurement/Inspection Data

This option updates any previously stored discharge measurement, CSG inspection data, or gaging station inspection data.

Enter either the discharge measurement number to be updated, C for a CSG inspection, G for a gaging station inspection, or a -9 to return to the program menu level. If the measurement number to be updated does not exist for the station, an error message is displayed.

If CSG or gaging inspection data are to be updated, enter the date of the inspection as MM/DD/YY. If the inspection to be updated does not exist for the station, an error message is displayed.

The information currently stored for the selected measurement or inspection is displayed. Enter either the variable number to be updated or a 99 to return to the program menu level. If a CSG inspection is selected for updating, the program checks to see if the current upstream and/or downstream pin elevations stored for the inspection differ from the pin elevations stored in the Site File before exiting back to the program menu level. If they differ, the user can update the CSG inspection pin elevations to agree with those in the Site File.

When updating the measurement number (variable 1 above), be sure that the new number does not match an existing number stored for the station. If the numbers match, an error message is displayed. The same applies when updating a CSG or gage inspection date. Also, it is illegal to change discharge measurement to CSG inspection or gaging station inspection data, or vice versa, by updating variable 1.

7.5.5   Delete Measurement/Inspection Data

        This option deletes any previously stored discharge measurement, CSG inspection data, or gaging station inspection data.

        Enter either the discharge measurement number to be deleted, C for a CSG inspection, G for a gage inspection, or -9 to return to the program menu level. If the measurement number to be deleted does not exist for the station, an error message is displayed.

        If a CSG or gage inspection is to be deleted, enter the date of the inspection as MM/DD/YY. If the inspection to be deleted does not exist for the station, an error message is displayed.

        Once the selected measurement or inspection data have been deleted from the file, the user can delete another measurement or inspection entry, or return to the program menu level.

7.5.6   List Measurement/Inspection Data

        This option prints a summary of all discharge measurement, CSG inspection data, and gaging station inspection data stored for a single station or for a group of stations. This summary can be printed on a line printer or at a terminal. After all printing/display is finished, the user is returned to the program menu level.

7.5.7   Retrieve/Print Measurement/Inspection Data

        This option retrieves and prints discharge measurement, CSG inspection data, and gaging station inspection data in a tabular format, either on a line printer or a terminal. The user can retrieve/print data for a single station or for a group of stations. Following is a list of steps to retrieve/print data:

        1.   Enter data type (1 = Discharge measurement/gaging station inspection, 2 = CSG inspection, 3 = Both types).

2.   Enter a starting 4-digit water year.   If a water year is not specified, data retrieval is not based upon water year and steps 3 and 4 below are bypassed.   If an 8888 is entered, all stored information for the selected data type(s) is retrieved, and steps 3-6 are bypassed.

3.   Enter an ending 4-digit water year.   If not specified, it will match the starting water year.

4.   Choose whether or not data retrieved for a given water year should also include any data stored within 3 months of the end of the water year (July to September of the previous water year, or October to December of the succeeding water year).

5.   If discharge measurement data are being retrieved, enter minimum and maximum measurement numbers, separated by a comma. If not specified, the data retrieval is not based on a minimum and maximum measurement number range.

6.   Enter the minimum discharge value (cfs) to be retrieved. If not specified, the data retrieval is not based on a minimum discharge value.

7.   Two report formats are available: A relatively long format which includes all the fields stored for a particular measurement, and a shorter format which includes the fields as recorded on Form 9-207.   Enter choice of format at this time. Also, an option is provided to omit gage inspections from the report.

8.   If a multiple station retrieval is selected, wait while the program searches the Site File to find the stations that satisfy the retrieval specifications.   If no stations are retrieved, an error message is displayed.   Otherwise, the number of sites retrieved is displayed.   If the user does not print the data for the retrieved sites, the program exits to the program menu level.

For each selected station number, the program checks which stored measurement or inspection data satisfies the given retrieval specifications.   The data that satisfies the specifications are printed in tabular format.   When printing CSG inspection data tables, the program uses any stored upstream and downstream readings and pin elevations to compute, if possible, upstream and downstream peak gage heights.   After all printing is finished, the user is returned to the program menu level.

7.6   Process Daily-Values Card-Image Data

The DV_STORE program is used to store daily-values data obtained from the mainframe system in the ADAPS Daily-Values File. The section briefly tells how to obtain card-image data, describes the card-image data formats, and indicates how the program runs.

Information on how to obtain daily-values card-image data is given in Attachment E of this manual.

7.6.1   Introduction

To obtain daily-values data in card-image format from the mainframe system at Headquarters, the user must submit a job to the mainframe system using the network facilities. The job is executed on the mainframe and the card-image data are returned to the originating node (District) and stored in a user-named file (usually under the requestor's origin directory or the File Transfer Service Depot (FTS_DEPOT)). An example job stream to be sent to the mainframe system to obtain daily-values data is presented in Attachment E.

Once card-image data are available on the minicomputer, this program allows the user to enter the data to the ADAPS Daily-Values File on the minicomputer. Remember that the data must have been retrieved from the national files, or stored in a file that looks like the retrieved file. The retrieved data must be formatted as WATSTORE (Hutchison, 1975) type-2 and type-3 80-column card data. The type-2 card (record) contains the station identifier (ID), parameter code, and statistic code. The type-3 card contains the daily-values dates and data. For each complete water year of data, there are 48 type-3 cards (4 per month). The program runs even if other types of WATSTORE cards (such as Z, H, or N) are encountered in the retrieved file. The program processes multiple stations, parameter codes, and statistic codes. Descriptions of these types of cards are presented in Section 10.1.3.

7.6.2   Program Operation

     This interactive program (option) goes through the startup
routine and prompts for the input daily-values card file name.
This is the name of the input file on the minicomputer that
contains the type-2 and type-3 card data retrieved from the main-
frame computer. Select one of the following three options:

     (1) Add only.
     (2) Add/Replace.
     (3) Add/Merge.

     Option 1 is used if no data exist in the Daily-Values File
on the minicomputer. Option 2 is used if new data will be added
and/or old data will be replaced (as if the same input file was
processed twice). Option 3 is used to merge (interleave or
extend) new and/or old input data with existing data.

     For options 1 and 2, blank fields on the cards are set to
the ADAPS missing value. Also, if card fields are equal to
999999 or 999998 (WATSTORE missing values), they are set to the
ADAPS missing value.

     If there is a change in the input station ID or parameter
code during processing, the program selects a new data descriptor
(from the DD File; therefore there must be DD's for all data that
are to be processed). If there is more than one DD for the
parameter being processed, the program pauses and prompts for the
desired DD selection. After the DD selection is made, the
program continues to process the card data. During processing,
the program displays each type-2 card data found and also lists
the water year being processed based on the type-3 cards. If a
type-N card is found, the station name is also displayed.

     When card processing is finished, the program summarizes the
processing by listing counts (tallies) of total cards (records)
processed and daily-values records written to the Daily-Values
File on the minicomputer. A count of records not written to the
file is also given.

7.7   Review/Delete Digital Tape Temporary Files

     The DRFILES program displays a list of the available
temporary files created by translating new data (see sec. 7.1) or
processing ADR card-image data (see sec. 7.2) for the user-
selected agency, station, and instrument. The user is given the
option to delete any temporary files that are no longer needed.

7.8   Process WRD Standard Input Data

        The STD_STOR program is used to store field-recorded data
(unit and daily values) into ADAPS from files in the standard
data-input format.   The WRD Standard Input Data Format is
described in Attachment F.

7.8.1   Introduction

        The STD_STOR program stores files produced from programs
such as DECODES, which converts different formats of electronic
field-recorder data into the standard data-input format. STD_STOR
can be run as a batch or interactive program, and produces a log
file showing details of the processing. If no errors are found
during the processing, the input file is archived and deleted.

7.8.2   Program Operation

        The STD_STOR program begins with the ADAPS startup routine
used for specifying the user's work directory, the data base, and
whether the program should be run batch or interactively. The
user is then queried for the name of the file, which contains the
data in WRD Standard Data Input Format. If the file is not
located in the user-specified work directory, the complete
pathname must be entered. The program then displays the
directory name, the file name, the name of the log file that will
record all information about the processing of the file, and the
current date and time.

        Next, the user is asked if primary processing should be
run after the entry of the data into ADAPS. If YES, standard
computation of each parameter's data is performed using the
current processing information, ratings, shifts, and data for
that parameter. If batch processing was specified, the program
asks if existing data should be overwritten by the data in the
input file, and then proceeds as a batch job.

        If interactive processing was specified, the program
proceeds interactively. In either batch or interactive
processing, progress of the program is recorded in the log file,
along with any generated error messages. For each site and
parameter that has data processed, the program prints a summary,
which includes the site name, parameter name, the type of data,

and the number of data values. If processing interactively and
existing data are encountered that will be overwritten by data
from the input file, the program prints a warning message and
asks permission to overwrite the existing data. If the answer is
YES for either batch or interactive processing, the message and
query will not be repeated during processing of the input file.
If the answer is NO, the program stops processing the input file;
however, any data processed prior to the warning message stays in
the data base.

        If the processing is completed without errors, the input
file is copied to the archive directory named WATSTORE>ADAPS>
REV85.1>TO_TAPE>ARCHIVE and the program deletes the original
input file. A message notifies the user that the input file has
been archived and displays the name of the archive file. If a
major error is found, the processing is aborted. The program
then asks if the user wishes to process another input file. If
YES, the program returns to the user information display. If NO,
the program stops and returns to the ADAPS menu.

7.8.3   Processing Messages

        Several messages are displayed during processing of an
input file. The most common are information or status messages,
such as which site and parameter are currently being processed.
Error messages are also possible and are divided into four
categories: (1) minor processing errors, (2) major processing
errors (user-caused), (3) major processing errors (incorrect
input file format), and (4) standard ADAPS errors. Standard
ADAPS errors are not discussed here, but the possible error
messages for the first three categories are described as follows:

7.8.3.1   Minor Processing Error Messages

     Minor processing errors are not fatal to processing and do
not abort the program. They are listed only to alert the user
about a problem with the input file data values.

UNIT VALUE TIME IS OUT OF ORDER, VALUE REJECTED
     The time of one unit value coming off of the field data
     recorder is not in time sequence with other unit-value times
     for the day. This may indicate a problem with the record
     received from the field recorder; this record should be
     reviewed for possible errors.

DAILY VALUE ON xx-xx-xxxx IS WRITE-PROTECTED, NEW VALUE NOT STORED
     A new daily value from the input file is overwriting an
     existing write-protected daily value. This is not allowed and
     the new value is ignored. If the new value is desired, it
     must be entered by (1) using the daily-values editing program,
     or (2) removing the write-protect flag for the existing value
     and reprocessing the input file.

7.8.3.2   Major Processing Error Messages (user caused)

     Major processing errors, which are caused by the user or user
setups, immediately abort the processing of the input file.
However, the user can usually fix these errors. Each error message
is listed below, with a description that may help resolve the
problem.

THE STANDARD INPUT-DATA FILE UPLOAD PROGRAM CANNOT BE USED TO LOAD
ARCHIVE FILES
     The user is attempting to use the standard input-data format
     program (STD_STOR) to load unit-values archive file format
     data into ADAPS. Use the unit-values archive restore program
     (UV_RESTORE) to process these types of files.

DATA-INPUT FILE IS NOT A STANDARD DATA-INPUT FILE
     The input file specified for processing by this program is not
     in the required standard input-data format. Please specify
     only files in the proper format.

SITE: xxxxxxx NOT FOUND IN SITE FILE
     The USGS site identification number or agency code (xxxxxxx)
     specified in the input file is not in the specified data base
     site file. Check your program producing the input file or add
     the site to the data base.

DD #xxx NOT FOUND IN DD FILE
     The data descriptor identification number (xxx) specified in
     the input file is not in the specified data base DD file.
     Check your program producing the input file or add the DD to
     the data base.

PARM. CODE xxxxx IN DD RECORD DOES NOT MATCH PARM. CODE yyyyy ON
SENSOR CARD
     The parameter code (xxxxx) from the specified data descriptor
     does not match the parameter code (yyyyy) found in the sensor
     (SE) record in the input file. Check your program producing
     the input file or the DD record in the ADAPS DD file.

WATER YEAR xxxx IS FLAGGED FINAL NO UPDATE IS POSSIBLE
     The daily-values water year record being updated by data from
     the input file is flagged as FINAL data and no update is
     possible. Verify that the correct data are being processed
     and, if so, the water year record needs the FINAL provisional
     flag changed before processing of this input data.

DATE xx-xx-xxxx IS FLAGGED FINAL NO UPDATE IS POSSIBLE
     The unit-values record for the indicated date being updated by
     data from the input file is flagged as FINAL data and no
     update is possible. Verify that the correct data are being
     processed and, if so, the unit-values record for that date
     needs the FINAL/PROVISIONAL flag changed before processing of
     this input data.

OVERWRITE OF EXISTING DATA REJECTED ABORT PROCESSING
     The user has specified that existing data not be overwritten
     by new data from the input file. Existing data have been
     found that will be overwritten; therefore, processing of this
     input file is aborted.

7.8.3.3   Major Processing Error Messages (incorrect input file)

        Major processing errors, which are caused by an incorrect
standard data-input format in the input file, immediately abort the
processing of the input file. The program (e.g., DECODES) that
generated the input file has made a mistake. To resolve the
problem, please contact the programming staff responsible for that
program. Since the user cannot correct these problems, no
explanations are given to the error messages listed below.

BEGINNING OF ENVELOPE RECORD NOT FOUND

xxx IS AN INVALID DATA SOURCE TYPE

DATABASE RECORD FOUND, OUT OF ORDER

THE START DATA RECORD HAS NOT BEEN READ, RECORDS OUT OF SEQUENCE OR
CARD MISSING

DIFFERENT DATA TYPE ENCOUNTERED WITHOUT A SENSOR CARD CHANGE

INVALID NUMBER OF VALUES FIELD READ ON xxxxxx RECORD

ERROR ENCOUNTERED IN READING FROM INPUT FILE
        (FOLLOWED BY PRIMOS ERROR MESSAGE)

DD ID FIELD BLANK ON SE RECORD

ERROR IN READING RECORDING INTERVAL: xxxx FROM SENSOR RECORD

INVALID STATISTIC CODE xxxxx ENCOUNTERED

THE SENSOR RECORD HAS NOT BEEN READ, RECORDS OUT OF SEQUENCE OR
CARD MISSING

THE DATE/TIME RECORD HAS NOT BEEN READ, RECORDS OUT OF SEQUENCE OR
CARD MISSING

INVALID TIME xxxxxx READ FROM RECORD

INVALID DATE xxxxxxxx READ FROM TIME CARD

INVALID TIME READ FROM TIME CARD

7.9   Enter Unit Values from a Digitizer

The UV_ENTER program is used to enter unit values manually, from a terminal or by using a digitizer. The program may also be used to review or modify existing unit values. Note that daily values calculated from the associated unit values are not automatically updated.

7.9.1   Specify Default Values

There are two codes stored with each day of unit values:

    (1)   Transmit status - status of transmission to mainframe
                                     at Headquarters
    (2)   Data status - whether data are PROVISIONAL or FINAL

Also, there are two codes stored with each unit value:

    (1)   Write-protect = protection status for unit value
    (2)   Rounding = special rounding to be used for value

There are default values for these codes which, unless overridden, are stored with new days and new unit values created during a session. At the start of the program you may review and/or change these default values. By specifying the codes on a day-by-day or value-by-value basis during processing, you can override the default values.

The preliminary startup of the program allows for specifying the default values for the session:

    Do you wish to change any defaults for the
    session [Y/N DEFAULT=N]:

It is normally not necessary to change the default values.

7.9.2   Select Station/Data Descriptor

     After the defaults that will apply for the entire session are
specified, the normal ADAPS startup allows selecting a station and
a data descriptor for which to enter data. Following is an example
screen from the UV_ENTER program:

```
                              MONTANA
                   UV_ENTER - UNIT VALUES ENTRY/EDIT
DATE: 10-29-1987    USER GROGERS                        TIME: 07:45:07
**********************************************************************
CURRENT USER INFORMATION
PA - FILE PATH      - GROGERS
----------------------------------------------------------------------
DB - DATA BASE     - Montana District ADAPS data
AG - AGENCY        - USGS    GEOLOGICAL SURVEY
ST - STATION(S)    - 05020500   ST MARY RIVER AT INTERNATIONAL
                     BOUNDARY
DD - DATA DESCR.   - GAGE HEIGHT, IN FEET ABOVE DATUM
**********************************************************************
Enter: PA,DB,AG,ST,DD  to edit field or
       [CR] to continue:
```


7.9.3   Select Keyboard/Digitizer Entry

     After the user selects a station and a data descriptor (DD),
the program asks if unit values will be entered from the terminal
or by using a digitizer:

          Entry from keyboard (K) or digitizer (D), (<CR>=K)?

If a return only or a K is entered, processing continues as
discussed in Keyboard Entry (sec. 7.9.4). If a D is entered,
processing continues as discussed in Digitizer Entry (sec. 7.9.5).

7.9.4   Keyboard Entry

     After the user selects a station and a data descriptor (DD),
the program alternately prompts for a specific date-time, and then
a value for that date-time. Options for automatically entering
date-time sets and/or values are available and discussed in the
following two sections.

7.9.4.1   Date-Time Entry

        The prompt for entering the date-time associated with a unit
value is the following:

        Enter date-time (yyyymmdd.hhmmss, <CR> to end):

The date-time entry is entered as year-month-day-hour-minute-second
in the following form:

        yyyymmdd.hhmmss

If entering many values, it would be very tedious to enter all 15
characters for every date-time entered. Therefore, the program
requires entering only that portion of the date that has changed
from the previous date, and only that portion of the time that is
not zero (00). Enter at least the day (dd) on the first entry,
although the year (yyyy) and the month (mm) will default to the
current year and month. An even number of digits must be entered;
that is, complete components for yyyy, mm, dd, hh, mm and ss.
Following are a few examples of date-time entries:

    AS-ENTERED   INTERPRETATION

    850701   19850701.000003
    02.01   19850702.010000
    .1230   19850702.123000   (If no date, the "."
                                     must be entered.)
    .16   19850702.160000

        Several options may be entered along with a date-time. These
options may be used to automatically generate date-times and/or may
be used to override the transmit-status or data-status codes for
the date in question. Enter the options by following the date-time
value by one or more entries of the form @=xxx, where @ is an
option code and xxx is the value to be used with the option. The
valid option codes and xxx values are explained in the next
section. Note that the date-time and the options must be separated
by one or more spaces.

        If you respond "P" to this query, individual prompts with
detailed individual helps are available for each option.

7.9.4.2   Date-Time Entry Options

This section describes the valid option codes and xxx values mentioned in the previous section. The @ is at the left of the equal (=) sign, and the xxx values to the right. For the M, X, and D option codes, the xxx values are selected from an additional group of options.

I=dd.hhmmss. This option indicates that the date-time entered is to be automatically incremented by the specified days, hours, minutes and seconds. Similar to the date-time entry, the days need not be entered if they are zero (00), and the hours, minutes or seconds need not be entered if they are zero. For example, if I=.01 is entered, that would specify that the date-time be automatically incremented by 1 hour. If you use this option, you will not be prompted to again enter date-time until the generated date-time exceeds the ending date-time (see E=xxx below) or until a null (return only) value is entered.

I=D. This option specifies that the date-time generated is to alternate between the first possible time of day (000003) and the last possible time of day (240000).

I=N. This option is similar to the I=dd.hhmmss option except that the date-time generated is the date-time of the next already existing unit value. This option is used when replacing or deleting existing data.

E=yyyymmdd.hhmmss. This option is used to specify an ending date-time and to terminate the automatic generating of date-time sets at the specified date-time. Similar to the initial date-time entry, you need not enter those elements of the date which are the same as the date entered for the initial date-time, and you need not enter the elements of time which are zero (00).

M=m. This option is used to specify how preexisting data are handled when new data are created. For m, enter one of the following:

D   Display only, no data to be entered.
I   Insert. Any existing data will be preserved. New data will be added only for new date-time sets.
M   Merge new data with existing data ignoring any existing data. If the date-time of new data is identical to the date-time of existing data, the new data will replace existing data. This option must be used when manipulating existing data.
N   Notify user if any data already exist in the time specified. An opportunity will be provided to review the data and then to bypass storing of the data. If the user elects to continue, data will be merged as if the M option were selected. This is the default.
R   Replace all existing data in the time specified. You will be advised if any data exist before the start time in the start day, or if any data exist after the end time in the end day.

X=x. This option sets the transmit status code for the current date. For x, enter one of the following:

Y   Ready to send.
N   Not ready to send. This is the default.
S   Sent.
K   Data OK, but do not send.

D=d. This option sets the data status code for the current date. For d, enter one of the following:

P   Provisional. Note that you cannot change the status code from F to P for previously existing data by using this program. P is the default for this option.
F   Final.

For example, the following response to the date-time prompt:

850701.01 I=.01 E=02.24 M=R

specifies that times be generated each hour from 01:00 on 7-1-85, through 24:00 on 7-2-85. Any existing data in this time span are deleted.

7.9.4.3   Value Entry

The prompt for entering the value part of a unit value is:

Enter value for YYYY-MM-DD HH:MM:SS or <CR> for new date-time:

Values are entered using one of four forms:

nnn   Store the number, nnn, for the current date-time.
         The number consists of 1-10 digits with or without
         a decimal point or sign.
D   Delete the value at the current date-time.
@+nnn   Add nnn to the existing value.
@*nnn   Multiply the existing value by nnn.

Enter the values as a number with or without a decimal point. As
with the date-time entry, there are several options that may be
coded with a value. These options are explained in the next
section.

If you respond "P" to this query, individual prompts and
detailed individual "helps" are available for each option.

7.9.4.4   Value Entry Options

This section describes the valid options (left of = sign) and
their values (right of = sign) for processing.

C=c. This option specifies that the value be used c times,
where c is any number greater than zero. You will not be prompted
to enter a value again until the current value has been used c
times.

C=E. This option is similar to the C=c option except that the
value specified is used until the ending date-time (see E=xxx
above) is exceeded.

E=e. This option specifies to use the unit value (a number)
that corresponds with the ending date-time (see E=xxx above), and
further specifies that interpolation be done between the starting
and ending date-time. The number of values calculated is
determined by either the date-time increment (see I=xxx above) or
by the value count (C=c).

W=w. This option specifies that the write-protect code (listed below) be stored with the current value. Note that this program will not override a write-protect code of "1" with a previously existing value. For w, enter one of the following write-protect codes:

    0 Not used.
    1 Write-protected.
    E Estimated.
    < Less than.
    > Greater than.

R=r. This option specifies that the rounding code be stored with the current numeric value. This code specifies the number of significant digits available and must be entered as 0,1,..9. This code is only used when you need to override the default rounding for the parameter in question. For example, the following response to the value prompt:

    100 C=E

specifies that the value 100 be stored in all the date-time sets generated from the date-time prompt.

7.9.4.5 Keyboard Entry Sequence of Processing

Keyboard sequential processing continues with entry or generation of a date-time, followed by entry or generation of a value for one of the following situations:

- Entry of a date-time followed by entry of a unit value. This process continues until a null date-time (return only) is entered, or until an automatic generation of date-time or value is specified.

- Entry of a date-time followed by generation of a unit value. This continues until a null date-time is entered, or until the value count is completed.

- Generation of a date-time followed by entry of a unit value. This continues until the ending date-time is exceeded, or until a null unit value is entered.

- Generation of a date-time followed by generation of a value. This continues until the ending date-time is exceeded or until the value count is completed.

7.9.5   Digitizer Entry

        The following discussion pertains to using a digitizer with a
15-key control where the keys 1, C, D, E, and F have been defined
to have specific functions. The characteristics of the digitizers
available at a site are defined in the file named WATSTORE>ADAPS>
REV85.1>AUXDATA>DIGITIZER.DEF. This file is described in section
7.9.5.3. Some of the dialog in this section will vary if the
digitized data are read from a file, or if the digitizer uses
different codes or has no code capability. These situations are
discussed next in sections 7.9.5.1 and 7.9.5.2.

        First, position the chart on the digitizer. It is not
necessary to place the chart parallel with the edge of the
digitizer; the program will adjust the recorded values as
necessary. The program starts with the following messages:

        PREPARE CHART FOR DIGITIZING

        TO CANCEL DIGITIZING AT ANY TIME DIGITIZE ANY POINT WITH C
        KEY

        DEFINE LOWER LEFT CORNER OF CHART --
        SET POINTER TO A KNOWN LOW VALUE AT START DATE-TIME
        DIGITIZE POINT.

        Position the digitizer pointer to a point at the lower left of
the area of the chart to be digitized. This point must be at a
known date-time and at a known value. Digitize the point. The
digitizing process may be restarted at any time by pressing the C
button on the digitizer keypad. After digitizing this point, the
prompt to enter the date-time associated with the point is
displayed as follows:

        Enter start date-time (yyyymmdd.hhmmss):

        Enter the date-time in the form: yyyymmdd.hhmmss. However, it
is not necessary that all 15 characters be keyed for each entry.
After the first time, enter only that portion of the date
(yyyymmdd) that changed from the last entry. If the year has not
changed from the previous entry, enter only the month (mm) and day
(dd). If the month also has not changed, enter only the day. If
the entire date (yyyymmdd) has not changed, enter only the time
(.hhmmss). It is not necessary to enter the seconds (ss) if
seconds are 00, or minutes if minutes are 00.

After entering the start date-time, enter the chart value associated with that date-time:

Enter value at (YYYYMMDD.HHMMSS), where YYYYMMDD.HHMMSS is the date-time entered above.

After the lower left corner has been digitized and defined, digitize the upper left corner:

DEFINE UPPER LEFT CORNER OF CHART --

SET POINTER TO A KNOWN HIGH VALUE AT START DATE-TIME DIGITIZE POINT.

This point must be at the date-time previously digitized and at a known chart value. After digitizing the point, enter the associated value:

Enter value:

After setting up the lower left and upper left corners of the chart, set up the lower right corner:

DEFINE LOWER RIGHT CORNER OF CHART --

SET POINTER TO CHART VALUE xxx.xx AT END DATE-TIME DIGITIZE POINT.

This point must be at the same vertical chart value as recorded for the lower left corner. Since the chart value is already known, you are prompted only for the ending date-time:

Enter chart ending date-time (yyyymmdd.hhmmss):

Note that unentered portions of the date-time will default as discussed above.

At this time, three points were specified that should define a right triangle. The program provides an indicator of the quality of your setup:

DEVIATION FROM RIGHT ANGLE IS: xx.x DEGREES

You are also notified of the scaling, as defined by your setup:

X-SCALE: xx.xxxxxx (dd.hhmmss) PER INCH
Y-SCALE: xx.xx UNITS PER INCH

After the chart layout is complete, the chart is ready for digitizing:

DIGITIZE CHART TRACE

DIGITIZE ANY POINT WITH KEY D TO DELETE PREVIOUS
POINT - MAY REPEAT
DIGITIZE ANY POINT WITH KEY E TO INDICATE REVERSAL AFTER
PREVIOUS POINT
DIGITIZE ANY POINT WITH KEY F WHEN FINISHED

Each point for digitizing must be entered with the 1 button. To delete one or more of the previously entered points, press the D button once for each point to be deleted. If the chart trace contains a reversal, digitize any point with the E button; the previous point is interpreted as a point of reversal. The next point digitized is the first point after the reversal. After entering the last point, press the F button. Points need not be digitized in any particular order.

After completing the digitizing, the following prompt is an opportunity to reposition the chart and continue digitizing:

Any more data to digitize?

If YES, processing continues with positioning of the chart, defining chart corners, and digitizing. After all digitizing is complete, data corrections may be applied. Due to mechanical problems with the recorder, paper swelling/shrinkage, etc., the end date-time and/or value as recorded may not agree with the actual values. A prompt to enter the true date-time of the latest-occurring point digitized is displayed:

Enter true (watch) date-time of latest point
(<CR>=YYYYMMDD.HHMMSS):

The default date-time will be the date-time as calculated by the program, based on your digitized point and the chart setup. If entering a different date-time, a time correction is applied to all the digitized points. A prompt to specify the true value corresponding with the true ending date-time is also displayed:

Enter true value of last point entered (<CR>=xxxxxx):

where the default value is the value as calculated by the program. The data digitized are then stored in the ADAPS unit-values file.

If any data already exist in the unit-values file for the time span digitized, you are notified and prompted to specify an option for merging the newly digitized data with the existing data. See the M=m paragraph of section 7.9.4.2 for more information about the available merge options.

7.9.5.1   Digitized Data From A File

If the digitizer selected is defined such that data are loaded from a file, the file must be formatted as follows:

Record 1:   X,Y values of lower left corner of chart
Record 2:   X,Y values of upper left corner of chart
Record 3:   X,Y values of lower right corner of chart
Record 4-n+3: X,Y values of trace (n points). If any
               reversals, each must be indicated with one
               extra line to indicate the point of the
               reversal(s).
Last record: String with code indicating digitizing
               is complete.

When prompted, enter the name of the file containing the above information. The file must be formatted as defined in the DIGITIZER.DEF file, which is described in sections 7.9.5 and 7.9.5.3. The dialog is similar to that above except that there are no prompts for digitizing, only for entering date-time sets and values for corners.

7.9.5.2   Digitizers Without Code Capability

If the digitizer does not have a code-key capability, the dialog is similar to that mentioned above, except that codes are indicated by digitizing a point outside the region defined:

To indicate cancellation of set-up, digitize a point to the left of the start date-time.

To indicate deletion of a point, digitize a point below the value recorded for the lower left/lower right corners.

To indicate a reversal, digitize a point above the value recorded tor the upper left corner.

To indicate that digitizing is complete, digitize a point to the right of the end date-time.

7.9.5.3   Description of Digitizer Definition File

The digitizers(s) available at a site are defined in a file named DIGITIZER.DEF, which is stored in the WATSTORE>ADAPS>REV85.1>AUXDATA directory. The following is a sample listing of this file, which is self-documenting.

File: 'DIGITIZER.DEF' - DEFINE DIGITIZER(S) AVAILABLE AT SITE FOR ADAPS NOTE: Retain the first 23 lines of this file - line 24 is first user entry. Enter one line of the following format for each digitizer available --

```
COLUMNS      DESCRIPTION
  1-2        ID number for digitizer (01,02,...)
  5-6        AMLC# (dec) if assigned line, 00 if terminal line,
               -1 if from file
 10-11       Total length of transmitted string, characters
 15-16       Character position of start of X-value in transmitted
               string
 19-20       Length of X-value, characters
    23       Number of decimal places in X-value
 28-29       Character position of start of Y-value in transmitted
               string
 32-33       Length of Y-value, characters
    36       Number of decimal places in Y-value
 40-41       Position of 1-character code in transmitted string
               (00 if no code)
    44       Code transmitted with digitized X,Y value (blank if none)
 45-48       Special codes: Cancel (45), Delete (46), Reversal (47),
               Finished (48)
 51-54       CONFIG if AMLC line, octal (ignored if not AMLC)
 56-60       LWORD if AMLC line, octal (ignored if not AMLC)
 63-80       Description (optional)
```

| ID | LN | STR | **X-VALUE** | | | **Y-VALUE** | | | CD | CODES | ***AMLC*** | | |
NO	NO	LEN	POS	LEN	DEC	POS	LEN	DEC	PS	1CDEF	CNFG	LWORD	DESCRIPTION
00	00	11	02	05	3	07	05	3	01	1CDEF	0000	00000	(EXAMPLE)
01	00	11	02	05	3	07	05	3	01	1CDEF	0000	00000	ALTEK
02	-1	11	02	05	3	07	05	3	01	1CDEF	0000	00000	DIGIT.DATA FILE
03													xxxxxxxxxxxxxxxx

7.9.6   Sample Session - Keyboard Entry

        The following examples take the user through a sample session
for keyboard entry.

7.9.6.1 Specify Defaults For Session

        The prompt for specifying defaults is displayed:

        Do you wish to change any defaults for session
          [Y/N DEFAULT=N]: Y

If YES, the program displays the following:

        The following default codes will be stored with each new
        date created during this session:
          (X)   Transmit status = N   (Not ready to send)
          (D)   Data status = P   (Provisional)

        The following default codes will be stored with each new
        unit value:
          (W)   Write-protect = 0   (Not used)
          (R)   Rounding = 0   (Not used)

        You will be able to override these default values for any
        particular dates or unit values.

        Enter X/D/W/R to change or enter <CR> if OK:

        Opening MIDAS data bases and getting user information.
        Please wait . . . .

```
                               MONTANA
                  UV_ENTER - UNIT VALUES ENTRY/EDIT
        DATE: 10-29-1987      USER GROGERS              TIME: 07:45:07
        **************************************************************
CURRENT USER INFORMATION
PA - FILE PATH      - GROGERS
-------------------------------------------------------------------
DB - DATA BASE      - Montana District ADAPS data
AG - AGENCY         - USGS   GEOLOGICAL SURVEY
ST - STATION(S)     - 05020500  ST MARY RIVER AT INTERNATIONAL
                      BOUNDARY
DD - DATA DESCR.    - GAGE HEIGHT, IN FEET ABOVE DATUM
        **************************************************************
Enter: PA,DB,AG,ST,DD  to edit field or
       [CR] to continue:

        Entry from keyboard (K) or digitizer (D), (<CR>=K)?
```

7.9.6.2   Example of Display Option

```
Enter date-time (yyyymmdd.hhmmss, <CR> to end): 850701 M=D

Data exist for: 19850701
SITE: 05020500 DD:7 DATE:19850701 XMIT-STATUS:Y DATA-STATUS:P
LAST UPDATED: 19871029 074315 BY GROGERS      N-VALUES:    23
HH MM SS  C R   VALUE     HH MM SS  C R  VALUE   HH MM SS  C R  VALUE

01 30 00  0 0    1.50     18 00 00  0 0  18.00
10 00 00  0 0   10.00     18 40 00  0 0  18.67
10 36 00  0 0   10.60     19 00 00  0 0  19.00
11 12 00  0 0   11.20     19 20 00  0 0  19.33
11 48 00  0 0   11.80     20 00 00  0 0  20.00
12 00 00  0 0   16.00
12 24 00  0 0   12.40
13 00 00  0 0   13.00
13 36 00  0 0   13.60
14 00 00  0 0   16.00
14 12 00  0 0   14.20
14 48 00  0 0   14.80
15 00 00  0 0   16.00
15 24 00  0 0   15.40
16 00 00  0 0   16.00
16 40 00  0 0   16.67
17 00 00  0 0   17.00
17 20 00  0 0   17.33
```

Continue [Y/N DEFAULT=Y]:

Note: You may respond P to this prompt in which case you will be
prompted to enter all options individually with detailed "help"   .
available for each option.

Enter value for 1985-07-01 12:00:00 or <CR> for new date-time:
12.00
Replacing existing value: 16.00

7.9.6.3   Example of Successive Entries

Enter date-time (yyyymmdd.hhmmss, <CR> to end): .13
Enter value for 1985-07-01 13:00:00 or <CR> for new date-time: 13
Replacing existing value: 13.00

Enter date-time (yyyymmdd.hhmmss, <CR> to end): .14
Enter value for 1985-07-01 14:00:00 or <CR> for new date-time: 14
Replacing existing value: 16.00

7.9.6.4   Example of Generating Date-Time Sets

Enter date-time (yyyymmdd.hhmmss, <CR> to end): 850701.10 E=.20
   I=.01
Enter value for 1985-07-01 10:00:00 or <CR> for new date-time:
12.34 C=E
Replacing existing value: 10.00
  Inserting new value...
  Replacing existing value: 12.00
  Replacing existing value: 13.00
  Replacing existing value: 14.00
  Replacing existing value: 16.00
  Replacing existing value: 16.00
  Replacing existing value: 17.00
  Replacing existing value: 18.00
  Replacing existing value: 19.00
  Replacing existing value: 20.00

7.9.6.5   Example With Generated Date-Time, Varying Values

Enter date-time (yyyymmdd.hhmmss, <CR> to end): .2015 I=.0015 E=.21
Enter value for 1985-07-01 20:15:00 or <CR> for new date-time: 20.1
Adding new value...
Enter value for 1985-07-01 20:30:00 or <CR> for new date-time: 20.2
Adding new value...
Enter value for 1985-07-01 20:45:00 or <CR> for new date-time: 20.3
Adding new value...
Enter value for 1985-07-01 21:00:00 or <CR> for new date-time: 20.4
Adding new value...

7.9.6.6   Example With Value Count

Enter date-time (yyyymmdd.hhmmss, <CR> to end): .21 I=.0130

Enter value for 1985-07-01 21:00:00 or <CR> for new date-time:
   21.11 C=2
Replacing existing value: 20.40
Adding new value...
Enter value for 1985-07-01 24:00:00 or <CR> for new date-time:

7.9.6.7   Example With Interpolated Values

Enter date-time (yyyymmdd.hhmmss, <CR> to end): .16 E=.20 I=.0030

Data exists for: 19850701
Do you wish to review [Y/N DEFAULT=N]:
Enter value for 1985-07-01 16:00:00 or <CR> for new date-time: 16
   E=20
Replacing existing value: 16.00
Inserting new value...
Replacing existing value: 17.00
Inserting new value...
Replacing existing value: 18.00
Inserting new value...
Replacing existing value: 19.00
Inserting new value...
Replacing existing value: 20.00

Enter date-time (yyyymmdd.hhmmss, <CR> to end):

 Updating UV file for: 19850701 ...

7.9.7   Sample Session - Digitizer Entry and Display

      This example is for a digitizer on the same line as the
terminal, and transmitting an 11-character string consisting of a
1-character code (col. 1), the X-value (cols. 2-6) and the Y-value
(cols. 7-11). X and Y are transmitted with three implied decimal
places.

UV_ENTER - UNIT VALUES ENTRY/EDIT - SET UP DEFAULTS FOR SESSION

Do you wish to change any defaults for session [Y/N DEFAULT=N]:

Opening MIDAS data bases and getting user information.
Please wait . . . .

                          MONTANA
               UV_ENTER - UNIT VALUES ENTRY/EDIT
      DATE: 05-25-1988   USER GROGERS   TIME: 10:52:20
      ****
      CURRENT USER INFORMATION
      PA - FILE PATH   - <MTUSR1>GROGERS

      DB - DATA BASE   - Montana District ADAPS data
      AG - AGENCY   - USGS   GEOLOGICAL SURVEY
      ST - STATION(S)   - 05020500 ST MARY RIVER AT INTERNATIONAL
                             BOUNDARY
      DD - DATA DESCR.   - GAGE HEIGHT, IN FEET ABOVE DATUM
      ****
Enter: PA,DB,AG,ST,DD to edit field or
        [CR] to continue:

Entry from keyboard (K) or digitizer (D) (<CR>=K)? D

PREPARE CHART FOR DIGITIZING

TO CANCEL DIGITIZING AT ANY TIME DIGITIZE ANY POINT WITH C KEY

DEFINE LOWER LEFT CORNER OF CHART --
SET POINTER TO A KNOWN LOW VALUE AT START DATE-TIME
DIGITIZE POINT.
11000002000

Enter start date-time (yyyymmdd.hhmmss): 19850630.2400
Enter value at 19850630.240000: 100

DEFINE UPPER LEFT CORNER OF CHART --

SET POINTER TO A KNOWN HIGH VALUE AT START DATE-TIME
DIGITIZE POINT.
11000010000

Enter value: 1200
DEFINE LOWER RIGHT CORNER OF CHART --

SET POINTER TO CHART VALUE 100   AT END DATE-TIME
DIGITIZE POINT.
13000002100

Enter chart ending date-time (yyyymmdd.hhmmss): 0702.24

DEVIATION FROM RIGHT ANGLE IS   0.0 DEGREES
X-SCALE: 00.022400 (dd.hhmmss) PER INCH - Y-SCALE: 137.50 UNITS
                                                         PER INCH

DIGITIZE CHART TRACE

DIGITIZE ANY POINT WITH KEY D TO DELETE PREVIOUS POINT -
    MAY REPEAT
DIGITIZE ANY POINT WITH KEY E TO INDICATE REVERSAL AFTER
    PREVIOUS POINT
DIGITIZE ANY POINT WITH KEY F WHEN FINISHED

11000005000
11100006000
11500008000
11900007000
12200006500
12500005000
13000004000
F
Any more data to digitize? [Y/N DEFAULT=Y]: N
Enter true (watch) date-time of latest point (<CR>=
    19850702.240000): .2330

Applying time correction: - 0 days 0 hours 30 mins 0 secs ...
Enter true value of last point entered (<CR>=   375.00: 400

Applying data correction: 25.00 ...

No data exist⌐ for: 19850630. Building new record.

Adding first value for date ...

Updating UV file for: 19850630 ...
Adding first value for date ...
Adding new value...
Adding new value...
Updating UV file for: 19850701 ...
Adding first value for date ...
Adding new value...
Adding new value...

Updating UV file for: 19850702 ...


```
                              MONTANA
                 UV_ENTER - UNIT VALUES ENTRY/EDIT
      DATE: 05-25-1988      USER GROGERS                TIME: 11:02:54
      *******************************************************************
CURRENT USER INFORMATION
PA - FILE PATH      - <MTUSR1>GROGERS
-----------------------------------------------------------------------
DB - DATA BASE      - Montana District ADAPS data
AG - AGENCY         - USGS    GEOLOGICAL SURVEY
ST - STATION(S)     - 05020500  ST MARY RIVER AT INTERNATIONAL
                        BOUNDARY
DD - DATA DESCR.    - GAGE HEIGHT, IN FEET ABOVE DATUM
      *******************************************************************
Enter: PA,DB,AG,ST,DD  to edit field or
     [CR] to continue:

Entry from keyboard (K) or digitizer (D) (<CR>=K)? K

In response to queries for entering data-time and values--,
     Enter   HELP  for more information
     Enter   P  for detailed prompting

Enter date-time (yyyymmdd.hhmmss, <CR> to end): 0630 M=D

SITE: 05020500  DD:7  DATE:19850630  XMIT-STATUS:Y  DATA-STATUS:P
LAST UPDATED: 19880525 110249 BY GROGERS          N-VALUES:     1
HH MM SS  C R  VALUE  HH MM SS  C R  VALUE  HH MM SS  C R  VALUE

24 00 00       512.50

Continue [Y/N DEFAULT=Y]:
```

Enter date-time (yyyymmdd.hhmmss, <CR> to end): 0701 M=D

SITE: 05020500 DD:7 DATE:19850701 XMIT-STATUS:Y DATA-STATUS:P
LAST UPDATED: 19880525 110250 BY GROGERS   N-VALUES: 3
HH MM SS C R   VALUE HH MM SS   C R   VALUE HH MM SS   C R   VALUE

02 22 33   651.24
11 52 33   931.19
21 22 33   798.63

   Continue [Y/N DEFAULT=Y]:

Enter date-time (yyyymmdd.hhmmss, <CR> to end): 0702 M=D

SITE: 05020500   DD:7 DATE:19850702 XMIT-STATUS:Y DATA-STATUS:P
LAST UPDATED: 19880525 110250 BY GROGERS   N-VALUES: 3
HH MM SS C R   VALUE   HH MM SS   C R   VALUE   HH MM SS   C R   VALUE

04 30 03   733.59
11 37 33   531.06
23 30 03   399.74

Continue [Y/N DEFAULT=Y]:

Enter date-time (yyyymmdd.hhmmss, <CR> to end):

8   PRIMARY PROCESSING

        This section presents the programs used for primary
processing of records. These programs provide for the entry and
update of ratings, datum corrections, and shift corrections. The
programs also provide for editing the unit and daily values and
performing primary computations.

PROGRAM
  NAME   TASK DESCRIPTION   SECTION

  RT_EDIT ------- Update/display rating tables 8.1
  DC_EDIT ------- Update/display datum corrections 8.2
  ST_EDIT ------- Update/display shifts by time 8.3
  SV_EDIT ------- Update/display variable shifts 8.4
  UV_EDIT ------- Edit unit values 8.5
  PRIMARY ------- Primary computations 8.6
  DV_EDIT ------- Edit daily values 8.7

8.1   Update/Display Rating Tables

        The RT_EDIT program allows the user to update and display
rating tables. Rating types are shown, and various updating
options are explained. See section 3.7 for a discussion on
ratings types and dates. While the user is within the update
program, no outside messages will be sent to the screen.

8.1.1   Introduction

        After selecting the agency code, site identifier (ID), etc.,
via the startup routine, this program checks to see if the
specified site has any entries in the Rating Table File. If an
entry does not exist, the program queries whether one is to be
added to the file.

        If the reply to adding a rating to the file is NO, the
program again displays the site selection screen. If the reply
is YES, a rating type menu is displayed, followed by the program
menu. The program menu presents selections to change, update,
delete, or list the rating points, or print an expanded rating
table. Next, choose to either process an existing rating or
create a new one. If creating a new one, the program proceeds
with the necessary steps to make an entry in the file. Up to 100

Up to 100 rating points (x-y values) per rating are allowed and each rating can have up to 10 assigned begin dates. For a linear expansion type rating, follow steps 1-6.

1. Select a rating type; valid types, as shown on the screen, are:
   - 0 - Conversion of input,
   - 1 - Standard rating,
   - 2 - Stage-fall (slope) rating,
   - 3 - Fall/discharge ratio rating,
   - 4 - Stage-area rating,
   - 5 - Stage-velocity correction factor rating,
   - 6 - Deflection-velocity rating, and
   - 20 - Conversion of auxiliary input.
2. Select a 4-digit rating identifier.
3. Enter an expansion type: linear, logarithmic, or an equation.
4. Optionally enter information in remarks field.
5. Enter starting date(s) and time(s).
6. Enter rating-table data via the input form displayed on the terminal screen.

For a logarithmic expansion type rating, follow steps 1-3 and then optionally enter the table offset values and stages. The rating edit offset screen accurately reflects how the ADAPS software handles multiple offset values and breakpoints. The first offset value is always applied until the second breakpoint is reached. The second offset value is then applied from the second breakpoint until a third breakpoint, if any, is reached and a third offset value is picked up.

The rating offset screen allows the entry of only 2 breakpoints and 3 offset values. A series of "carriage returns" through the screen will exit to the next edit screen with all current values retained. There is also an option to enter an "e", which will skip past the offset editing screen and retain all current values. Only a direct "d" (delete) command will delete a value, which may than be changed. If rating table offset values and stages are used, methods to determine these values are described by Kennedy (1984, p. 5-10).

For an equation type rating, follow steps 1-3; use the current values of the equation constants A and B and exponent C as displayed, or enter new values for A, B, and C; then follow steps 4 and 5. Values for C (the power for the equation) greater than 25 are not allowed, as machine storage capacity would be exceeded and primary processing would fail.

There are some peculiarities in handling ratings that need an explanation. In general, ratings are stored under the data descriptor (DD) associated with the "input" side of the rating. However, where there are auxiliary DD's and ratings, all ratings are stored under the DD associated with the base input DD. For example, the slope-discharge computation has an auxiliary gage-height DD and a base gage-height DD. The rating to convert the auxiliary gage-height dial readings to feet (called an input conversion) must be stored with the corresponding base gage-height DD, not the auxiliary gage-height DD. Explicitly, for a slope computation, the rating types to create and store with the base gage-height DD are the following:

    0 - Conversion of input (used to convert the base
         gage-height dial readings to feet),
    1 - Standard rating,
    2 - Stage-fall rating,
    3 - Fall/discharge ratio rating, and
   20 - Conversion of auxiliary input (used to convert
         auxiliary gage dial readings to feet).

8.1.2   Rating-Table Change/Update Options

       The rating-table input form update/display options that are available are as follows:

    Q - Quit with no save.
  * E - Exit with no save.
  * S - Save and quit.
    F - Page forward.
    B - Page Backward.
    U - Up 1 line.
    M - Down 1 line.
  * I - Insert line.
  * D - Delete line.
  * C - Change line.
  * A - Add to the end of the list.
    X - Exit the current mode (usually entered
         in Column 1 or first field on the form).

These single letter options are used throughout the following sections, and those preceded by an asterisk (*) are discussed separately in individual sections.

8.1.3   Cursor Movement on the Rating-Table Input Form

The rating table form displays up to 28 rating points per page (screen). To move the cursor from one rating point to another rating point, enter an M to move to the next one or a U to move to the previous one. It is not necessary to enter a carriage return after selecting an input-form option. If a carriage return is entered, the program displays a message of an invalid option and then returns for another instruction.

The rating tables are displayed in four columns on a page. The first column contains the first seven rating points, the second column contains the next seven rating points, and so on up through the fourth column. If there are more than 28 points in the file, they are stored on the succeeding pages. To see the next page of rating tables, enter an F. There can be up to four pages of rating points for a site. To move back to a previous page, enter a B, which returns the page immediately preceding the current one.

8.1.4   Add a New Rating Point

A new rating point is added to the end of the rating pair (input and output values) list by entering an A without using a <CR>. This automatically places the cursor at the end of the list after which the entry is made. If there are no entries for the particular rating, an A (Add mode) must be entered to begin adding entries. The user must enter the input value, then a blank, and then the output value. A <CR> is necessary after a pair of values has been entered. After the <CR>, the cursor goes to the next line and a new entry is made. The user can enter as many pairs of rating points as needed while in Add mode. To stop making entries and exit from Add mode, enter an X followed by a <CR>.

The edit program checks for ascending and descending rating table input and output values according to the "rating type" (i.e., conversion of input, stage-area, etc.). The rating input values will always be checked for ascending value. The rating output values are checked ⁻⁻ᵣ ⁻⁻⁻⁻nding order except for the following rating types:

a)   stage-fall ratings
b)   fall/discharge ratio ratings
c)   stage-velocity factor ratings
d)   standard ratings for all parameters,
       except parameter 00060 (discharge)
       and parameter 00054 (reservoir storage)

Currently, the greatest rating table point value and offset value accepted by the edit program is 99,999,999, due to a machine storage limitation.

8.1.5   Insert a Rating Point

A rating point is inserted the same way as adding a rating point except that only one pair of rating points is inserted at a time. To make an insertion, place the cursor on the line where the entry is to be made and then enter an I. To exit from Insert mode without making an insertion, enter an X followed by a <CR>.

8.1.6   Change a Rating Point

A rating point is changed by placing the cursor on the line that is to be changed and then entering a C. This puts the user in Change mode, after which a new rating point is entered over the current one. Once in Change mode, a new rating point must be entered.

8.1.7   Delete a Rating Point

Rating points are deleted one at a time. To delete a rating point, place the cursor on the rating point to be deleted and enter a D. There is a prompt to ensure that this is the rating point to be deleted.

8.1.8   Exit the Rating-Table Update Program

To exit the rating-table program, enter an E. This causes
an exit completely out of ADAPS. If the user does not want to
leave ADAPS, enter a Q, which will return the user to the program
menu level. Note: If data have been modified and not saved (see
next section), they are left unmodified when exiting.

8.1.9   Save Rating Table

The user can save the new or updated rating-table data by
entering an S. This saves all the current changes that have been
made. All changes that were made will be present the next time
the user enters the rating-table program. Saving the rating
table takes the user back to the program menu level.

Several programs are dependent upon the rating offset
breakpoints matching a rating table input value. The Rating Edit
program does not allow a SAVE (s) command at the rating table
input/value editing screen level if an offset breakpoint does not
have a rating table input value match. The breakpoint is
displayed and an option given to edit either the offset screen or
the rating table input/value screen. The SAVE command may then
be given again for execution.

8.1.10   Display Expanded Rating(s)

One of the options in the rating table program is to expand
a rating (Option PE). The rating expansion can also be obtained
using the menu option DI 6. (See sec. 12.6.)

The rating expansion program automatically expands a rating
from its descriptors (input points that define the rating).
Actual rating input points are indicated by asterisks (*) after
their table values. The program also computes (expands) values
for an Equation type rating. The expanded rating is outputted to
the device selected in the Startup menu (i.e., terminal, file, or
printer). If the rating is printed at a printer, the user may
specify the number of copies to be printed.

Standard defaults may be overridden by the user by
specifying the increment desired and indicating that standard
precision be used. With standard precision, values are displayed

with fewer digits of precision as determined by the rounding stored in the Parameter Code File.

Unless special alternate rounding has been stored with the Data Descriptor record, the expanded rating table applies standard parameter code rounding, plus 1 for the expanded rounding (except for discharge). For discharge, the recommended significant figures for rounding in expanded rating tables are as follows:

SIGNIFICANT FIGURES   (DISCHARGE ONLY)

DISCHARGE RANGE	RATING TABLE (STANDARD)	RATING TABLE (EXPANDED)
<0.01	0	1
0.01-0.1	1	2
0.1-1	2	3
1-10	2	4
10-100	3	4
>100	3	4

If the desired rating to be expanded is an Equation type, the program queries the user for a minimum and maximum value to use in the computation (expansion). These minimum and maximum values define the lower and upper boundary values for which the computations (expansion) are done by the equation.

In addition, if the user has selected the output to go to a file in the Startup/Selection menu, the expanded rating table for the standard stage discharge rating type 1 will include a banner with blanks for filling in notes on the rating curve development.

8.2   Update/Display Datum Corrections

The DC_EDIT program allows the user to update and display datum corrections. While the user is within the update program, no outside messages are sent to the screen.

For clarity when using the DC_EDIT program, refer to the two recommendations concerning DIAL/REAL variables and datum corrections presented in section 3.6.2.

8.2.1   Introduction

After selecting the agency code, site ID, etc., via the startup routine, this program checks to see if the specified site/year combination already exists in the Datum Correction File. If no datum correction record exists, the program queries if one should be added to the file. If the reply is NO, the program restarts.

If the reply to the program query is YES, the input form is displayed for entering datum corrections. If the record already exists, a program menu appears from which selections are made to change/update, delete, or list (print) the datum corrections for the selected year. To do any editing of the datum corrections, an appropriate option must be selected.

If the update/change option is selected, the input form in which corrections are edited is displayed. The available editing options are listed at the bottom of the input form. The user can use any listed options to edit the datum corrections. Up to 100 datum corrections can be stored for each water year, and are displayed as 28 entries per page.

If the delete option is selected, the first page of corrections is shown, and the user is queried if this is the record to be deleted. If the reply is YES, the entire year of datum corrections is deleted.

The list option is used to view the datum corrections on the screen, or tr route the list to a previously selected output destination.

8.2.2   Datum Corrections Update/Display Options

The datum-correction input-form update/display options that are available are as follows:

```
    Q - Quit with no save.
  * E - Exit with no save.
  * S - Save and quit.
    F - Page forward.
    B - Page backward.
    U - Up 1 line.
    M - Down 1 line.
  * I - Insert line.
  * D - Delete line.
  * C - Change line.
  * A - Add to the end of the list.
    X - Exit the current mode (usually entered
        in Column 1 or first field on the form).
```

These options are used throughout the following sections, and those preceded by an asterisk (*) are discussed separately.

8.2.3   Cursor Movement on the Datum-Correction Form

The datum-correction input form displays up to 28 corrections per page. Enter an M to move the cursor from one correction to the next correction; enter a U to move the cursor to the previous correction. It is not necessary to enter a <CR> after selecting an input-form option (this applies to several other programs in which a similar input form is used).

The datum corrections are displayed in four columns on a page. The first column contains the first seven corrections, the second column contains the next seven corrections, and so on up through the fourth column. If there are more than 28 corrections in the file, then they are stored on the succeeding pages. To see the next page of datum corrections, enter an F. There can be up to four pages of corrections for a site. To move back to a previous page, enter a B, which returns the page immediately preceding the current one.

8.2.4   Add a New Datum Correction

     Add a new datum correction to the end of the list by
entering an A without using a <CR>. This automatically places
the cursor at the end of the list after which the entry is made.
If there are no entries for the particular site, an A (Add mode)
must be entered to begin adding entries. Enter the month, day,
time, and value in the spaces provided. A <CR> is necessary
after the value has been entered. After the <CR>, the cursor
goes to the next line and a new entry is then made. You may
enter as many datum corrections as needed while in Add mode. To
discontinue entries and exit from Add mode, enter an X followed
by a <CR>.

8.2.5   Insert a Datum Correction

     Insert a datum correction by placing the cursor on the line
where the entry is to be made and then entering an I. The date
and time of the inserted correction must be between the datum
correction before it and the datum correction after it, and only
one correction can be inserted at a time. To exit from Insert
mode without making an insertion, enter an X followed by a <CR>.

8.2.6   Change a Datum Correction

     Change a datum correction by placing the cursor on the line
to be changed and then entering a C. This puts the user in
Change mode, after which a new datum correction is entered over
the current one. Once in Change mode, a new datum correction
must be entered.

8.2.7   Delete a Datum Correction

     Delete a datum correction by placing the cursor on the datum
correction to be deleted and then entering a D. There is a
prompt to ensure that this is the datum correction to be deleted.
Datum corrections are deleted one at a time.

8.2.8   Exit the Update/Display Datum-Correction Program

     Exit the datum-correction program and ADAPS by entering an
E. If you do not want to leave ADAPS, enter a Q to return to the
program menu level. Note: If data have been modified and not
saved, they are left unmodified when exiting.

8.2.9   Save New Datum Corrections

     Save the new or updated datum corrections by entering an S.
This saves all the current changes that will be present the next
time you enter the datum-correction program. After saving the
datum corrections, you are returned to the program menu level.

8.3   Update/Display Shifts by Time

The ST_EDIT program allows the user to update and display shifts by time. When within the update program, no outside messages are sent to the screen.

8.3.1   Introduction

After selecting the agency code, site ID, etc., via the startup routine, this program checks to see if the specified site/year combination already exists in the Shift-By-Time File. If a site record does not exist, the program queries if shift data are to be added to the file. If the reply is NO, the program restarts.

If the reply to the program query is YES, the input form is displayed for entering shift-by-time values. If the shift record already exists, a menu appears from which selections can be made to update/change, delete, or list the shift values for the selected year. To do any editing to the shift values, an appropriate option must be selected.

If the update/change option is selected, the input form in which shifts are edited is displayed. The available editing options are listed at the bottom of the input form. Any listed options can be used to edit the shift values. Up to 100 shift values can be entered and stored for each water year, and are displayed as 28 entries per page.

If the delete option is selected, the first page of shift values is shown, and the user is queried if this is the record to be deleted. If the reply is YES, the entire year of shift values is deleted.

The list option is used to view the shift values on the screen, or to route the list to a previously selected output destination.

8.3.2   Shift-by-Time Update/Display Options

The shift-by-time input form update/display options that are available are as follows:

```
  Q - Quit with no save.
* E - Exit with no save.
* S - Save and quit.
  F - Page forward.
  B - Page backward.
  U - Up 1 line.
  M - Down 1 line.
* I - Insert line.
* D - Delete line.
* C - Change line.
* A - Add to the end of the list.
  X - Exit the current mode (usually entered
      in Column 1 or first field on the form).
```

These options are used throughout the following sections, and those preceded by an asterisk (*) are discussed separately.

8.3.3   Cursor Movement on the Shift-by-Time Form

The shift-by-time input form displays up to 28 shift values per page. To move the cursor from one shift value to another shift value, enter an M to move to the next one or a U to move to the previous one. It is not necessary to enter a <CR> after selecting an input-form option.

The shift values are displayed in four columns on a page. The first column contains the first seven shifts, the second column contains the next seven shifts, and so on up through the fourth column. If there are more than 28 shifts in the file, then they are stored on the succeeding pages. To see the next page of shift values, enter an F. There can be up to four pages of shifts for a site. To move back to a previous page, enter a B, which returns the page immediately preceding the current one.

8.3.4   Add a New Shift by Time

Add a new shift-by-time value to the end of the list by entering an A without using a <CR>. This automatically places the cursor at the end of the list after which the entry is then made. If there are no entries for the particular site, an A (Add mode) must be entered to begin adding entries. Enter the month, day, time, and shift value in the spaces provided. A <CR> is necessary after a value has been entered. After the <CR>, the cursor goes to the next line and a new entry is made. Enter as many shift values as needed while in Add mode. To discontinue entries and exit from Add mode, enter an X followed by a <CR>.

8.3.5   Insert a Shift by Time

Insert a shift-by-time value by placing the cursor on the line where the entry is to be made and then entering an I. The date and time of the inserted shift value must be between the shift value before it and the shift value after it, and only one correction can be inserted at a time. To exit from Insert mode without making an insertion, enter an X followed by a <CR>.

8.3.6   Change a Shift by Time

Change a shift-by-time value by placing the cursor on the line that is to be changed and then entering a C. This puts the user in Change mode, after which a new value is entered over the current one. Once in Change mode, a new value must be entered.

8.3.7   Delete a Shift by Time

Delete a shift-by-time value by placing the cursor on the value to be deleted and then entering a D. There is a prompt to ensure that this is the value to be deleted. The values are deleted one at a time.

8.3.8   Exit the Update/Display Shift-by-Time Program

       Exit the shift-by-time program and ADAPS by entering an E.
To stay within ADAPS and return to the program menu level, enter
a Q. Note: If data have been modified and not saved, they are
left unmodified when exiting.

8.3.9   Save New Shifts by Time

       Save the new or updated shift-by-time values by entering an
S. This saves all the current changes that have been made, and
will be present the next time you enter the shift-by-time
program. After saving the shifts, you are returned to the
program menu level.

8.4   Update/Display Variable Shifts

The SV_EDIT program allows the user to update and display variable shifts. When within the update program, no outside messages are sent to the screen.

8.4.1   Introduction

After selecting the agency code, site ID, etc., via the startup routine, the program checks to see if the specified site/year combination already exists in the Shift-By-Stage File. If a site record does not exist, the program queries if shift data should be added to the file. If the reply is NO, the program restarts.

If the reply to the program query is YES, the input form is displayed for entering variable shift values. If a shift record already exists, a menu appears from which selections can be made to update/change, delete, or list the shift values for the selected year. To do any editing to the shift values, an appropriate option must be selected.

If the update/change option is selected, the input form in which shifts are edited is displayed. The available editing options are listed at the bottom of the input form. The user can use any listed option to edit the shift values for the specified site/year combination. Up to 100 shift values can be entered and stored for each site and water year, and are displayed as seven entries per page.

If the delete option is selected, the first page of shift values is shown, and the user is queried if this is the record to be deleted. If the reply is YES, the entire year of shift values is deleted.

The list option is used to view the shift values on the screen, or to route the list to a previously selected output destination.

8.4.2   Variable Shift Update/Display Options

       The variable shift input form update/display options that
are available are as follows:

       Q - Quit with no save.
     * E - Exit with no save.
     * S - Save and quit.
       F - Page Forward.
       B - Page Backward.
       U - Up 1 line.
       M - Down 1 line.
     * D - Delete line.
     * C - Change line.
     * I - Insert line.
     * A - Add to the end of the list.
       X - Exit the current mode (usually entered
           in Column 1 or first field on the form).

These options are used throughout the following sections, and
those preceded by an asterisk (*) are discussed separately.

8.4.3   Cursor Movement on the Variable Shift Form

       The variable shift input form displays up to seven shift
values per page. To move the cursor from one shift value to
another shift value, enter an M to move to the next one or a U to
move to the previous one. It is not necessary to enter a
carriage return after selecting an input-form option. To see the
next page of shift values, enter an F. There can be up to 15
pages of shift values for a site. To move back to a previous
page, enter a B which returns the page immediately preceding the
current one.

8.4.4   Add a New Variable Shift

       Add a new variable shift value to the end of the list by
entering an A without using a <CR>. This automatically places
the cursor at the end of the list after which the entry is then
made. If there are no entries for the particular site, an A (Add
mode) must be entered to begin adding entries. Enter the month,
day, time, input value, and corresponding shift values in the
spaces provided. The inputs and shifts must be separated by a

blank or a comma. There must be three pairs of inputs and shifts on a line after the time data. These three points are entered with the first point being the lowest input and corresponding shift, to define a temporary shift (Vee) diagram. A <CR> is necessary after the last value has been entered. After the <CR>, the cursor goes to the next line and a new entry is made. Up to 100 shift values can be added while in Add mode. To discontinue entries and exit from Add mode, enter an X followed by a <CR>.

8.4.5   Insert a Variable Shift

     Insert a variable shift value by placing the cursor on the line where the entry is to be made and then entering an I. The date and time of the inserted shift value must be between the previous shift value and the next shift value, and only one correction can be inserted at a time. To exit from Insert mode without making an insertion, enter an X followed by a <CR>.

8.4.6   Change a Variable Shift

     Change a variable shift value by placing the cursor on the line to be changed and then entering a C. This puts the user in Change mode, after which new values are entered over the current ones. Once in Change mode, new values must be entered.

8.4.7   Delete a Variable Shift

     Delete a variable shift value line by placing the cursor on the value line to be deleted and entering a D. There is a prompt to ensure that this is the value line to be deleted, and the lines are deleted one at a time.

8.4.8   Exit the Update/Display Variable Shift Program

     Exit the variable shift program and ADAPS by entering an E. If you do not want to leave ADAPS, enter a Q to return to the program menu level. Note: If data have been modified and not saved, they are left unmodified.

8.4.9   Save New Variable Shifts

     Save the new or updated variable shift values by entering an
S. This saves all the current changes that will be present the
next time you enter the variable shift program. After saving the
shifts, you are returned to the program menu level.

8.4.10   Example of Percentage Shifts

     ADAPS does not have a percentage shift-by-recorded value
option, as may be required to process a quality-of-water (QW)
monitor record. However, this operation is duplicated by using
the variable shift program if a straight time correction is not
acceptable. An example of how this is done is given below.

          1. A field trip is run on May 1. At 1200 hours, the QW
              monitor for specific conductance (parameter 00095) is
              calibrated so that it agrees with the field conductance
              and with calibration standards. All recorded values
              throughout the range of values will be correct.

          2. The next field trip is run on June 1. At 1300 hours,
              the QW monitor indicates a conductance value of 100
              microsiemens per centimeter. However, the field
              instrument indicates a correct value of 120 and
              calibration standards also show the monitor reading to
              be 20 microsiemens per centimeter low (equal to 20
              percent of 100). These readings mean that a correction
              of 20 percent needs to be added to the monitor
              readings.

          3. Since the monitor, field instrument, and calibration
              standards agree on May 1, the error (drift) found on
              June 1 is assumed to have occurred uniformly between
              the two dates. The method to apply the needed
              correction is to use a percentage shift-by-recorded
              value prorated by time. This means starting with no
              correction on May 1, and prorating to a 20 percent
              correction on June 1. Since the corrections are addi-
              tions (not a multiplication) to the monitor values
              between May 1 and June 1 (i.e., computed values in
              ADAPS), three pairs of "shift" values are calculated as
              follows:

(a)   Select the lowest possible value for the parameter. In this example, conductance can only go as low as 10, so the lowest error value is equal to 20 percent of 10 (10 x 0.2 = 2.0). Therefore, the first pair of values for June 1 are 10.0 (for "stage") and 2.0 (for "shift").

(b)   The second pair of values for June 1 are based on the actual monitor and the field instrument readings. Subtracting, 120 - 100 = 20, that is 20 percent, values are 100 (for "stage") and 20 (for "shift").

(c)   Select the highest probable value for the parameter. In this example, assume conductance values will not exceed 10,000, so that the largest error is equal to 20 percent of 10,000 (10,000 x 0.2 = 2,000). Therefore, the third pair of values for June 1 are 10,000 (for "stage") and 2,000 (for "shift").

4.   The above information is summarized as follows:

o   For May 1, at 1200 hours, the three pairs of "stage" and "shift" values, respectively, are: 10.0, 0.0; 100.0, 0.0; and 10,000, 0.0.

o   For June 1, at 1300 hours, the three pairs of "stage" and "shift" values, respectively, are: 10.0, 2.0; 100, 20.0; and 10,000, 2,000.0.

Note: When using the variable shift program to process percentage variable shift value records, the screen headings, titles, and notes may be inappropriate for the parameter being processed.

8.5   Edit Unit Values

     The UV_EDIT program allows the user to view, edit, and
screen (verify) EDITED unit-values (UV) data. Program-specific
information is set by the user at the start-up menu invocation.
The information items particular to UV_EDIT are: output options,
station ID, DD ID, starting date, and batch setup for submitting
recomputation. Even though the actual editing and screening/
verification is performed interactively, the startup menu sets
the program to batch (BA) job mode. The batch mode information
is only used to submit an optional job for recomputing all
pertinent unit and daily values after the editing session. The
actual UV data editing and display screen consists of three
regions: the center region is filled with rows of time and UV's
descending in chronological order, the left region contains a
pointer or arrow that indicates the time and UV currently being
edited, and the right region displays messages from editing or
screening on the row containing the time and UV being addressed.

     The main functions of UV_EDIT are to:

     (a) scan edited unit values between specified dates,
         stopping and showing UV's that exceed the screening
         thresholds and allowing the user to edit the values
         around the value in question.
     (b) prevent the editing of UV's for a day when it is
         flagged as final data.
     (c) allow for the deletion of single values, consecutive
         values and/or all values between a starting date and
         time and an ending date and time.
     (d) allow the user to add edited unit values at a preset
         time interval or at user identified times; the editing
         begins at a starting date and time and continues until
         finished.
     (e) optionally recompute (perform primary computations)
         for time periods when an update of edited unit-values
         was made.

After selecting the startup menu information and entering a <CR>,
the main UV_EDIT menu options are displayed:

                    VE - VERIFY AND EDIT VALUES
                    ED - EDIT VALUES
                    DE - DELETE PERIOD OF RECORD
                    US - CHANGE USER INFORMATION
                    CL - CLOSE EDITING SESSION

8.5.1   Verify and Edit Values (VE)

The user supplies a starting and ending date to perform the unit-value verification or screening of data values. Screening threshold prompts follow for high value, low value, value-to-value test difference, and time between "consecutive values" test difference. A <CR> after any threshold prompt will default to no test for that threshold. The verification is then run from the starting date to the ending date, stopping at each value that exceeds a set threshold, pointing to that value, and giving the option to screen backward, screen forward, and add/delete/ change values. Following is the prompt for the VE screen:

```
          **** TYPE RETURN TO CONTINUE VERIFICATION ****
S-STOP EDITING; B-BACK A SCREEN; F-FORWARD A SCREEN; TIME<HHMMSS>
```

S - STOP EDITING will stop the editing session and return you to the previous menu. It will queue a batch job to recompute all days between the first and last days edited since last VE or ED.

F - FORWARD \
B - BACKWARD/   > will screen forward and backward through the record for the selected station and data descriptor regardless of day boundaries.

TIME<HHMMSS>   will accept times with 1, 2, 3, 4, and 6 digits; 5-digit times are not allowed. A leading zero is added to times of 1 and 3 digits and trailing zeroes are added to all times to form the correct 6-digit time input format. Colons in the time are OK (i.e., 10:12:59 will work).

<CR>   a carriage return will continue by running the verification, proceeding with the UV last verified.

Entering a value for time begins the editing session. The steps are as follows:

1. When the time entered matches an existing UV data
    time, the user has the option to change the UV or to
    delete one or more consecutive UV's. The following
    prompt is displayed:

    ENTER THE NEW VALUE (<CR> - TO DELETE VALUE):

    Note: If a <CR> was issued the next prompt would be
    displayed.

    NUMBER OF CONSECUTIVE VALUES TO BE DELETED (<CR> = 0):

2. If the time entered does not match an existing time,
    the user has two add options: to add a single UV for
    each time manually entered, or to give a time interval
    to automatically generate times to assign UV's to.
    For example, an interval of 60 minutes would produce
    prompts for UV's at hourly time intervals into the day
    (0100, 0200, 0300, 0400, etc.). The following prompt
    is displayed:

ENTER AUTOMATIC ADD TIME INTERVAL (<CR> - TO MANUALLY ADD TIMES)

    An entry other than <CR> produces the next prompt:

    !!!! TYPE RETURN WHEN DONE ADDING VALUES !!!!
    TIME xx:xx:xx: ADD NEW VALUE -->

    At the value prompt, enter the UV or one of the
    following data replication and interpolation codes:

    P - FILL IN VALUES WITH PREVIOUS VALUE
    N - FILL IN VALUES WITH NEXT VALUE
    I - FILL IN VALUES WITH LINEAR INTERPOLATED VALUES

    If an automatic interval is selected for the above
    three option codes, you are prompted on how many
    values you want to automatically insert. If the
    automatic option is not used (using manual), the
    program prompts for the time and performs the data
    replication and interpolation option(s) on only that
    time and UV. The manual or automatic time interval
    asks how far (in days) to search for the previous (P)
    and/or next (N) values. If you select the I or N
    option and no next value is located within the time
    interval of the number of values you want inserted,
    the add will not work and you are notified that no
    next value was found. If more values are to be

inserted than there is space to insert, the insertion
fills the available space and tells you how many
values were inserted.

The verification proceeds with the value immediately
following any added/changed/deleted values. After verification
is complete, you have a chance to submit the batch recomputation
job and return to the UV_EDIT main option menu.

8.5.2   Edit Values (ED)

The options for ED are the same as VE. However, in ED there
is no reference to or ability to run the verification tests. The
<CR> in the data display/editing screen simply repaints the
screen, whereas the <CR> continues the verification for the VE
option.

8.5.3   Delete a Period of Record (DE)

Delete only computed UV's or delete edited UV's by entering
the begin date and time and the end date and time when prompted.
If times are left out, deleting begins at the start of the begin
day and deletes all records until the end of the end day.

The program completes the deletion and gives the option to
submit the batch job to perform primary computations. If not
submitting the job now via UV_EDIT, submit the job later using
the main primary processing program, PRIMARY. A recomputation
after deleting edited UV's will delete the corresponding
unprotected computed UV's and DV's for this DD and its related
DD's. For example, deleting edited stage and then recomputing
will cause the deletion of previously computed stage and
discharge records. Recomputing after deletion or editing is
recommended, since the computed UV's and DV's should reflect the
modifications to the edited data.

8.5.4   Change User Information (US)

        This option returns to the startup menu where the user can
change any site-specific options.

8.5.5   Close Editing Session (CL)

        The CL option terminates the editing session and returns the
user to an ADAPS program selection level or menu.

NOTES: Quitting or exiting during the actual data editing
        session will cause unpredictable results (i.e., the
        editing done on the day you were in at the time of the
        exit is not saved, while other edited data are saved, and
        without the recomputation of the data performed). Please
        exit the editor through the menu options path!

        The ADAPS Unit-Values File is limited to 1,440 values per
        day.

8.6   Primary Computations

The primary computations program (PRIMARY) allows the user to select the station number, the data descriptor, the time period to be processed, and the destination of the printed output before proceeding with interactive or batch mode computations. Once these user values are set, the program then loads the applicable processor file record(s) and uses those values along with the initial values to complete the processing automatically.

Note the following constraints when running the primary computations program:

1.   The date range given for primary computations cannot cross a water-year boundary (October 1 and September 30), but will prorate shifts, datums, and ratings automatically across water years. This ensures the continuity of computations across the water-year boundaries, even though you can only specify computation periods within a water year.

2.   The primary computations are performed from the input or base DD record. For example, for computations involving one parameter or DD, like pH or DO (dissolved oxygen), it's the DD for that parameter. For two parameter/DD computations, i.e., stage-discharge, the stage is the input or the data source DD. In three parameter/DD computations, i.e., slope and velocity computations of discharge, the stage input is the base DD. For a slope computation, the stage input from the base gage DD is the input data, not the auxiliary gage DD. For the velocity-discharge computations, the stage input from the base gage DD is the input data, not the velocity DD which is considered the auxiliary DD.

3.   For primary computations or SATIN computations to proceed, all DD's involved in the computation must have processor (PR) records. If any processor record is missing, the message NO ACTIVE PROCESSING FOR THIS STATION is displayed. The message also tells which DD type (INPUT, OUTPUT, or AUXiliary) was missing its processor record. If the primary computations were run as a batch job, the message will be in the error file along with the station ID and DD ID.

4. Primary computations cannot be performed during a
    water year where FINALIZED daily-values records
    already exist for the DD's concerned in the
    computation. For example, a slope station cannot be
    recomputed anytime in a particular water year if any
    one of the DD's involved in the computation (base gage
    height, auxiliary gage height or discharge) has a
    daily-values record for any statistic in that water
    year marked FINAL.

5. The limit on the total number of rating changes that
    can be accommodated for any one site/DD during a
    computation is 500.

In ADAPS, standard time corrections (discussed in sec.
7.3.2) can be applied to the values, and a historic type primary
(described in sec. 3.10) can be subsequently requested. However,
it is probable that the values shown on the right side of the
primary are interpolated values (the standard time correction is
a true time correction). Therefore, if historic primaries are
desired historic time corrections should be requested.

After the interactive computations are completed, you are
asked if you want additional computations. If YES, the values
from the initial selection are again displayed. These values can
be changed to perform another primary computation. If no further
computations are wanted, select another menu or exit from the
system.

The batch mode primary computations option uses a control
file to direct the computations. An existing control file may be
used as input to the program, or a new one can be created based
on a single data descriptor, a single instrument, or a group. In
addition, a batch queue must be selected for job submission, and
a file name must be supplied for logging of processing errors.
The same limitations mentioned in the previous section are
applicable with the batch processing.

Steps leading up to performing the primary computations
are presented in Attachment C.

8.7   Edit Daily Values
————————————————

        The DV_EDIT program allows the user to edit daily values.
Valid daily values remarks flags are listed, and editing options
are explained. When within the edit program, no outside messages
are sent to the screen.

8.7.1   Introduction

        After the startup routine is used to select the agency code,
site ID, etc., this program checks if the specified site/year
combination already exists in the Daily Values File. If the
combination does not exist, the program queries if one is to be
added to the file. If NO, the program restarts.

        If the site/year combination record does exist, the program
displays information for the particular site/year combination.
Once the information is validated, an entry/update menu is
displayed. If the entry/update option CH is selected, you are
prompted to supply the starting month. After entering the month,
the input form used to enter or update daily data is displayed.
Options to use with the form are shown at the bottom of the
display. To do any editing of the data, select an appropriate
option.

        Daily-values data may be added, changed, deleted, or listed.
The input form stores the data by months. There are 12 pages of
daily-values data, each page corresponding to a month. The
numbers shown on the input form correspond to the days of each
month.

        The valid remarks flags or codes (shown as Column F on the
input form) are:

        E or e = Estimated (the small e is always
                 printed on the daily-values table).
        < = Less than.
        > = Greater than.
        1 = Value is "Write" protected (i.e., cannot
             be changed unless the flag is turned off).

Column R on the form allows the user to enter alternate rounding specifications (number of significant figures) for that particular value. If no R value is entered when updating, the default value is displayed.

If the delete option in the entry/update menu is selected, the first month of data is shown, and you are queried if this is the record to be deleted. If YES, the entire water year of daily values is deleted.

8.7.2   Daily Values Input-Form Options

The daily-values input-form options that are available are as follows:

```
     Q - Quit with no save.
   * E - Exit with no save.
   * S - Save and quit.
     N - Next month.
     P - Previous month.
     R - Right 1 column.
     L - Left 1 column.
     U - Up 1 line.
     M - Down 1 line.
   * C - Change line.
   * A - Add values to list.
     X - Exit the current mode.
```

These options are used throughout the following sections, and those preceded by an asterisk (*) are discussed separately.

8.7.3   Cursor Movement on the Daily-Values Input Form

The daily-values input form displays all the days of each month. To move the cursor from one day to another day, enter an M to move to the next day or a U to move to the previous day. It is not necessary to enter a carriage return after selecting an input-form option. The cursor can also be moved from one column to another. By entering an R, the cursor moves one column to the right, and by entering an L the cursor moves one column to the left. The daily-values data are displayed in four columns per page. The first column contains the first 8 days, the second column contains the next 8 days, and so on up through the fourth column. To view the next month of daily values, enter an N. To view the daily values for the previous month, enter a P which returns the month immediately preceding the current one. Note

that the program does not allow data editing outside of the water year.

8.7.4   Add a New Daily Value

Add new daily-values data anywhere in the file by moving the cursor to where the entry (month and day) is to be made and entering an A without using a <CR>. This automatically places you in Add mode to make an entry or entries. In Add mode, enter the value for the write-protect flag (this is different than the ACL Write), the rounding code, and the data value. Entry of the write-protect flag and the rounding code is optional. A <CR> is used after entering the data value. After the <CR>, the cursor moves to the next line for a new entry. As many daily values as desired can be entered while in Add mode. To discontinue entries and exit from Add mode, enter an X followed by a <CR>.

8.7.5   Change a Daily Value

Change a daily value by placing the cursor on the line that needs to be changed and then entering a C. This puts you in Change mode, after which remarks flags, alternate number of significant figures, and the new daily value can be entered over the current value. Once in Change mode, enter a new daily value.

8.7.6   Exit the Daily-Values Update Program

Exit the update program and ADAPS by entering an E. If you do not want to leave ADAPS, entering a Q returns you to the program menu level. Note: If data have been modified and not saved, they are left unmodified.

8.7.7   Save Daily Values

Save the new or updated daily values by entering an S. This saves all the current changes that were made, and will be present the next time you enters the daily-values edit program. After saving the daily values, you are returned to the program menu level.

9   DATA DISPLAY

This section presents the programs used to display daily and unit values in tabular form on a terminal screen or printer. Data can also be displayed in graphical form.

9.1   Daily-Values Tables

The DVTABLE program is used to produce all types of daily-values tables.

9.1.1   Introduction

The program produces tables of daily-values data. Five basic table types are available: single station/parameter code/ statistic code combination tables, two statistic tables, three statistic tables, suspended sediment discharge/concentration/load tables, and concentration/load tables. The single station/ parameter code/statistic code combination tables are available in a skeleton format with various forms of monthly and annual summaries also available. Single station/parameter code/ statistic code combination tables can be printed with the body of the table suppressed and with only the monthly and annual summaries shown. Metric and other conversions of table units are also available.

The DVTABLE program can run in either an interactive mode, where your terminal is tied up while the tables are being produced, or as a batch job preprocessor, where the actual table production is done as a PRIMOS batch job. When run in batch mode, the program produces a DVTABLE control file. The control files are written in ASCII format so they can be manually edited and modified if desired. However, if an existing control file

requires extensive changing to meet new needs, it is suggested
that the DVTABLE program be used to create a new control file.

9.1.2   Program Operation

        The DVTABLE program operation is controlled through a series
of three menu screens.

        The first menu screen controls the tabling options. The
menu displays the user's current settings, each option category
identified with a two-character identifier. Any of the displayed
options can be changed by entering the two-character identifier
of the option to be changed. The options available and the table
types to which the options apply are:

    TY (all table types) - Select table type.

    SU (type 1 only) - Select table summary options.

    RM (all table types) - Turn printing of remark codes
       on/off.

    RN (all table types) - Turn rounding of values on/off.

    BD (type 1 only) - Turn suppression of body of table
       on/off.

    MO (type 1 only) - Turn suppression of monthly summaries
       off.

    AN (type 1 only) - Turn suppression of annual summaries
       on/off.

    SS (all table types - Turn summary suppression when data
       are missing on/off.

    PR (all table types)- Specify whether, if you use a group,
       you want all station/DD combinations to use the same
       retrieval period.

    SC (types 1, 2, 3, and 5) - Specify statistic codes to
       use.

    DS (type 1 only) - Specify whether, if you use a group,
       you want all station/DD combinations to use the same
       statistic code list.

FM (type 1 only) - Specify the first month to print when a narrow (6-month) table is printed. A narrow table will be printed when you route print to either an 80-column terminal or an 80-column printer.

PC (type 5 only) - Specify the concentration parameter code.

PL (type 5 only) - Specify the load parameter code.

CU (all table types) - Turn units conversion on/off. The selection of conversions will be done in the third menu screen.

The second menu screen is the standard ADAPS startup menu. Select an option from the menu such as batch/interactive mode, station/group, or output routing.

The third menu screen is displayed only if conversion of units was selected in the first menu screen. If selected, a list of the parameters to be tabled in the current session is displayed; specify conversion for any or all of them.

9.2   Print/Display Unit-Values Tables

The UV_TABLE program allows the user to display the values stored in the Unit Values File in tabular form. Either edited or computed (if stored) unit values can be displayed or printed.

9.2.1   Introduction

Select a single station and parameter or a group of stations and parameters, the starting and ending dates, and the destination of the tables (user's terminal, specified file, or specified printer). Next, the unit-values tabling option list is displayed, with tabling defaults, and you are queried on what options to change, restart the program, quit the program, or <CR> to execute the unit-values tables with the selected options indicated. The available options are discussed in the following sections.

9.2.2   Changing Type of Data Viewed

This option queries whether to view output-computed or input-edited unit values. The default on entering the program is to view computed unit-values data. Therefore, unless you need to view edited unit values, this option is not needed. Entering TY and <CR> changes the type of unit value, if needed. After the single query, you are returned to the program menu level.

9.2.3   Table Type

     This option allows selecting the type of unit-values table to be displayed. The available unit-values table types are:

* UNIT-VALUES INVENTORY TABLE, a table similar to a daily-values table but showing the number of unit values stored per day in the Unit-Values File, and whether the day of unit values is marked FINAL or considered a partial day of unit values based upon the daily values abort time limit stored in the processor record.

* STANDARD UNIT-VALUES TABLE, which shows information about the station, the date (year, month, day), the type of data (computed or edited), the time zone, the times (hours, minutes, seconds), the data values, and the screening/source codes, one day per page.

* COMPRESSED UNIT-VALUES TABLE, which shows information about the station, the date (year, month, day), the type of data (computed or edited), the time zone, the times (hours, minutes, seconds), the data values, and the screening/source codes, putting as many days on one page as will fit.

* ON-HOUR HOURLY ONLY TABLE, which shows information about the station, the date (year, month, day), the type of data (computed or edited), the time zone, and the data values that fall exactly on the hour (all other data values are ignored).

9.2.4   Unit-Values Conversion

     This option allows the tabling of the unit values converted to different units than as stored. A list of available conversions for each parameter being tabled is displayed, along with an option for a user-defined conversion. If the user-defined conversion is chosen, you are queried for the elements of a conversion equation and a label to be used for identifying the conversion units.

9.2.5   Rounding

        This option is used to "toggle" between the normal rounding
and the suppressed rounding of the unit values being tabled.

9.2.6   Restart Program

        You can restart the program and display the last information
stored in the User File, and subsequently change any of the items
displayed to obtain more unit-values tables.

9.3   Plot Hydrographs Using Preprinted Forms

The HYDROGRAPH program produces single water year plots of daily-values data on preprinted hydrograph forms. Note that the preprinted forms (Form 9-285B) can be ordered using the U.S. Geological Survey forms catalog.

9.3.1   Introduction

The program runs interactively and produces graphics output for any device supported by the DISSPLA (Integrated Software Systems Corporation, 1984) graphics software package. Up to 4 water years of data may be overlaid on a single plot. The Y (vertical) axis may be either logarithmic or linear. The use of preprinted forms saves time because the grid plotting does not have to be done during the plotting operation. Some hydrograph plots will have tic marks on the Y axis at the value of the basin drainage area.

9.3.2   Program Operation and Options

Initially, a list of graphics devices is presented. The options and devices are listed below (TEK means Tektronix, and HP means Hewlett-Packard).

T) TEK 4010 and TAB terminals with graphics,
C) TEK 4105 color terminal,
F) TEK 4010 or TAB terminal with hardware
   characters,
G) GRAPHON graphics terminal,
H) HP 7586 plotter,
N) LP80, 80-column line-printer plot,
O) LP132, 132-column line-printer plot, and
.) DISSPOP, the DISSPLA postprocessor.

Through the ADAPS startup routine, select plot output destination, plot file name (if needed), station/data descriptor/group selection, and water   ars to plot. Next, a menu of plotting options is presented, described as follows:

FO - Form Choice. The user is asked to specify which preprinted form is to be used. A special file, called

WATSTORE>ADAPS>REV85.1>AUXDATA>HYDROGRAPH.FORMS

is maintained by the Data Base Administrator. This file contains a list of the forms available in ADAPS and the specific form parameters needed by the plot software to align the plots correctly on the form. These form parameters include paper size, the grid size, title offsets, etc.

NF - Plots per Frame. This number specifies the number of water years of data to be overlaid on a single plot. A maximum of four plots per frame is allowed.

MS - Plot Measurements. If plotting discharge and also plotting 1 water year of data per plot, the user has the option to plot measurements from the measurement file overlaid on the discharge plot.

LP - Axis Type. The user is given the choice of a linear or logarithmic Y (vertical) axis. This choice depends upon on the preprinted form that is or will be loaded on the plotter.

MD - Years or Stations per Frame. If more than 1 water year of data is to be overlaid on each plot, the user may specify whether the overlay is to be a comparison of several different water years, or of several different station/Data Descriptor combinations.

PN - Lift Pen for Missing Data. The user can select whether or not to have the plotter pen lift for missing days of record.

AN - Plot Annotation. The user can specify the station name and give a date.

After all selections are made, the data to be plotted are processed and plot files are created (if necessary).

9.4   Plot Time-Series Data

The PLOTWAT program allows the user to display and analyze time-series data.

9.4.1   Introduction

In the course of analyzing hydrologic data, either when computing the data or when performing hydrologic studies, it is important to be able to review the data graphically. Also important is to be able to compare data from different locations graphically, or to compare several different types of data for a single location or for several locations.

9.4.2   Program Capabilities

The display and analysis program, called PLOTWAT, is an interactive program that provides the capability of plotting multivariate or univariate time-series data taken from the Unit, Daily, or Measurement/Crest Stage Gage (CSG) ADAPS files. PLOTWAT can plot up to 32 time series simultaneously. Multiple time series can be plotted on a single plot or on a series of plots, drawn side by side. The 32 time-series maximum, as well as PLOTWAT's memory capacity, may be increased at a site by editing the file named PLOTWAT.SIZE located under the pathname WATSTORE>ADAPS>REV85.1>ADRSRC>PLOTWAT.

A wide variety of plot types can be produced. Line or bar plots can be drawn with linear or logarithmic axes. The line type, plotting symbol, or bar-shading patterns for each time series can be varied, as can the color, if a color graphics device is used.

The PLOTWAT program has two additional types of plots: step and impulse. A step plot is similar to a line plot. However, instead of connecting each pair of consecutive values with a line, the values are connected with two lines, a vertical line followed by a horizontal line. Step plots are appropriate when values being plotted are based on a statistic computed fc. each time interval. Step plots preserve the timing of the data and also clearly show that the data are noninstantaneous.

Impulse plots are appropriate when the data are viewed as a series of discontinuous events. This is useful for plotting tipping-bucket tips, recorded using an event-based recorder.

The user can specify a host of different parameters which govern the appearance of individual plots, or PLOTWAT will select parameters automatically. Having specified retrieval and plotting information, the user can save this information for later analyses. Because PLOTWAT interfaces directly to the ADAPS system, it is easy to interactively plot different types of data and examine data from different time periods without having to move data from one software program to another.

The PLOTWAT program also will pick the default plot type for each time series, based on the statistic code of the data:

● For instantaneous data (statistic codes: 00011 and 3xxxx), such as unit-value discharge, line plots will be the default.

● For sum or total data (statistic code: 00006), such as precipitation or evaporation data, bar plots will be the default.

● For all other statistic codes, step plots will be used, by default.

The PLOTWAT program has a data modification menu that allows performing several types of transformations on data, including time lagging.

Another feature of PLOTWAT is that it is possible to divide each value by the associated time period. The main application of this is to plot precipitation data. The PLOTWAT program allows you to plot precipitation intensities (the default), rather than sums, which is critical when comparing precipitation records that have different recording intervals. For example, if you plot hourly precipitation volumes on the same plot with 5-minute precipitation volumes, the volume for hourly data often appears larger even if the actual volume of the two records is the same. Plotting intensities, rather than volumes, overcomes this problem.

9.5   Plot Ratings on Preprinted Forms

        The RATPLOT program plots ratings, along with selected
measurements, on preprinted forms or on blank forms.

9.5.1   Introduction

        The RATPLOT program plots ratings on preprinted forms; both
the log-log and rectilinear parts are plotted. Optionally,
selected measurements can be plotted on the rating curve. The
program plots on the large (4 cycles by 3 cycles) or small (3
cycles by 2 cycles) rating forms. Also, the RATPLOT program
plots on blank paper and draws the grid lines.

9.5.2   Program Operation and Options

        The RATPLOT program operates interactively. Select the
plot output destination, data base, and station to be processed,
by using the ADAPS startup menu. When the RATPLOT program is
executed, it selects values to generate an initial ratings plot,
which is displayed on the screen. After viewing this initial
plot, the user can alter it by selecting options, which are
displayed on a menu. Following is a brief description of the
menu options:

        Option 1 is used for changing the previously selected plot
output destination. Any plotting devices used by ADAPS will work
with RATPLOT.

        Option 2 asks whether or not to plot grid lines. If YES,
the program plots major grid lines. No grid is used for plotting
on preprinted forms. If the response is NO, the plot origin is
shifted to allow for the plotter to be aligned with the
preprinted form. The plotter pen should be set at the lower left
corner of the first log cycle to begin the plot.

        Option 3 allows selecting measurements to be plotted.
When the date is entered, measurements subsequent to this date
are flagged and numbered. The program then asks for a discharge
value; measurements above this value and prior to the date
entered are plotted as unnumbered dots. These measurements
represent carry-over high-water measurements from year to year.
Next, the program asks whether you want to plot ice measurements.

If YES, measurements will be plotted when control conditions are entered as ice cover or shore ice in the ADAPS 9-207 file (i.e., Measurement File). Measurements selected use the inside gage heights for plotting, unless a null value exists, in which case the outside gage height is used.

Option 4 is used for selecting the height of text for rating plots. Select "height of text = 0.16" for screen plots; select "height of text = 0.14" for plotting on paper.

Option 5 is used for selecting a scale offset that would best yield a straight line. You are prompted for the scale offset, the first log-cycle interval for gage height (i.e., 0.1, 1, 10), and the beginning discharge value for the log scale.

Option 6 allows positioning or expanding the rating by selecting the bottom gage height. The gage height increment always remains a constant 0.10 feet.

Option 7 allows positioning or expanding the rating on the rectilinear scale by selecting beginning cfs value and cfs increment. Note: A beginning value of less than 0.00 is valid, and sometimes this is useful when positioning the plot.

Option 8 generates the plot to the user-selected plotter.

Option 99 exits the RATPLOT program's menu and returns you to the main ADAPS menu.

10   DATA RETRIEVAL

This section presents the programs that are used to retrieve unit-values, daily-values, and measurement data into transportable (machine-readable) files. The programs provide for retrieval (reading and writing) of data from these time-series data files in a number of different formats.

PROGRAM NAME	TASK DESCRIPTION	SECTION
RETR_DV -------	Retrieve/write daily-values data	10.1
OUTWAT --------	General retrieval of time-series data ...	10.2

10.1   Retrieve/Write Daily-Values Data

The RETR_DV program allows the user to retrieve and write daily-values data as machine-readable output in the following formats:

- 80-column WATSTORE (Hutchison, 1975) Types 2 and 3 card formats.

- 80-column WATSTORE Types Z, H, N, 2, and 3 card formats.

- 408-byte WATSTORE monthly format.

- 1656-byte WATSTORE yearly format.

- 2560-byte ADAPS yearly format.

10.1.1   Introduction

This program retrieves daily-values data and variables from the respective ADAPS Daily Values, Site, Data Descriptor, Parameter Code, and Statistic Code files, and subsequently uses this information to create machine-readable output records in a single file. The output record or group of records comprise the data for each water year retrieved and outputted. The first four

output options mentioned in section 10.1 include output formats that are available in WATSTORE on the mainframe computer.

The machine-readable records that are created are primarily for use by "application" or postprocessor programs, which the user must develop or already have available.

10.1.2   Program Operation and Options

The RETR_DV program is straightforward. The program initially calls the ADAPS startup program in which you specify the station, data descriptor, and year(s) to be retrieved. A water year period-of-record retrieval is specified by keying 9999 for both the begin and end years. Years other than a water year can be specified by entering a starting month and year. Next, the program queries for the output file name; if no file name is given, the default name is supplied by the program by entering a <CR>. The default name is of the form:

                          DV.RETR.yymmdd.hhmmss
                    where
                          yymmdd = year, month, day, and
                          hhmmss = hour, minute, second.

This output file is subsequently written into the user's origin directory.

The program then asks for the type of output file format. The options are:

   (1)   80-column Types 2 and 3 card format(s). See next option for Types 2 and 3 card information.

   (2)   80-column Types Z, H, N, 2, and 3 card format(s). All data are in a character format. Type Z card presents the Agency Code for the station, the H and N cards present selected Site File information, the Type 2 card presents site/data identification information, and the Type 3 cards present year/month/sequence information, along with data values.

(3)   408-byte monthly format.
      This record presents monthly data in a character
      format. One year of data generates 12 monthly
      records. Selected Site File information is
      included in each record, along with the daily
      values for the month.

(4)   1656-byte yearly format.
      This record presents yearly data in a mixture of
      character and numeric data. It also includes
      selected Site File information.

(5)   2560-byte yearly format.
      This record also presents yearly data in a
      mixture of character and numeric data. It
      includes more Site File and supplementary
      information about the station than any of the
      other formats. Some of this supplementary
      information is unique to ADAPS. This record is
      like a dump of the data as stored in the computer
      files.

The record layouts for formats 1-4 are described in detail
in the WATSTORE User's Guide (Hutchison, 1975), Sections III-B
and IV-B. They are also discussed and summarized in the next
several sections of this manual, along with the layout of the
record for option 5. The RETR_DV program records for options 1-3
are created as formatted records since they are all character
data, and those for options 4 and 5 are created as unformatted
records because they are a mixture of character and numeric data.

The program continues by querying for a statistic code. All
other needed retrieval information was specified via the initial
startup operation in the RETR_DV program. You must know what
statistic code(s) are applicable to stored Daily Values File
data. Statistic Code 3 (mean) is the most common one. Others
may be: 1 (maximum), 2 (minimum), 6 (sum), and a code of 30000
plus the hour (in military time), e.g., 32400 to designate a
midnight reading. You may specify up to 10 statistic codes to be
retrieved.

Finally, the program queries if you want to only retrieve
records flagged as FINAL data. If no, both FINAL and PROVISIONAL
data are retrieved and output.

The program then continues by displaying file processing
messages, creating temporary control files, which are later
deleted, and retrieving specified records. A message is

displayed as records are retrieved; if no messages appear to indicate that data are being retrieved, then the specifications may be erroneous. Records are output to the file specified in your ADAPS origin directory. You can do retrievals repeatedly with the RETR_DV program. Be aware that each retrieval creates a separate and independent file in your ADAPS origin directory. This file may be empty if no data were retrieved.

10.1.3   Descriptions of Output Daily-Values Records

A description for each type of output record (80-, 408-, 1656- and 2560-byte) created from retrieved daily-values records are given in tables 2-5. In the tables, TYPE refers to the data type (method of representation in the computer) of the variables. "C5" means that the variable is stored as a character variable which is five characters (bytes) long, "R" means that the variable is a real number, and "I" means that the variable is an integer. ARRAY is the size of dimensional arrays where applicable. SUM (end-column number) is the running total of bytes or characters (integer numbers are equivalent to either two or four characters, and real numbers are equivalent to four characters). On output, if the variable is character data, the field is usually blank if no data are available. Fields needing additional description are footnoted in the tables.

Table 2 shows the layouts of the Types Z, H, N, 2, and 3 80-column WATSTORE records, and tables 3, 4, and 5 show the layouts of the 408-byte WATSTORE monthly, the 1656-byte WATSTORE yearly, and the 2560-byte ADAPS yearly records, respectively. These formats (except the 2560-byte format) are documented in the WATSTORE mainframe computer manuals.

Table 2.--Retrieved 80-column daily-values records

___

● TYPE Z

VARIABLE	TYPE	SUM
Record Type Z	C1	1
Reserved	C31	32
Agency Code	C5	37
Reserved	C43	80

● TYPE H

VARIABLE	TYPE	SUM
Record Type H	C1	1
Station Identifier	C15	16
Latitude	C6	22
Longitude	C7	29
Sequence No.	C2	31
State Code	C2	33
District Code	C2	35
County Code	C3	38
Site Code	C2	40
Hydrologic Unit Code	C8	48
Total Drainage Area	C7	55
Contributing		
Drainage Area	C7	62
Gage Datum (elevation)	C8	70
Well Depth	C9	79
Reserved	C1	80

● TYPE N

VARIABLE	TYPE	SUM
Record Type N	C1	1
Station Identifier	C15	16
Station Name	C48	64
Geologic Unit Code	C8	72
Aquifer Type	C1	73
Reserved	C7	80

___

Table 2.--Retrieved 80-column records--Continued

_____

● TYPE 2

VARIABLE	TYPE	SUM
Record Type 2	C1	1
Station Identifier	C15	16
Cross Section Location	C6	22
Depth Locator	C6	28
Parameter Code	C5	33
Statistic Code	C5	38
Reserved	C16	54
Always ENT	C3	57
Reserved	C23	80

● TYPE 3

VARIABLE	TYPE	SUM
Record Type 3	C1	1
Station Identifier	C15	16
Calendar Year Date	C4	20
Month Designation 1/	C2	22
Card Sequence Number 2/	C2	24
Daily Values 3/	C56	80

_____

1/ Month designation. '01' is January; '12' is December.

2/ Two-digit number representing the fraction of the month that the daily values represent.

Code	Days
01	1-8
02	9-16
03	17-24
04	25-31

3/ Daily data. Eight 7-column fields that contain the daily data for the designated day. Blank fields indicate no data are available for that day.

Table 3.--Retrieved 408-byte daily-values monthly record

VARIABLE	TYPE	ARRAY	SUM
Reserved	C1		1
Agency Code	C5		6
State Code	C2		8
Station Identifier	C15		23
Cross Section Location	C7		30
Depth Locator	C7		37
Parameter Code	C5		42
Calendar Year Date	C4		46
Month Designation	C2		48
Statistic Code	C5		53
Reserved	C7		60
Daily Values 1/	C217	(31)	277
District Code	C2		279
County Code	C3		282
Station Name	C48		330
Total Drainage Area	C7		337
Contributing			
Drainage Area	C7		344
Well Depth	C8		352
Gage Datum	C7		359
Hydrologic Unit Code	C8		367
Aquifer Type	C1		368
Site Code	C2		370
Latitude	C6		376
Longitude	C7		383
Sequence Number	C2		385
Geologic Unit Code	C8		393
Final/Provisional Flag	C1		394
Reserved	C14		408

1/ Daily data. Thirty-one daily values (7 characters each).
   Blank field indicates no value available.

Table 4.--Retrieved 1656-byte daily-values yearly record

VARIABLE	TYPE	ARRAY	SUM
Reserved	C2		2
State Code	C2		4
Agency Code	C5		9
Station Identifier	C15		24
Cross Section Location 1/	R4		28
Depth Locator 1/	R4		32
Parameter Code	I4		36
Calendar Year Date	I2		38
Statistic Code	I2		40
No Value Indicator 1/	R4		44
Daily Values 1/ 2/	R4	(12,31)	1532
Reserved	C3		1535
State Code	C2		1537
County Code	C3		1540
Station Name	C48		1588
Total Drainage Area 3/	R4		1592
Contributing			
Drainage Area 3/	R4		1596
Well Depth 1/	R4		1600
Gage Datum 1/	R4		1604
Hydrologic Unit Code 1/	I4		1608
Retrieval Sequence Number	I2		1610
First Month Number	I2		1612
Site Code	C2		1614
Latitude	C6		1620
Longitude	C7		1627
Sequence Number	C2		1629
Geologic Unit Code	C8		1637
Reserved	C1		1638
Aquifer Type	C1		1639
Final/Provisional Flag	C1		1640
Reserved	C18		1656

1/ A value less than or equal to the No Value Indicator (byte
   positions 41-44), indicates that no value is stored.
2/ Daily data. A 2-dimensional array (12,31) containing all of
   the values for a 12-month period. In ADAPS, the data are
   stored in the array beginning with the first month (byte
   positions 1611-1612); that is, if a water year is the yearly
   period, October is the first month outputted and September is
   the last. (Note that in WATSTORE, the first 3 months for a
   water year--October, November, December--are outputted at the
   end of the array).
3/ A value of 0.0 or a value less than or equal to the No Value
   Indicator indicates no value stored.

Table 5.--Retrieved 2560-byte daily-values yearly record

VARIABLE	TYPE	ARRAY	SUM
Agency Code	C5		5
Station Identifier	C15		20
DD Identifier Number	C4		24
Year	C4		28
First Month Number	I4		32
Daily Values 1/ 2/	R4	(31,12)	1520
Write/Protect Flags	C1	(31,12)	1892
Daily Rounding Flags	C1	(31,12)	2264
Rounding Specifications	C1	(10)	2274
Parameter Code	C5		2279
Statistic Code	C5		2284
Short Parameter Name	C20		2304
Short Statistic Name	C20		2324
Missing Value Indicator 2/	R4		2328
Work File Flag	C2		2320
Optional File Description	C30		2360
Cross Section Location 3/	C8		2368
Depth or Elev. Locator 3/	C8		2376
Station Name	C50		2426
Latitude	C7		2433
Longitude	C8		2441
District Code	C3		2444
State Code	C2		2446
County Code	C3		2449
Gage Datum (elevation)	C8		2457
Hydrologic Unit Code	C16		2473
Site Codes 4/	C1	(20)	2493
Total Drainage Area	C8		2501
Contributing Drainage Area	C8		2509
Primary Water Use Code	C1		2510
Aquifer Type Code	C1		2411
Aquifer (geologic) Type	C8		2519
Well Depth	C8		2527
River Mile (above month)	C8		2535
Final/Provision Flag	C1		2536
Reserved	C24		2560

1/ Daily data. A 2-dimensional array (12,31) containing all of the values for a 12-month period. In ADAPS, the data are stored in the array beginning with the first month (byte positions 29-32); that is, if a water year is the yearly period, October is the first month outputted and September is the last. (Note that in WATSTORE, the first 3 months for a water year--October, November, December--are outputted at the end of the array).

2/ A value less than or equal to the No Value Indicator (byte positions 2325-2328), indicates that no value is stored.

3/ A value of 0.0 or a value less than or equal to the Missing Value Indicator indicates no value stored.

4/ A string of Y's, N's, or both; this is unique to the Prime NWIS Site File.

10.2   General Retrieval of Time-Series Data

The OUTWAT program allows the user to retrieve time-series and measurement file data.

10.2.1   Introduction

The OUTWAT program provides the ability to retrieve time-series data and other data from ADAPS. The OUTWAT program is menu-based, similar to the PLOTWAT program (sec. 9.4), which allows the user to set up retrieval parameters for a large number of stations or time series, and to retrieve the data in a variety of formats. By default, up to 256 stations or time series can be specified at one time. This limit can be increased for an office by editing the file named OUTWAT.SIZE under the pathname WATSTORE>ADAPS>REV85.1>ADRSRC>PLOTWAT.

10.2.2   Program Capabilities

The OUTWAT program can be used to retrieve the following:

- Time-series data (which include Unit-/Daily
  Values File and Measurement/Inspection File data),
- Measurement File records (complete data for
  each station),
- Site File records,
- Variable Shift records
- Rating File data

Data can be retrieved and outputted in a variety of formats, which include:

- WATSTORE (Hutchison, 1975) Type-2 and B cards (time-
  series data only),
- P-STAT system files (P-STAT, Incorporated, 1986),
- 20/20 data import files (Access Technology, Inc., 1985),
- Data Interchange Format (DIF) files (Software Arts, Inc.,
  1980), for use with proprietary software such as Lotus
  1-2-3 and DBase, and
- Flat (simple, free-format) files.

For time-series data, the OUTWAT program provides options for the suppression of missing-value data and for compressing repeated cases.

The OUTWAT program uses a number of subprograms (BOUTWAT, BOUTMS, BOUTRATE, BOUTSITE, and BOUTSV) to actually retrieve ADAPS data. These programs can also be used by user-written CPL programs. P-STAT macros are available for using these subprograms to access ADAPS data from within P-STAT.

10.2.3   Description of Output Unit-Values Records

Table 6 describes WATSTORE Type-B records (80 bytes each) created from retrieved unit-values records and are presented because of their extensive use. Type-2 records are also created, one per time-series and before the series of B records, by the OUTWAT program. Type-2 format and the meaning of each column are described in Section 10.1.3.

Table 6.--Retrieved 80-column unit-values records

● TYPE B

VARIABLE	TYPE	SUM
Record Type B	C1	1
Station Identifier	C15	16
Date:		
Calendar Year	C4	20
Month Number	C2	22
Day Number	C2	24
Time of First Reading:		
Hour (24-hour clock)	C2	26
Minutes	C2	28
Seconds	C2	30
Number of Readings per		
Day (e.g., 288, 96)	C5	35
Reserved	C3	38
Unit Values 1/	C42	80

1/ Unit data. Six 7-column fields that contain the unit data for successive time increments for the designated date and time. Blank fields indicate no data are available for that day and time.

In ADAPS, unit-values data are stored at unequal time intervals due to time corrections or missing data. The number of readings per day (fixed time interval) to output data is specified by the user in the OUTWAT program, therefore the user must be aware that at times unit values may be interpolated (estimated) values. These data are not flagged in any way as being interpolated. The OUTWAT program provides the option of retrieving data using the variable time step actually stored in the file. If this option is used, then B-cards will have only one unit value or card.

11   APPLICATIONS

    This section presents the programs that are used to obtain statistics, perform analyses, and inventory daily-values data.

PROGRAM
  NAME   TASK DESCRIPTION   SECTION

    DVMAS ---- Daily-values monthly and annual statistics ... 11.1
    DVSTAT --- Daily-values duration and N-day low/high
               value analysis 11.2
    DVINV ---- Daily-values inventory 11.3
    DV_MANIP - Daily-values manipulation 11.4
    GENPEAR -- Pearson Type-III frequency analysis 11.5

    Selected application programs in ADAPS, such as DVMAS and DVSTAT (and in other water data-processing systems), may optionally create an output file containing what are called Application Programs Transfer File (APTRAF) records. This file contains records of several different types that are suitable for the processing of hydrologic data from several different sources. The file is a stand-alone file containing the information necessary for further analytical purposes, and it is usable by a variety of different computer programs. The file is meant to accommodate many different types of data, thereby simplifying and generalizing the processing of data via use of one commonly formatted file. The created file may subsequently be processed by other application programs, which in turn create other APTRAF records, and so on, until no further processing and analyses are desired.

    The APTRAF records are conceptually a collection of one or more alphanumeric and/or numeric valued data sets of hydrologic data that may be stored (displayed) in tabular form (a matrix of rows and columns). The table contains title lines (headings), column and subcolumn headings, a body of labeled or unlabeled (row names) numeric data stored in rows and columns, auxiliary data that may be needed or that supplements the tabular data, and information, like footnotes to a table, which describes the column headings. Complete documentation for APTRAF records is in preparation (Kirby, W.K., U.S. Geological Survey, written commun., 1987). However, in the interim, a general description of APTRAF records is given in Attacnment B of the manual. Because the APTRAF package is still under development, Districts should not develop software (programs) to process these records at this time.

ADAPS uses the Data Descriptor File to provide for alternate rounding specifications of numeric data. If the user does not specify alternate rounding, then the Parameter Code File rounding specifications are used. These rounding specifications include a maximum number of decimals specification. The ADAPS application programs output numeric data in machine-readable APTRAF records with the maximum number of decimals, regardless of the magnitude of the number, as specified in the DD File if alternate rounding is specified, or as specified in the Parameter Code File if alternate rounding is not specified. Data are outputted according to the maximum number of decimals for most values; some values such as logarithmic data may be output with greater precision.

11.1   Daily-Values Monthly and Annual Statistics

The DVMAS program allows the user to perform monthly and annual statistical calculations using daily-values data. The kinds of calculations made and how they are made is explained.

11.1.1   Introduction

This ADAPS application program, called DVMAS, consists of two programs: a preprocessor and a computation program. The DVMAS application uses user-input and daily-values data to compute and report monthly and annual statistics. Examples of the statistical information computed include: (1) a zero and missing values summary, (2) the monthly and annual means, (3) univariate statistics of monthly and annual means, (4) a monthly correlation matrix, (5) the monthly serial correlation (autocorrelation) coefficients for lags up to one-fourth of the number of years in the retrieval period, and (6) the quartiles of monthly and annual means. The program also has computational options, which allow for the exclusion of zero-value and missing days and for the transformation of data to a logarithmic base. The computed statistical information is outputted as either printed output and/or as APTRAF records. The APTRAF records are suitable for processing by a frequency-analysis program.

The interactive preprocessor program runs before the computation program and queries the user for the necessary information to create a control file that subsequently drives the computation program as a batch job. When the batch job is run, and the user is queried to choose a batch queue on their node, a queue that allows a large time period for execution should be selected. This is particularly necessary if the job has a large number of stations to process and statistics to compute.

11.1.2   DVMAS Preprocessor Program

     The DVMAS preprocessor program takes the user through a
series of menu selections, questions, and answers. The user's
menu selections and answers are used to create a control file
that is used by the DVMAS computation program (next section). The
user either supplies a name for the control file or accepts the
default name. Assistance for answers is available by keying
HELP. Essential choices made in the preprocessor step are:

- Accept or reject information from User File.
- Specify control file name or accept default name for use
  by the computation program.
- Specify desired printed statistical output (11 options,
  which are described in the next section of the manual).
- Specify desired machine-readable statistical output.
- Specify desired computation/transformation options.
- Specify statistic codes.
- Specify output data name if APTRAF formatted data are
  selected.
- Select computational period and begin month of annual
  period.
- Specify maximum number of no-value days allowed.
- Specify individual station ID/data descriptor/statistic
  code combinations and computational periods if desired.

     Control files created by the DVMAS preprocessor program for
the computation program are in ASCII format so they can be edited
and modified manually if desired. However, if an existing
control file requires extensive changing to meet new or different
needs, use the preprocessor to create a new control file. If an
existing computation program control file is to be used, invoke
the preprocessor program, supply the name of the existing control
file, and indicate to the preprocessor that the existing control
file is to be executed. The computation program is then invoked
as a batch job and the preprocessor program terminates.

     The control file records created by the preprocessor program
and those required by the computation program are discussed in
Attachment A. Refer to Attachment A for record formats to
manually edit records in the control file.

11.1.3   DVMAS Computation Program

The DVMAS computation program, getting its specifications from the control file created by the preprocessor program, retrieves the daily-values data. The program then computes the desired statistics and writes them to files that are either saved, or spooled and deleted.

11.1.4   Descriptions of Printed Output Statistics

The possible output statistics produced by the computation program are discussed in the succeeding sections. Each section gives the option number (as shown on the screen) in parentheses.

11.1.4.1 Zero-Value/No-Value Summary

This option (1) is a tabular summary of zero-value and no-value time units (daily, monthly, yearly) expressed as counts and percentages of total days, months, and years retrieved. A zero-value time unit is a day, month, or year during which the variable is stored as a zero. A no-value time unit is one where the value of the variable is unknown.

11.1.4.2 Monthly Mean Values

This option (2) is a table of monthly mean values for each year of data retrieved. The monthly mean is computed as the sum of the daily values for each month divided by the number of days in each month. Normally, a monthly mean is not computed if there are missing days. (See sec. 11.1.6, No-Value Option.)

11.1.4.3 Statistics - Monthly Mean Values

This option (3) is a table of statistics computed using monthly mean values. The statistics and the equations used to compute them are given below.

- Number (N) = The total number of months used in the analysis.

- Mean (M) = $\dfrac{1}{N} * \sum_{i=1}^{N} M(i)$

- Variance (V) = $\dfrac{\sum_{i=1}^{N} M(i)^{**}2 - \dfrac{1}{N} * (\sum_{i=1}^{N} M(i))^{**}2}{N-1}$

- Standard Deviation (SD) = $\sqrt{V}$

- Skewness =

$$\dfrac{N^{**}2 * \sum_{i=1}^{N} M(i)^{**}3 - 3*N * \sum_{i=1}^{N} M(i) * \sum_{i=1}^{N} M(i)^{**}2 + 2*(\sum_{i=1}^{N} M(i))^{**}3}{N * (N-1) * (N-2) * SD^{**}3}$$

- Coefficient of variation = SD/M

- Percent of Average Value = $\dfrac{100 * M(k)}{12}$
  $\sum_{k=1}^{} M(k)$

where: >   Indicates summation,
     N = Number of years used,
     M = Monthly mean (statistic),
     i = A year index,
     k = A month index,
     V = Variance (statistic), and
    SD = Standard deviation (statistic).

11.1.4.4 Correlation - Monthly Mean Values

This option (4) is a table of the upper half of a symmetric correlation coefficient matrix. The correlation coefficient is a measure of the strength of the linear relationship between two variables. Herein, the variables are the mean values of data for 2 months, Xi, Yi, for the period retrieved. The correlation coefficient is computed by the product-moment formula. The formula is given below.

$$
\frac{N * \sum_{i=1}^{N} X(i)*Y(i) - \sum_{i=1}^{N} X(i) * \sum_{i=1}^{N} Y(i)}{\sqrt{N * \sum_{i=1}^{N} X(i)**2 - (\sum_{i=1}^{N} X(i))**2 * N * \sum_{i=1}^{N} Y(i)**2 - (\sum_{i=1}^{N} Y(i))**2}}
$$

where: >   Indicates summation,
      N = Number of years used,
      X = Mean for month X (statistic),
      Y = Mean for month Y (statistic), and
      i = A year index.

11.1.4.5 Autocorrelation - Monthly Mean Values

This option (5) is a table of the 1- to n-year lag serial correlation (or autocorrelation) coefficient for each month. The maximum value of n is equal to one-fourth of the number of years in the retrieved period. The serial auto correlation coefficient is analogous to the correlation coefficient computed by the product-moment formula except that the series is divided into two sets of data, Xi and Xi+n, one lagging the other by n time units. The serial autocorrelation coefficient for a lag of n years is computed using the formula given below.

$$
\frac{N * \sum_{i=1}^{N} X(i)*X(i+n) - \sum_{i=1}^{N} X(i) * \sum_{i=1}^{N} X(i+n)}{\sqrt{N* \sum_{i=1}^{N} X(i)**2 - (\sum_{i=1}^{N} X(i))**2 * N* \sum_{i=1}^{N} X(i+n)**2 - (\sum_{i=1}^{N} X(i+n))**2}}
$$

where: >   Indicates summation,
       N = Number of years used (years in period
           retrieved - n),
       n = Number of years of lag,
       X = Monthly mean (statistic), and
       i = A year index.

11.1.4.6   Quartiles - Monthly Mean Values

This option (6) is a ranking of monthly means in ascending order and a determination of the median (Q2) and first (Q1) and third (Q3) quartiles of the data. In a set of ranked monthly means, the first quartile is the value such that 25 percent of the values are less than that value, and 75 percent of the values are greater than that value. The median or second quartile is the middle value in the ranked data set. The third quartile is the value such that 75 percent of the values are less than that value, and 25 percent of the values are greater than that value. The quartiles divide the ranked data set into four equal parts. The position of the quartiles in the ranked data is computed using the following formulas:

$$Q1 = \frac{N+1}{4}, \qquad Q2 = \frac{2(N+1)}{4}, \qquad Q3 = \frac{3(N+1)}{4},$$

where N is the number of items in the data set. The monthly means are printed in ranked order along with the year that designates chronological order. Quartiles and medians are printed for each of these sets of months for a period of years.

11.1.4.7   Quartiles - Monthly Runoff (Inches)

This option (7) is a computation of cumulative monthly runoff in inches. Runoff in inches is computed as the total cubic feet per second (cfs) - days multiplied by 0.0372 and divided by the drainage area in square miles. The value for each month is the cumulative runoff for that month plus each preceding month's runoff throughout the water year. This option also computes the cumulative runoff for April through September. The median and first and third quartiles are computed for each month of cumulative runoff and for the April through September runoff.

11.1.4.8 Quartiles - Monthly Runoff (Acre-feet)

This option (8) is a computation of cumulative monthly runoff in acre-feet. Runoff in acre-feet is computed as the sum of daily discharges (total cfs-days) multiplied by 1.9835. The value for each month is the cumulative runoff for that month plus each preceding month's runoff throughout the water year. This option also computes the value of runoff for April through September. The median and first and third quartiles are computed for each month of cumulative runoff and for the April through September runoff.

11.1.4.9 Annual Mean Values

This option (9) is a table of annual mean values for the period retrieved.

11.1.4.10 Statistics - Annual Mean Values

This option (10) is a table of statistics computed from annual mean values. The statistics are the number, mean, variance, standard deviation, skewness, coefficient of variation, and 1- to n-year serial correlation (autocorrelation) coefficients.

11.1.4.11 Quartiles - Annual Mean Values

This option (11) is a ranking of annual mean values in ascending order and a determination of the median and first and third quartiles of the data. The annual means are printed in ranked order along with the year designating chronological order. The median and quartiles are printed for a period of years.

11.1.5   Computational Options

     The computational options (numbered as 1 through 4 below)
determine whether or not the statistical computations described
in the preceding sections are based on the following:

     1. All days, untransformed.
     2. Non-zero days, untransformed.
     3. Log transformed all days means.
     4. Log transformed non-zero days means.

The log transformation is base 10. Any or all of these options
may be chosen. If both 1 and 2, or both 3 and 4 are chosen and
there are no non-zero days for the period retrieved, printout for
2 and/or 4 is suppressed since it would duplicate printout for
options 1 and 3.

11.1.6   No-Value Option

     The maximum number of no-value days option allows the user
to select the maximum number of no-value days that are permitted
within a month before that month is excluded from the statistical
computations. If the maximum number of no-value days is
exceeded, the monthly mean is not computed and the year in which
that month occurs is not included in the annual computations. A
year is excluded from annual computations if a single month is
missing.

11.1.7   Program Output

     Output from the DVMAS application program in APTRAF format
is available for monthly and annual means and the statistical
data (number, mean, variance, standard deviation, etc). The
program output options are as follows:

     1. Monthly mean values.
     2. Statistics of monthly mean values.
     3. Annual mean values.
     4. Statistics of annual mean values.

Note that output is available for means based on all four
computational options.

11.2   Daily-Values Duration and N-Day Low/High Value
            Analysis

        The DVSTAT program allows the user to perform duration and
N-day low- and high-value analyses using daily-values data.

11.2.1   Introduction

        This ADAPS application program, called DVSTAT, consists of
two programs: preprocessor and computation.   The DVSTAT
application uses user-input and daily-values data to: (1) perform
a duration analysis and compute statistics, (2) do N-day low-
and/or N-day high-value analysis, (3) produce data sums for each
period selected for duration analysis, and (4) compute means for
each period(s) selected for low- and/or high-value analyses.
These analyses are done on a yearly or partial-year basis, or on
a monthly basis.   The duration analysis is based on a series of
class limits computed by the program (default) or specified by
the user.   Low-value analyses are based on up to nine selective
periods of N-consecutive days. These analyses determine the
lowest N-day mean value for each period selected.   The high-value
analyses are based on similar selective periods of N-consecutive
days and determine the highest mean values for each of the
periods selected.

        The interactive preprocessor program runs before the compu-
tation program and queries the user for the necessary information
to create a control file that subsequently drives the computation
program as a batch job.   When the user runs the batch job and is
queried to choose a batch queue on their node, a queue that is
set up with an unlimited (or large) time period for execution
should be selected.   This is particularly necessary for jobs that
are for multiple stations or have a large number of computations
to perform.

        Historically, it has been possible to perform a log-Pearson
Type-III analysis on low- and high-value data in the same job;
therefore the preprocessor program also queries for enough
information to create a separate control file for a later
frequency analysis if desired.   The user i ˥sked to supply file
names for each control file created.   In addition, the user has
the choice of making or not making a logarithmic transformation
of the data.

*** Notice ***

In the current release of ADAPS, a Pearson frequency-analysis program is not available. Therefore, although the appropriate questions are asked and a Pearson control file can be created, processing of that control file in this release is not possible.

****

The DVSTAT application, and eventually the Pearson program, can create APTRAF records if they are requested. The user is asked to supply file names for each program's APTRAF records if they are created.

11.2.2   DVSTAT Preprocessor Program

The DVSTAT preprocessor program takes the user through a series of menu selections, questions, and answers. The user's menu selections and answers to specific queries are used to create the control file that drives the computation program. Assistance for answers is available by keying ? or HELP. Initial choices made in the preprocessor step are:

- Specify control file name(s).
- Accept or reject information from user file.
- Specify overall analysis years and months.
- Specify statistic codes.
- Specify analysis period as yearly/partial years, or on a monthly basis.
- Specify APTRAF file name (optional).

After the initial choices, further multiple choice type menus are displayed. Selections available at this point relate to output types, analysis instructions, and the availability of Pearson analysis frequency postprocessing. The user specifies one of the default menu selection groups provided, or selects options independently from an all-inclusive menu list.

After selecting from these menu options, there is a query for the begin/end year periods for the duration analysis, the low-value analysis, and the high-value analysis. If no begin/end year period is given for a particular analysis, that analysis is not performed and subsequent menu selections relating to that type of analysis are not displayed. Once the menu options are selected and begin/end years are specified, the user is queried on whether to retain or to override program defaults as follows:

For duration analysis --

- Specify maximum number of no-value days allowed or accept default.
- Specify class limits or accept default.
- Select duration plot type.
- Specify exceedance percentages or accept default.

For low-value analysis --

- Specify low-value consecutive day (N-day) values or accept default.

For high-value analysis --

- Specify high-value consecutive day (N-day) values or accept default.

If a Pearson frequency analysis of the low- and/or high-value data generated by DVSTAT is desired and the appropriate menu selection has been made earlier, the preprocessor program queries the user for the appropriate information to create a control file to later drive the Pearson program. The user is also asked to provide a name for the Pearson control file. The Pearson processor subsequently reads the low- and/or high-value data from generated APTRAF records. The user must have selected low- and/or high-value analyses in the previous menus in order for a frequency analysis to be done. If the user wishes the Pearson program to generate APTRAF records, a file name is requested by the DVSTAT preprocessor program.

Control files for both the computation program and the Pearson frequency-analysis program that may be created or constructed by DVSTAT are completely annotated so that they can manually be edited and modified if desired. However, if an existing control file requires extensive changing to meet new or different needs, it is suggested that the preprocessor be used to create a new control file. If an existing DVSTAT control file is to be executed, the user should invoke the preprocessor program, supply the name of the existing control file, and indicate to the preprocessor that the existing control file is to be executed. The DVSTAT computation program is then invoked as a batch job and the preprocessor program terminates. Existing control files for the Pearson frequency-analysis program are handled in a similar fashion. Further discussion of executing an existing Pearson control file can be found in section 11.5, which describes the Pearson frequency-analysis program.

The control file records created by the preprocessor program
and those required by the computation program are discussed in
Attachment A of the manual.   Refer to Attachment A for record
formats to manually edit records in the control file.

11.2.3   DVSTAT Computation Program

The DVSTAT computation program is invoked as a batch job by
the DVSTAT preprocessor program and is driven by the control file
that was created by the preprocessor.   The control file reflects
the user's choices and specifications with respect to the
analysis types to be performed, sites selected, types of output
desired, etc.   The computation program does the duration analysis
and/or the low-value analysis, and the high-value analysis as
requested by the user.   These analysis types are requested on a
yearly or partial-year basis, or on a monthly basis.

Note that for the duration analysis, missing days are
allowed.   The user is queried to supply the number of allowable
missing days.   On the other hand, missing days are not allowed
for the low- and high-value analyses.   This is because the
determination of the low and high values is based on a "sliding"
algorithm (for example, the 3-day low or high uses groups of days
such as October 1, 2, 3, October 2, 3, 4, October 3, 4, 5).

11.2.3.1 Duration Analysis

The duration analysis includes the following determinations:
(1) a count of the number of daily values in each of a maximum of
35 magnitude classes, (2) a total parameter value summation for a
specified period, (3) a summary of the number of days in each
class for specified periods within the period of record analyzed,
(4) the accumulative number of days having a value greater than
or equal to each class limit, and (5) the percent of all days in
which a class limit was equaled or exceeded.

Class limits may be supplied by the user or are computed by
the program.   If the class limits are computed by default by the
program, they are based on a geometric pror ssion between the
lowest non-zero value and the second highest value for the
specified periods within the period of record analyzed.   The
computed class limits can range from zero to the second highest
value.

The duration analysis also provides interpolated values for user-supplied or default-exceedance percentages, based upon the actual class limits and the percent of all days in which a class limit was equaled or exceeded.

If duration plots are requested, the computation program provides them. The type of plot is either rectangular, log-normal, or arithmetic-normal. The parameter values are plotted on the ordinate (Y) scale and the corresponding percentage of time that the value was equaled or exceeded is plotted on the abscissa (X) scale. In the current release of ADAPS, these plots are designed only for line-printer output. If any parameter values are negative, only a rectangular plot will be done.

If a duration plot is requested, the user also may compute supplementary duration-curve statistical characteristics. If supplementary duration-curve statistical characteristics are requested, the mean, the standard deviation, the coefficient of variation, and the coefficient of skew are computed for the interpolated values corresponding to 19 exceedance percentages (95,90,85,...,5) supplied by the program.

If a "log-normal" plot type is selected, the data will be transformed to logarithmic (base 10) values before the supple-mentary statistics are computed. If the data are transformed, the standard deviation may be referred to as the variability index (Searcy, 1959). For certain data the coefficient of vari-ation may be negative (if the mean is negative), in which case the statistic has little meaning. The user is responsible, as in most applications, for the interpretation and validity of the statistics. NOTE: Negative values cannot be log-transformed; therefore, an occurrence of negative values will cause an error to be written to the error file and no statistics will be computed.

11.2.3.2 Low-Value Analysis

The low-value analysis is a determination of the lowest mean daily value for a series of nine selective periods of N-consecutive days for specified periods within the period of record analyzed. The nine periods of N-consecutive days are user-specified in the preprocessor step. If the nine periods are not specified, the preprocessor defaults the periods to 1, 3, 7, 14, 30, 60, 90, 120, and 183 days. Note that the user can supply different values if desired. The low-value analysis is done only for specified periods that have no missing days; incomplete periods are not processed and the program moves on to the next complete period. After the lowest mean values for each consecutive day period are determined, each set of data for all of the consecutive day periods are ranked sequentially from low to high. This ranking begins with 1 and ends with a number that is the maximum number of periods analyzed. As a part of the low-value analysis, a mean for each period analyzed is computed. Low-value analysis must be done if the user wishes to do postprocessing for low-value Pearson frequency analysis.

11.2.3.3 High-Value Analysis

The high-value analysis is a determination of the highest mean daily value for a series of nine selective periods of N-consecutive days for specified periods within the period of record analyzed. The nine periods of N-consecutive days are user-defined in the processor step. If the nine periods are not specified, the preprocessor defaults the series to 1, 3, 7, 15, 30, 60, 90, 120, and 183 days. Note that the user can supply different values if desired. The high-value analysis is done only for specified periods that have no missing days; incomplete periods are not processed and the program moves on to the next complete period. After the highest mean values for each consecutive day period are desired, each set of data for all of the consecutive day periods are ranked sequentially from high to low. This ranking begins with 1 and ends with a number that represents the maximum number of periods analyzed. As a part of the high-value analysis, a mean for each period analyzed is computed. High value analysis must be done if the user wishes to do postprocessing for high-value Pearson frequency analysis.

11.2.4   Program Output

In the current release of ADAPS, the DVSTAT computation program can produce two basic types of output--both as ASCII files. All output designated in the preprocessor to be a spoolable file is written to a file that can be edited or printed at the user's convenience. The spool file is named:

DVSTAT.xxyyzzzz.userid

where xx is the month, yy is the day, zzzz is the time, and userid is the user's ID. All output designated in the preprocessor to be included as APTRAF records is written to a file named by the user in the preprocessor. These records may be edited and modified and can be used as input to other postprocessing programs.

11.2.5   Program Enhancements

The ADAPS version of the DVSTAT computation program is a complete rewrite of the program available on the mainframe computer. The new version offers a number of enhancements such as interactive instruction specifications, flexibility of period of interest definition for analysis types, expansion of analysis specification instructions, and other features that become apparent with use of the preprocessor program. There are also some computation differences in the new version. These differences relate to an improved computation of default class limits for duration analysis. In the mainframe version, an extra rounding of class limits is done inappropriately. This can cause count errors in the duration analysis for certain classes that may be affected. A more significant difference in the computation of class limits for monthly duration analysis is corrected in the new version. In the mainframe version, default class limits for monthly duration analyses are computed based on the entire period retrieved instead of for each specified month or month period. In the new version, all default class limits are computed for the specified periods for the periods analyzed.

11.3   Daily-Values Inventory

The DVINV program produces an inventory listing of the contents of the Daily-Values File for a single data base. The inventory is a report of all daily-values data contained in the selected data base and cannot, at this time, be restricted to a single station or combination of selected stations. For each agency/station/data descriptor/statistic combination encountered in the file, a report line is produced for each contiguous period of record found. A contiguous period of record is defined as the longest period that does not contain any "missing" months, i.e., each month in the period contains at least 1 nonmissing day of data. Each report line contains the following information about the contiguous period: parameter code, statistic code, begin year and month, end year and month, number of nonmissing days, number of missing days, number of water years flagged provisional, number of water years flagged final, total number of water years, maximum value, minimum value, and mean value.

The program is a preprocessor that uses the standard startup menu to let the user select the data base, batch queue, and output destination, after which a batch job is submitted to process the Daily-Values File (for the particular data base) and produce the report.

11.4   Daily-Values Manipulation

The DV_MANIP program allows the user to manipulate daily-values data. Examples are adding values for two stations together, subtracting one station from another, and lagging a station by a specified amount of time.

11.4.1   Introduction

The daily values manipulation program, DV_MANIP, provides various functions for manipulating ADAPS daily-values data. The program currently can:

- Display existing daily-values data for a specified data set. A data set is defined as daily-values data for one site, data descriptor and statistic code for one water year or portion of a water year.

- Copy data from one data set to another. The existing data, including rounding and write-protect flags are copied without change.

- Create output data set by evaluating the equation $Y(i) = a + b*[X(j)+c]^d$. where a, b, c and d are constants, * denotes multiplication and ^ denotes raising to a power. If b is specified as zero, then no input data set, X, is used and all values of the output data set are set to the constant, a.

- Create output data set by combining two data sets, $Y(i) = X(j) @ Z(k)$, where @ is one of the arithmetic operators: + - * / ^ .

- Create output data set by transforming the input data set, $Y(i) = @[X(j)]$, where @ is one of the following transformations: log, inverse log, ln or inverse ln, where log is logarithm to the base 10 and ln is natural logarithm (base e).

- Enter daily values on a day-by-day basis.

- Convert English units of cubic feet per second (CFS) to metric units of cubic meters per second (CMS), $Y(i) = .028317*X(j)$. Note that this is a special case of evaluating an equation.

● Compute sediment load from water discharge and sediment concentration, $Y(i) = .0027*[X(i)]*[Z(k)]$. Note that this is a special case of combining (multiplying) two data sets, then evaluating an equation.

● Round data to nearest .5 units: $Y(i) = [rounding-function][X(j)]$

● Set write-protect and/or rounding flags

An additional option is available if the output data set is an ADAPS data set that has been modified during the current session. In this case, the user has the opportunity to restore the original ADAPS data.

In the above, $X(i)$ represents one daily value in the output data set while $X(j)$ and $Z(k)$ represent values in the input data set(s). The subscript i varies as follows: output data set start-date, output data set start-date + 1, output data set start-date + 2, ... output data set end-date. The subscripts j and k vary similarly for the first input data set and the second input data set, respectively. Note that the time periods for the output and input data set(s) need not be the same and, in fact, need not even be of the same length. If the output data set is longer than the input data set, a missing value indicator will be supplied for the missing days. Values for the missing period in the output data set will depend upon the merge option discussed below. If the output data set is shorter than the input data set, the extra data in the input data set will be ignored.

One reason for specifying differing time periods when combining data sets would be to cause "lagging" of data from one site with respect to another.

11.4.2 Program Operation

The program begins each manipulation by displaying the current manipulation number --

BEGIN DAILY VALUES MANIPULATION 1

Enter <CR> to continue (QU/EX to quit) ...

The program then pauses until <CR> is entered. The user is then prompted to specify the output destination.

Specify output destination (A/C/Tn,<CR>=A):   HELP

Next, the user is prompted to specify where the output data are
to be stored. Most of the prompts in this program have on-line
help available and, in this example, the user entered HELP for
more information. The "help" displayed for this prompt is as
follows:

You will soon be prompted to select the particular
manipulation option you wish to perform. First, however,
you must specify where you wish the results of the
manipulation to be stored. That is, you must indicate a
destination for the daily-values data that will be computed
under the manipulation you select. You have 3 options for
storing the results:

A   The results are to be stored in an ADAPS daily-values
      record. You will be given an opportunity to specify
      the data base, agency, site number, data descriptor
      number, statistics code, and start/end date.

C   The results are to be written to a file of card images
      in the WATSTORE "2-3 cards" format.

Tn   The results are to be written to a temporary file
      (T1,T2,..T5). Temporary files exist only during a
      DV_MANIP session and are typically used for storing
      the intermediate results of a complex set of
      manipulations. That is, the output data set in one
      manipulation could become the input data set for the
      next manipulation.

Note that the output data set can contain data only within
one water year.

After the "help" display, the original prompt reappears:

Specify output destination (A/C/Tn,<CR>=A: T1

Note that in this example, a temporary data set has been
selected for the output. This means that the results of the
manipulation will be retained temporarily but will not be stored
in the ADAPS daily-values file. The data will be available for
use as input to another manipulation during the current DV_MANIP
session. The normal ADAPS startup then appears.

The description of the data set being specified is displayed on the second line of the startup display. For temporary data sets the user may only specify the date-span of the data set. If an ADAPS data set is selected for output, or if a card-image file is selected, the user may specify data base, agency, site, data descriptor and statistic code as well as the date-span. Since no data yet exist for temporary file 1, the following is displayed:

NO DATA EXISTS. BUILDING NEW RECORD.

After specifying the output data set, the prompt to select the manipulation option is displayed:

SPECIFY DAILY VALUES MANIPULATION OPTION --

The options available are:

(1) Review (display) existing data.

This option will display existing data for the water year of the data set specified.

(2) Copy DV data from one data set to another.

This option will copy DV data from one data set to another. Data are copied without change from the input data set to the output, $Y(i) = X(j)$.

(3) Compute by evaluating the equation: $Y = a + b(X+c)^d$.

This option will evaluate equation: $Y(i) = a + b*[X(j)+c]^d$ (* denotes multiplication and ^ denotes "raised to the power")

(4) Combine two data sets: $Y = X1$ (operator) $X2$.

This option will combine: $Y(i) = X(j)$ @ $Z(k)$ where @ is one of the operators: +   -   *   /   ^

(5) Transform a data set: $Y =$ (transformation) X

This option will transform: $Y(i) = @[X(j)]$ where @ is one of the transformations: log (base 10), inverse log, ln (log base e), or inverse ln

(6) Enter daily values, day-by-day.

This option will enter daily values as prompted.

(7)   Convert English (CFS) to metric (CMS).

This option will convert English units (CFS) to metric (CMS), $Y(i) = .028317 \cdot X(j)$.

(8)   Compute sediment load from water discharge and sediment concentration.

This option will compute load from discharge and concentration, $Y(i) = .0027 \cdot X(j) \cdot Z(k)$.

(9)   Round to nearest .5 units.

This option will round data to nearest .5 units and is usually used for temperature data.
$Y(i) = X(j)$ [rounded]

Note that Y is the output data set, X is the first input data set and Z is the second input data set (where required). Then:

i = output start-date, start-date+1, start-date+2, ... output end-date

j = 1st input start-date,start-date+1,start-date+2,... 1st input end-date

k = 2nd input start-date,start-date+1,start-date+2,... 2nd input end-date

Where data sets are not of the same length, missing values will be provided.

If you select Option 2, the following prompt will be displayed:

COPY DATA SET

After specifying the output data set and selecting the manipulation option desired, you are prompted to specify the input data set(s):

Specify input data source 'A/C,<CR>=A:

This prompt is similar to the prompt for selecting the output data set. However, since no temporary data sets yet exist, that option (Tn) is not available.

If you enter a <CR> only, this indicates that an ADAPS data set
is to be specified. The normal ADAPS startup display relative to
the input data set is then displayed. The manipulation option
and a description of the data set being specified appears on the
second line of the ADAPS start-up display. If the date-span (DT)
was selected to be modified, the following prompts appear:

ENTER STARTING DATE AS (MM DD YYYY): 10 05 1985

ENTER ENDING DATE AS (MM DD YYYY): 09 30 1986

Note that the date-span selected for the input data set is not
the same as the date-span of the output data set. The
characteristics of the data set are again displayed in the
startup menu so that other parameters can be changed.

If no other parameters are to be changed, the processing
specified is performed and the following is displayed --

Manipulation complete - ready to store

Do you wish to Review, Store, or Cancel (R/S/C,<CR>=R): HELP

The results of the manipulation may be reviewed before actually
storing the data. In this example, HELP was entered, which
caused the following display --

The manipulation you requested is now complete but the data
have not yet been stored in the data set you specified. You
have an opportunity now to review the results before
actually storing the data. You have 3 options:

R   Review, the output data will be displayed at the
     terminal.

S   Store, the output data are to be stored in the data
     set previously specified.

C   Cancel, the current manipulation is to be cancelled
     with the results not stored.

After the "help" display, the original prompt reappears:

Do you wish to Review, Store, or Cancel (R/S/C,<CR>=R):   S

At this time, the next manipulation process begins --

BEGIN DAILY VALUES MANIPULATION 2

Enter <CR> to continue (QU/EX to quit) ...

Specify output destination (A/C/Tn,<CR>=A):   T1

In this example, the selected output data set (temporary file 1) already exists. The user is warned and is prompted to specify how the new data are to be merged with the existing data (merge option).

DATA EXISTS IN OUTPUT DATA SET - DO YOU WISH TO:

   D   Display data.

       The existing data for the water year will be displayed and this set of options will again be provided.

   I   Insert - Retain existing data if conflict.

       Any existing data will be preserved. New data will be inserted only for those days where the existing data are missing.

   M   Merge - Use new data if conflict.

       Available new data will replace existing data on a day-by-day basis. This is the default.

   R   Replace - Replace all existing with available new.

       All existing data in the output data set will be replaced by available new data. Days where new data are not available will be set to missing values.

   C   Cancel - Respecify output data set.

       Cancel the current output selection and reenter.

   Q   Quit program.

       Return to ADAPS menu.

Note that this program will not modify any data where the water year has been marked as final.

If you choose D, Display data, the existing data are displayed. The following illustrates the format of the review display. Although the display is actually 132 columns wide, the middle months are omitted here:

SITE:TEMP FILE 1   DD: PARM: STAT: UPD BY:

DAY	OCT	NOV	DEC	JAN	. . .	AUG	SEP
1	7520	6810	3500	7500	. . .	10900	9970
2	7490	6770	4000	8000	. . .	10100	9470
3	7790	6780	5000	7500	. . .	9430	8940
4	7930	6750	6000	7000	. . .	8630	8710
5	7960	6730	7000	6500	. . .	8100	8610
6	7870	6700	8000	6000	. . .	7610	8590
7	7970	6820	7000	5500	. . .	7500	8600
8	8120	6260	6000	6000	. . .	7400	8640
9	8020	6040	5000	7000	. . .	7510	8780
10	7800	5700	6000	6500	. . .	7380	9010
11	7760	5700	7000	6000	. . .	7260	9140
12	7750	5350	6500	6000	. . .	7430	9330
13	7700	4500	6000	7500	. . .	7430	9840
14	7610	3500	5500	7000	. . .	7120	10100
15	7380	2500	6500	6500	. . .	6980	11700

Continue [Y/N DEFAULT=Y]:

DAY	OCT	NOV	DEC	JAN	. . .	AUG	SEP
16	7060	2000	7000	5500	. . .	6840	12400
17	6410	2500	6500	6000	. . .	6540	12700
18	6940	3000	6500	6500	. . .	6340	12200
19	7230	2500	6000	7000	. . .	6370	11700
20	7230	2200	5500	7500	. . .	6380	11900
21	7170	1900	6000	7500	. . .	6290	15100
22	7070	1800	6000	7000	. . .	6280	23700
23	7070	1800	6500	7000	. . .	6890	37800
24	7120	2000	6000	6500	. . .	6830	32400
25	7070	2500	5500	6000	. . .	6640	21000
26	7050	3000	5500	5500	. . .	6500	15600
27	7000	3500	5500	5500	. . .	6510	
28	6940	4000	5000	5000	. . .	6690	
29	6900	4000	6000	5000	. . .	8920	
30	6880	4000	7000	5000	. . .	14900	
31	6880		7000	4500	. . .	11300	

Continue [Y/N DEFAULT=Y]:

Note that since the output data set was for the entire water year while the input data set was for 10-5 through 9-30, there were no data available for the last 5 days in the water year.

After the existing data are displayed, the user is again prompted on how the new data are to be merged with the existing data.

At this point the output data only exist in the temporary data set. To retain the data, a manipulation option with output to an ADAPS data set or to a card-image file would have to be processed.

11.5   <u>Pearson Type-III Frequency Analysis</u>

    The GENPEAR program allows the user to perform a Pearson
Type-III frequency analysis using nontransformed or transformed
(logarithms to base 10) data.

    Not available.

12   HYDROLOGIC UTILITIES

This section presents the programs used to perform hydrologic utility functions. These programs are used primarily in support of the primary processing operations described in Section 8. The programs provide for a number of different processing needs including display of datum corrections and shifts, an end-of-year summary, copy and display of ratings, and merging or replacement of unit-values data.

The submenu options that are available for this selection are used to update (maintain) and display several time-series related files, to perform a shift analysis, and to perform an end-of-year summary (analysis) using a year of data.

PROGRAM NAME	TASK DESCRIPTION	SECTION
SHFT_TABLES ---	Display expanded shifts and datum corrections	12.1
SHIFT_ANLY ----	Shift analysis	12.2
EOYSUMM -------	End-of-year summary	12.3
RT_COPY -------	Copy a rating	12.4
RT_DATES ------	Display rating table dates	12.5
RT_DISPLAY ----	Display rating(s)	12.6
UV_MERGE ------	Merge/replace unit-values data	12.7

12.1   Display Expanded Shifts and Datum Corrections

The SHFT_TABLES program allows the user to display expanded shifts and datum corrections. Allowable query selections and tabular output are explained.

12.1.1   Introduction

This program presents tabular displays of expanded shifts or datum corrections applied at specific times. Through a series of menus and queries, the user establishes table-display parameters and specifies the type of table that is desired. The information is passed to the proper computation routines, which produce a table of times and resulting shifts or datum corrections.

12.1.2   Establishing Table-Display Parameters

    Enter the expanded shifts and datum-correction program using
the regular ADAPS startup procedures. Station identifier, Data
Descriptor, and choice of output (i.e., file, printer, or
terminal) selections are made. Select the dates on which the
table is to begin and end.

    A series of queries follow the startup selections. These
queries establish the remaining parameters for the table.

12.1.3   Query Selections

    Following the startup selections, the screen tells the user
if data are available in each of the three files (Shift by Stage,
Shift by Time, and Datum Corrections), and if there is data for
the primary station and/or the auxiliary station related to the
selected station number and DD. A choice is made to work with
either the primary station data or the auxiliary station data. If
there are no data available for the chosen station, the query is
made again.

    Available types of tables are listed on the screen and a
selection is made. The available table types are:

● Datum corrections:
        - chronologically lists datum corrections.

● Shift by time:
        - chronologically lists shifts by time.

● Variable shift:
        - chronologically lists shifts by parameter and time
          according to established rules (see sec. 3.8.), or
        - chronologically lists shifts by parameter only.

If there are no data available for the type of table and station,
the query for table type is made again. An exit from the program
is available at this point or at any time via the query exit
routines.

The next query is for a beginning time of day and an ending time of day, followed by a time increment query. The table times are incremented by the time specified. The increments can be made by year, month, day, hours, minutes, seconds, or a combination of these times. The increment is entered as a string of numbers in the format YY MM DD HH MM SS.

Example: (YY MM DD HH MM SS)
   00 00 01 05 30 00

The example indicates to increment from the
beginning date and time to the ending date and
time by 00 years, 00 months, 01 day(s), 05 hours,
30 minutes, and 00 seconds.

The string must be numeric and each field must be separated by one blank. A check is made for an incomplete entry or for a nonnumeric entry. However, it is important that this string be entered properly. The string is displayed again, and an opportunity is available to verify the figures and format.

If a variable shift table has been selected, three additional queries are made. These are for a beginning parameter value, an ending parameter value, and an increment for the parameter value. The variable shift table terminates when either the maximum parameter value or the ending time is exceeded.

12.1.4   Table Output

The Datum-Correction table output consists of the specific time increments as specified by the user, and the datum correction that is applied at that specific time. These corrections are computed from the times contained in the Datum-Correction File for the selected station. The output table for Shift by Time is similar.

The variable shift "only" table consists of the specific time increments, the incremented parameter at that time, and the computed shift.

The variable shift table, as computed during regular processing, contains the specific time increment, the incremented parameter value at that time, the computed shift, and the type of shift. The type of shift is either VARY (computed from the Shift-by-Stage File), or TIME (computed from the Shift-by-Time File).

12.2   Shift Analysis

    The SHIFT_ANLY program performs a shift analysis for a specified period using data from measurement, rating, and datum files.

12.2.1   Introduction

    Shifts in discharge ratings reflect the fact that stage-discharge relations are not permanent but vary from time to time, either gradually or abruptly, because of changes in the physical features that form the control for the station. If the effective period of a specific rating change is of short duration or is small and within certain limits, the original rating is usually kept in effect. During this period, shifts or adjustments are computed and applied (shifting-control method). The shifting-control method is used extensively to compute discharge records; therefore a shift analysis is necessary.

12.2.2   Program Operation

    The shift-analysis program operates as follows: (1) the program takes the measured (recorded) stage (gage height) without a shift and applies data from the Rating File for the station to obtain an original rating discharge, (2) the measured discharge and Rating File data are used to obtain a corresponding "new" stage (backward look-up), and (3) the shift is computed by subtracting the measured stage from the "new" stage. The percent difference (either with or without the shift) in discharges is computed by subtracting the original rating discharge from the measured discharge, dividing by the rating discharge, and multiplying by 100.

    After entering the rating shift-analysis program, any or all of the specified user information that is displayed can be changed. To make a change, select one of the options shown at the bottom of the screen. Items that might need changing frequently are where to send the output, the station number, the parameter code, and the starting and ending dates.

    NOTE: The shift analysis is performed for a duration in time and not on one specific rating unless only one rating is "active" during the user-specified time period. Active ratings

12.3   End-of-Year Summary

The end-of-year summary (EOYSUMM) allows the user to select the station number, the data descriptor, the time period to be processed, and the destination of the printed output before commencing with the interactive or batch mode computations. Once these values are set, the program then loads the applicable processor file record(s) and uses those values along with the initial values to complete the processing automatically.

The program produces a table that contains the discharge peaks, which are above the base discharge stored in the extreme event computation option in the Processor File (not the Site File, even though the value can be stored in the Site File), and based on some other criterion (Novak, 1985). The program also lists the minimum discharge, the maximum and minimum gage heights, and the maximum and minimum daily mean discharges. The date, time, shift and datum values are also tabled for each of the above items when applicable.

After the table is completed, the initial selection values are seen again. These values can be changed so that another summary can be run, or the user can go to another menu or can exit from the system.

When the EOYSUMM program executes in the batch mode, the program uses a control file to direct the processing. The user can optionally use an existing control file as input to the program; or a new one can be created based on a single data descriptor, a single instrument, or a group. In addition, a batch queue must be selected for job submission, and a file name must be supplied for the logging of processing errors.

are based on these type 1 ratings found on the ADAPS rating file whose starting date occurs prior or during the user time period.

When the user information is correct, a carriage return invokes the program. The output consists of a heading on each page of data, along with the shifts, percentages, measurement numbers, dates, stages (gage heights), and discharges which are retrieved from the Measurement File.

NOTE: The rounding used for discharge in the Shift Analysis program differs from the usual rounding stored in the Parameter Code File. Usually one more significant figure is needed with original rating discharge in order to compute percent differences more accurately (Kennedy, 1983). For example, Districts most likely report figures between 10.0 and 99.999 to three significant figures in the Measurement File (electronic Form 9-207), instead of two significant figures that are held in the Parameter Code File for this range of numbers. This number of significant figures in the Parameter Code File is correct, and is used for producing tables of discharge. Therefore, for discharges in this program only, rounding is to three significant figures for ranges of values between 1-10 and 10.0-100.

12.4   Copy a Rating

The RT_COPY program copies a rating from one Station Identifier/Data Descriptor number to another, or to the same Station Identifier but a different Data Descriptor number. Invoke the RT_COPY program by selecting the appropriate ADAPS submenu option. When the startup routine menu is displayed, select the Station Identifier/Data Descriptor number for the rating to be copied. The next screen displays a list of available rating types. Select the rating (type) to be copied. Next, a list of options pertaining to the copying of the new rating is displayed as follows:

1) Station identifier
   (This option displays a list of station identifiers
   and data descriptors from which to choose.)

2) Data descriptor number
   (This option displays a list of available data
   descriptors from which to choose.)

3) Rating identifier number
   (This option prompts for a new 4-digit alphanumeric
   rating identifier and changes to the new
   4-digit rating identifier.)

4) Rating Type
   (This option displays a list of the rating types
   from which to choose.)

5) SAVE with current information
   (Self-explanatory; must be invoked to store any
   changes made or new ratings created).

6) No changes - QUIT without saving
   (Self-explanatory).

As many change options (1-4) may be selected as needed, but only one can be selected at a time. After one is made and completed, the program options are redisplayed. Option 5 must be used to save the changed or copied rating. Option 6 quits without saving the changes or newly copied rating. None of these options has an effect on the original rating.

12.5   Display Rating Table Dates

     The RT_DATES program allows the user to display rating table
dates. ADAPS uses the starting date and time stored with each
rating to determine when to use that rating. Each rating can
have up to 10 starting dates and times associated with the
rating. ADAPS programs sort all rating dates of a given type
before using them in the computations. The user can change
rating values, dates, and so forth. It is not necessary to be
the Data Base Administrator to modify ratings.

     The RT_DATES program is a program that lists the starting
dates and times for all the ratings for a selected Station
Identifier/Data Descriptor number. The program also lists the 4-
digit alphanumeric rating identifier for each rating. Invoke
the rating dates program by selecting the appropriate ADAPS
submenu option. When the startup routine menu is displayed,
select the Station ID/DD number for which ratings are to be
displayed. The program lists the ratings by type and name.
Within each type, the ratings are listed in chronological order.

12.6   Display Rating(s)

        The RT_DISPLAY program allows the user to select one of
two output options: (1) output rating information, or (2) output
an expanded rating table.   The selected option is outputted to
the device selected in the startup menu (i.e., terminal, file, or
printer).   Each option is explained below.

12.6.1   Output Rating Information

        This option presents rating information such as rating
types, starting dates, offsets (for logarithmic ratings only),
comments, and the rating equation or input point pairs for the
user-selected rating.

12.6.2   Output Expanded Rating Table

        This option presents an expanded rating table.   It
automatically expands a rating from its descriptors (input points
that define the rating).   Actual rating input points are
indicated by asterisks (*) after their table values.   The program
also computes (expands) values for an Equation type rating.

        Standard defaults may be overridden by the user by
specifying the increment desired and indicating that standard
precision is to be used.   With standard precision, values are
displayed with fewer digits of precision as determined by the
rounding stored in the Parameter Code File.

        Unless special alternate rounding has been stored with the
Data Descriptor record, the expanded rating table applies
standard parameter code rounding, plus one more significant
figure for the expanded rounding (except for discharge).   For
discharge, the significant figures for rounding in the expanded
rating table are as follows:

SIGNIFICANT FIGURES   (DISCHARGE ONLY)

DISCHARGE RANGE	RATING TABLE (STANDARD)	RATING TABLE (EXPANDED)
<0.01	0	1
0.01-0.1	1	2
0.1-1	2	3
1-10	2	4
10-100	3	4
>100	3	4

If the desired rating to be expanded is an Equation type, the program queries for a minimum and maximum value to use in the computation (expansion). These minimum and maximum values define the lower and upper boundary values for which the computations (expansion) are done by the equation.

In addition, if selecting the output to go to a file in the Startup/Selection menu, the expanded rating table is displayed with a banner, which you fill in with information pertinent to that rating curve's development. This banner is only available for the standard stage-discharge rating type 1.

12.7   Merge/Replace Unit-Values Data

The UV_MERGE program allows the user to merge and replace unit-values data.

12.7.1   Introduction

This program (option) allows the user to take unit-values data identified by one DD (source) and add, merge, and replace with unit-values data identified by another DD (destination) for the same site. The two DD's must have the same parameter code.

12.7.2   Program Operation

This interactive program (option) goes through the startup routine and allows selecting a site. A display of seven program options with suboptions are presented, and any or all of the options may be changed. The options and suboptions are as follows:

● Option 1 is the ADD/MERGE/REPLACE option.

ADD ONLY NEW DAYS: This option adds data for a day for the source DD only if not currently in the Unit-Values File for the destination DD.

ADD/REPLACE EXISTING DAYS: This option adds data for days for the source DD that do not currently exist for the destination DD, and replaces existing days for the destination's DD with the available data from the source DD.

ADD/REPLACE EXISTING DAYS, MERGE FIRST AND LAST DAYS: This option is the default, and adds data for days for the source DD that do not currently exist in the Unit-Values File for the destination's DD, and replaces existing days for the destination's DD with the data for the source DD, except for the two cases involving the first and last day of the source *DD* unit values. For the first day, all data for the destination's DD unit-values record are kept that occur before the starting time of the data for the source DD. For the last day, all data in the destination's DD unit-values record are kept that occur after the ending time of the data for the source DD unit-values record. Therefore, the first and last day's data are merged if both exist.

ADD/MERGE EXISTING DAYS, NEW VALUES OVERRIDE OLD: This option adds data for days for the source DD unit-values record that do not currently exist in the destination's DD unit-values record, and merges the data for the source DD with the existing unit-values data in the destination DD. For duplicate times, source DD unit-values overwrite the existing values in the destination's DD unit-values record.

ADD/MERGE EXISTING DAYS, OLD VALUES OVERRIDE NEW: This option adds data for days from the source DD unit-values records that do not currently exist in the destination's DD unit-values record, and merges the data for the source DD with the existing unit-values data in the destination DD. For duplicate times, destination DD unit-values over-write the existing values in the source DD unit-values record.

● Option 2 is the SOURCE DD option. The user selects, from a list of DD's for the site, the DD that will be the source of the unit-values to be moved and merged.

● Option 3 is the DESTINATION DD option. The user selects, from a list of DD's for the site, the DD that will be the destination of the unit-values being moved for the source DD. This destination DD must have the same parameter code as the source DD, and must not be the same DD as the source DD.

● Option 4 is the STARTING DATE option. The user selects the starting date of the source DD unit-values data that are to be moved. The default value (<CR>) of this date is taken from the user file record as displayed during the startup operation.

● Option 5 is the STARTING TIME option. The user selects the
  starting time of the source DD unit-values data that are to be
  moved, or uses the <CR> to indicate that all the unit-values
  for the starting day are to be moved. The default value (<CR>)
  for this time indicates that all unit-values for the starting
  date are to be moved.

● Option 6 is the ENDING DATE option. The user selects the
  ending date for the source DD unit-values data that are to be
  moved. The default value (<CR>) of this date is taken from the
  user file record, as displayed during the startup operation.

● Option 7 is the ENDING TIME option. The user selects the
  ending time of the source DD unit-values data that are to be
  moved, or uses the <CR> to indicate that all the unit-values
  for the ending day are to be moved. The default value (<CR>)
  for this time indicates that all unit-values for the ending
  date are to be moved. After the user is satisfied with the
  options and keys a <CR>, the program executes the move and
  merge operations according to the selections. The date of each
  day that is processed will be written to the screen indicating
  whether or not the day was found in the source DD. The user is
  given the option to quit the program or to restart and process
  another merge operation.

13   SYSTEM UTILITIES

    This section presents the programs used to perform system
utility functions. The programs are generally system specific,
rather than hydrologic in nature as described in Section 12.
Output print files can be viewed on the terminal screen prior to
printing, the site/data descriptor groups can be updated, and
terminal type can be displayed or changed.

13.1   Display/Print Output Files at Terminal

    The TERMPRINT program prints a file at a printer attached to
the terminal's auxiliary/printer port, or displays an output file
at the user's terminal, one screen at a time. The output file
that is printed or displayed must have Fortran carriage control
characters. If the control characters are not present, the
resultant document is garbled.

    The user is prompted for the file name or complete pathname
of the file to be printed or displayed. If just a file name is
entered, the program assumes the file is located in the user's
ADAPS origin directory given at the top of the ADAPS programs
entry (startup) display. This origin directory may or may not be
the same as the user's login origin directory (Seybold, 1985,
p. 2-6). If a complete pathname is entered, that file will be
found via a system-wide directory search and then printed or
displayed.

13.2   Update Site/Data Descriptor Groups

The GR_EDIT program allows the user to create and update site/data descriptor groups.

13.2.1   Introduction

A site/data descriptor group is a concatenation of the agency code, site identifier, and data-descriptor number. This concatenation of data is stored in the Group File and is used primarily in data retrievals. The user can have more than one Group File entry, and probably will have several in order to have greater retrieval flexibility. These multiple entries constitute a group list. Each entry in the list is a member.

The program allows the following operations on group files:

- Build a group.
- Edit a group - giving the group a new name,
               - giving the group a new description,
               - deleting members from the group,
               - adding members to the group,
               - splitting members from a group
                 to form a new group.
- Delete a group.
- Display a group.
- Display the group list.
- Copy another group.
- Select a group.

Initially, the program displays some user information. Then, select one of the above options. Each option is designated by a two-letter mnemonic symbol. If the edit, delete, or display option is selected and no group is already selected, select a group from a list of user-owned groups. The available options are subsequently explained.

13.2.2   Group File Update Options

Since group information is important in ADAPS, each available update option is discussed separately.

13.2.2.1 Build a Group

To build (create) a group record, the following steps are taken.

1. The first step in building a group is the station selection option; enter a group name and description at the respective prompts. The group name is 1-15 characters long, and the description is 1-50 characters long.

2. Next, choose a station selection method. The two options are:

   1 - Single station selection.
   2 - Multiple station selection.

   If the single station method is selected, enter each station identifier (ID), one at a time when prompted. Otherwise, search the Site File in order to build a selected list (subset) of sites that are to be included in the group record. The search is based on the selection of certain search elements. The available single character search options and the associated elements are:

   # - Partial site-identifier number.
   N - Site name.
   S - State code.
   C - County code.
   U - Hydrologic unit code.
   A - Aquifer code.
   P - Project number.
   T - Site type.
   D - Drainage area.

The user is prompted to enter one or more of these options.

3. Once the sites that belong to the group have been retrieved, make one of three choices: 1) keep all of the sites, 2) edit the list, or 3) delete (abort) the list.

4. After the station list is built, go through the parameter/data descriptor (DD) selection process. Select a DD option. These options and their meanings are:

    1 - No DD records to be selected.
    2 - Select DD records by parameter code.
    3 - Select all DD records for a station.
    4 - Select DD records individually.
    5 - Select DD records from instruments.

Once a DD option is selected, the DD's are added to the group list and are stored in each group list record.

If either option 2 or 3 above is selected, the selection process also allows for selecting the type of data record to be included with the group. These options are:

    1 - Primary data records.
    2 - Work data records.
    3 - Both primary and work records.

Note that the type of data record is not stored in the Group File, but is used as part of the selection process.

13.2.2.2 Edit a Group

     There are three main options to edit a group. The options
and a description of each are as follows:

  ● Change the group name - This involves
    selecting a new name for the group.

  ● Change the group description - This involves
    selecting a new description.

  ● Edit members of the group - This allows the user to
    (1) add new stations to the group list,
    (2) delete stations from the group list, or
    (3) split a number of stations from the group,
        creating a new group.

After any one of these editing options is executed, you may
perform another edit of the group. If another edit is not
requested, quit and return to the program menu.

13.2.2.3 Delete a Group

     This option asks if the current group selection is to be
deleted. If the reply is YES, the group is deleted; if the reply
is NO, you are returned to the program menu.

13.2.2.4 Display a Group

     This option displays the user's currently selected group. If
the group is not available, the program queries for one.

13.2.2.5 Display the Group List

     This option displays a list of the users' names and
descriptions on the screen.

13.2.2.6 Copy Another Group

        This option asks for a user login identifier. (Use the
terminal carriage return for your own identifier.) The groups
for that ID are displayed to allow selecting a group. The
selected group is then copied to form a new group.

13.2.2.7 Select a Group

        A list of user's groups is displayed, select the desired
group to be edited, deleted, or displayed.

13.2.3   Manual Update and Format of Group File

        If the Group File program (described above) does not provide
the needed capability, you can build a group file manually. It
is recommended, however, that the program be used whenever
possible.

        The Group File is a simple sequential 80-column file in
ADAPS and entries can be created or updated using a text editor
or a user program. Each file entry is a single file that resides
under a directory with the following name:

        WATSTORE>ADAPS>REV85.1>AUXDATA>GROUPS>xxxxxxxxx

        where xxxxxxxxx is the directory name of the data base
        being used.

        Each group file entry stored under the above directory is
named as follows:

        Groupname.Loginid

        where Groupname = a user-supplied name 1-15
                          characters long, and
              Loginid = the user's origin directory
                        login identifier.

Note that there are no spaces in the above name and there is a
period connecting the two parts. Also, the file name must be a
valid PRIMOS file name of 32 characters or less.

The format of each Group File entry is as follows:

Columns	Contents	Description

First record:

Columns	Contents	Description
1-5	/DESC	Record identification
6	Blank	
7-56	A*50	Group description

Succeeding records (as many as needed):

Columns	Contents	Description
1-5	/SITE	Record identification
6	Blank	
7-11	A*5	Agency code, left-justified
12	Blank	
13-27	A*15	USGS site identifier left-justified
28	Blank	
29-32	A*4	Data Descriptor (DD) identifier number, right-justified

13.3   Display Terminal Type

The SHOWTERM program displays the user's terminal type. The ADAPS User File contains terminal-type information for each user who uses ADAPS on the minicomputer. This information remains static unless the user replaces a terminal, or runs as a remote user. The file contains terminal characteristics which allow the ADAPS programs to adapt their screen displays to conform with a terminal's capability.

The program displays what type of terminal is attached to the communications line currently connected to the computer. If the type of terminal displayed does not agree with the type of terminal actually being used, the Change Terminal Type option (next section) can be used to change the terminal type.

13.4   Change Terminal Type

The TERMNL program allows the user to change terminal type. The ADAPS User File contains terminal-type information for each user. The information remains static unless the user replaces a terminal or runs as a remote user. The file contains terminal characteristics which allow the ADAPS programs to adapt their screen displays to conform with a terminal's capability.

13.5   Tag Current COMO File and Open New One

The NEWCOMO program allows the user to tag (identify) a current COMO file and then open a new one. When ADAPS is invoked, a command output (COMO) file, one for each user in ADAPS, is opened in a special directory. The COMO file can be used by the system administrator or by the ADAPS programmers to help resolve problems. Each time ADAPS is invoked, the COMO file from the previous session is overwritten. To prevent overwriting a COMO file, the program allows tagging (renaming) the file and then opens a new file. Once the new file is created, the tagged COMO file will not be overwritten and remains available until deleted. When the NEWCOMO program is selected, the user provides the desired tag and is then notified ot the complete tagged COMO file name.

13.6   EMACS Explore of User's Origin Directory

     The EMACS_ORIGIN program allows the user to explore origin
directory files. The program invokes Prime's EMACS full-screen
text editor and executes the Explore Mode option on the origin
directory. The explore option displays all of the files in the
user's origin directory and allows subsequent execution of
options such as editing, creating, and deleting a file. Refer to
the Prime EMACS manual (Buck, 1982) for more information on EMACS
commands. To exit EMACS and return to the ADAPS menu,
simultaneously key "CTRL-X CNTRL-Q" (where "CTRL" is a key on the
terminal keyboard).

14   DOCUMENTATION

    This section presents the programs used to display or spool
the User's and Administrator's manuals on the terminal screen or
on a printer. If spooling to a printer that has options, select
the 10-pitch option with no margins, as the margins are already
provided.

PROGRAM NAME		TASK DESCRIPTION	SECTION
DSP_UDOC	-----	Display ADAPS User's Manual on screen	14.1
PRT_UDOC	-----	Spool ADAPS User's Manual to printer	14.2
DSP_ADOC	-----	Display ADAPS Administrator's Manual on screen	14.3
PRT_ADOC	-----	Spool ADAPS Administrator's Manual to printer	14.4

14.1   Display ADAPS User's Manual on Screen

    The DSP_UDOC program allows the user to display the User's
Manual on the terminal screen.

    NOTE: If the document is put to the screen, 24 lines are
displayed at one time; the user can quit viewing at any time by
responding NO to the --More-- screen query.

14.2   Spool ADAPS User's Manual to Printer

    The PRT_UDOC program allows the user to spool the User's
Manual to a printer.

    NOTE: If the document is spooled to a printer, the user is
queried for a destination and form. If the defaults are
selected, the document goes to the system default printer. The
document is large; therefore, allow enough time to print and have
an ample supply of paper.

14.3   Display ADAPS Administrator's Manual on Screen

The DSP_ADOC program allows the user to display the Administrator's Manual on the terminal screen.

NOTE: If the document is put to the screen, 24 lines are displayed at one time; the user can quit viewing at any time by responding NO to the --More-- query.

14.4   Spool ADAPS Administrator's Manual to Printer

The PRT_ADOC program allows the user to spool the Administrator's Manual to a printer.

NOTE: If the document is spooled to a printer, the user is queried for a destination and form. If the defaults are selected, the document goes to the system default printer.

15   SATELLITE OPERATIONS

This section presents the programs used to perform operations involving the transmission and processing of satellite relayed data. Additional information is presented in the ADAPS Administrator's Manual.

The programs described are used for obtaining data collection platform (DCP) performance reports and SATIN processing errors. The link to a DRGS computer is also described.

```
PROGRAM
   NAME            TASK DESCRIPTION                         SECTION

AIMS ----------- Automated Instrument Monitoring System .. 15.1
ER_TABLE ------- Display of SATIN processing errors ...... 15.2
DRGS_MONITOR -- Link to DRGS computer ................... 15.3
SATIN_STATUS -- SATIN processor status .................. 15.4
```

Note: The DRGS_MONITOR program is available only to a host site that is allowed to link to a DRGS computer. This means that this program is not always seen by all users.

15.1   Automated Instrument Monitoring System (AIMS)

The Automated Instrument Monitoring System (AIMS) is a tool for producing reports on the performance of Data Collection Platforms (DCP's), on the actual data sent by DCP's, and on the time taken to transfer data from host site to remote site. The AIMS Exception Reports are based on ADAPS groups of stations. Reports may be produced automatically each day, or may be requested interactively as desired.

AIMS Exception Reports may be produced by any user after that user has defined one or more ADAPS groups of stations. Reports produced interactively may be viewed on the terminal, spooled to a printer, or sent to a file from within the ADAPS menu. AIMS Exception Reports may be produced interactively for any time period up to 30 days.

For automatic daily AIMS Exception Reports, see section 4.8 of the ADAPS Administrator's Manual.

15.1.1   AIMS Exception Reports

The AIMS Exception Reports have several parts. In order to minimize time reading an Exception Report, most parts are prepared only if there is exceptional data (missing data, data values that exceed programmed thresholds, DCP performance values that exceed established thresholds, more than one bad character, random transmissions, and missing transmissions). The Data Delivery portion is prepared only upon request.

All of the data on the AIMS Exception Report is drawn from the computed Unit-Values data file, and therefore should match that data as shown on a UV-TABLE. (See notes on edited unit values in the following section.)

15.1.1.1   Data Summary Report

The first portion of the AIMS Exception Report, the Data Delivery Report (if requested), lists only those stations for which there is an exception, identifying with an asterisk each exception which could cause the line to be printed. The DCP ID, station ID, and parameter code identify the line on the report. Any datum missing, excluding the time since the latest transmission, is flagged as an exception.

The remaining columns depend on thresholds previously programmed into ADAPS. If no thresholds have been programmed, all are reported as "0" and will never flag a line to be printed in the report. If the data value from reading to reading fluctuates less than the time programmed as "fluctuation for stuck instrument" and continues with that low fluctuation for longer than the time programmed as "lower time limit for stuck instrument", then "minutes of same data" are printed and flagged. The eight remaining columns show the number of values that exceed the thresholds for very low, low, high, or very high values, or for rapid or very rapid decrease or increase.

If a station is programmed to store edited unit values only, there are no data from which to produce the last eight columns. Therefore, stations that store edited unit values only will not appear on the report unless there are missing or the same data.

15.1.1.2   DCP Performance Report

     The DCP Performance portion of the AIMS Exception Report is
printed only if there is an exception for one or more DCP's in
the user group. It identifies the DCP ID and station ID, and
then lists all the DCP values for that instrument, flagging with
an asterisk those values that are out of tolerance. Tolerances
and units are listed in the column headings and in the footnotes.
DCP information includes effective isotropic radiated power
(EIRP), ratio of signal plus noise to noise, modulation index,
frequency offset, battery voltage, time drift between scheduled
transmission time and actual transmission time, number of bad
characters, number of missing transmissions, and number of random
transmissions. Complete descriptions of these terms are beyond
the scope of this manual, but are found in the "GOES Data-
Collection System Instrumentation, Installation, and Maintenance
Manual" (Blee and others, 1986).

15.1.1.3   Data Delivery Report

     The Data Delivery portion of the AIMS Exception Report is
printed only if the user requests it, or on Sunday for automatic
reports. (See sec. 4.8.2 of the ADAPS Administrator's Guide.)

     For the time period requested by the user, the report
analyzes delivery times from the primary site and from the backup
host site (site that generally relays DCP data, and site that
relays it if the primary site is down), and the total of all
transmissions. In each of these categories it lists the (a)
number of transmissions; (b) number delivered within 15, 30, 45,
and greater than 45 minutes; (c) minimum, maximum, and mean
delivery times; and (d) standard deviation. If more than 10
percent of the transmissions were delivered more than 30 minutes
after reception by the host site, a warning appears at the top of
the report.

     "Delivery time" means the time that the host site used to
process the data, plus the time used to send the data to the
remote site, plus the time used by the remote site to store the
data in the unit-values file.

15.1.1.4   Support File Error Report

The Support File Error portion of the AIMS Exception Report is produced only if there is an omission in programming one of the stations in the DD, Processor, or Instrument file, serious enough that the unit-values records cannot be examined by AIMS. These same omissions may cause the unit-values data not to be stored in ADAPS, or to be stored incorrectly; therefore, any errors reported here should be addressed promptly.

15.1.2   Preparation of Groups for AIMS Exception Reports

Since the Exception Report works only from ADAPS groups, one or more groups should be built with the login ID of the user who will be executing AIMS.   When a group is built using the ADAPS menu, it is named with the group name chosen and the login ID of the person building it.   For example, if John J. Jones defines a group called "wells," ADAPS names the group WELLS.JJJONES and stores it in the directory

WATSTORE>ADAPS>REV85.1>AUXDATA>GROUPS>DATABASEn

(The "n" after DATABASE refers to the number of the ADAPS data base selected, usually "1".)

Only John Jones will be able to use that group for AIMS or for any other purpose within ADAPS.   To permit WRSMITH to use the same group, anyone can attach to the DATABASEn directory and COPY WELLS.JJJONES WELLS.WRSMITH, or make copies named WELLS.SATIN or WELLS.JOB_TIMER if desired.

A group name for AIMS should have no more than 13 characters preceding the period and user ID, and should not have periods within the group name.   Examples:

WELL-STATIONS.JRGISSENHEIMER	-- will work
RAINFALL-SITES.JDOE	-- will not work
TEN.DCPS.JDOE	-- will not work
TEN-DCPS.JDOE	-- will work
TEN_DCPS.JDOE	-- will work

Groups may be edited using any editor, and that is often the easiest way to make changes.   The ADAPS format must be followed.

When building a group for AIMS, any of the options for building groups may be used. DD's are not necessary for AIMS, but do not cause any problems; all DD's for each station are always examined by AIMS.

15.1.3 Producing an AIMS Exception Report

Interactive AIMS Exception Reports are prepared using the ADAPS menu. After one or more groups named with your login ID are prepared, invoke ADAPS, go to the appropriate submenu (SA 1), and set up the user data (PA, OT, DT) in the usual manner. (See sec. 4.2.) AIMS will work for any time period up to 30 days, and may include the current day. If the site has more than one ADAPS data base, that also must be selected. When the user data are set, press the [CR] to continue.

The Data Delivery Report is optional--request it only if desired; it takes considerable time and resources.

AIMS then queries for the groups. The user may elect "ALL" groups with one's login ID, or may enter "*" for selecting one or more groups. If the latter choice is taken, the user may enter the sequence numbers of groups, in any order, and end selection by entering "999" as prompted.

After group selection, a message is displayed telling the user to wait while the report is being prepared. Requesting another output device returns the user to the USER menu for device selection. The report will then be delivered to the user-designated output device without recomputing the report.

15.1.4   AIMS Summary Report

A separate statistical report, the AIMS Summary Report, shows statistics on the success of the satellite data relay method of storing data. For the time period selected, the report shows the number of station-days having all data, some data, or no data stored in the ADAPS Unit-Values File, and presents statistics on the nur. .r and length of missing data "gaps." After the "Totals" section for all sites, each site is listed with statistics for that station (and parameter code, if requested).

15.1.5   Control File for AIMS Summary Report

     A special control file, WATSTORE>ADAPS>REV85.1>AUXDATA>
GROUPS>DATABASEn>AIMSUM.CTRL, is required to execute the AIMS
Summary Report. Menu option 2 in the AIMS submenu leads to still
another submenu that contains two methods to build this control
file. The two methods are:

     1 -- Automatic Build from SATIN Groups
     2 -- Enter All Category Names and Station ID's
          from Terminal

     Choosing method 1 concatenates all the groups named with the
ADAPS phantom's name into a single control file named AIMSUM.CTRL
and names each "category" with the group descriptions. This
method is very quick. If the AIMSUM.CTRL control file already
exists, confirmation is requested before the existing file is
overwritten.

     Choosing method 2 prompts the user to enter as many
"categories" (subdistricts, cooperators, etc.) as desired, each
followed by the station ID's for that category.

     The AIMSUM.CTRL control file may be edited using any editor,
but be extremely careful not to change the top six lines nor the
format of any line.

15.1.6   Requesting an AIMS Summary Report

     Once the AIMSUM.CTRL control file is available (previous
section), select option 3 -- Execute AIMS Summary Report (Submit
BATCH Job), on the AIMS submenu. Since the Summary Report takes
a long time, it is available only in BATCH mode. The program
prompts for a starting date, and the report covers all data from
that date up to the present. If desired, you may request that
all parameter codes be itemized. When prompted for the name of
the batch queue, select a queue that handles long jobs.

     The output is named WATSTORE>ADAPS>REV85.1>SYSTAT>
AIMS_SUMMARY. When a new report is produced, any previous report
is overwritten.

     On the AIMS Summary Report, no data are analyzed for a given
site until some data within the report period are encountered, so
that statistics are not penalized for sites started up after the
beginning date.

15.2   Display of SATIN Processing Errors

The ER_TABLE program allows the user to view the SATIN processing errors.

15.2.1   Introduction

SATIN processing errors are retrieved by the use of one of three different alternatives: a known station, an unknown station, or all errors. After the alternative is chosen, the user appropriately specifies (1) the station or group of stations to be displayed, (2) the starting and ending dates, and (3) the destination of the output as selected from the User File. The tables are sent to the user's terminal, a specified file, or a specified printer. Each available program option is discussed below.

15.2.2   Display All Errors for Selected Station(s)

The display of errors consists of a listing for each of the dates specified for one station or for a group of stations. Exiting this display returns the user to the program menu level.

15.2.3   Display Unidentified Station(s) Errors

This option allows for display of all errors in the Error File that are not linked to any identifiable station. The default selected station or stations for the selected time period is ignored. Exiting this display returns the user to the program menu level.

15.2.4   Display All Errors

This option allows for display of all errors in the Error File for the time period selected, ignoring the selected station or stations. Exiting this display returns the user to the program menu level.

15.2.5   Restart Program

The user can restart the program, display the default information, and then change any of the desired items.

15.3   Link to DRGS Computer

The DRGS_MONITOR program allows the user to link to a DRGS computer and then perform allowable functions.

15.3.1   Introduction

This program allows netlinking and logging in to the DRGS computer to perform any of the functions allowed for a particular user. Logging in to a DRGS computer is available only in offices (Districts) that serve as host sites for the satellite system. The user needs to be familiar with the login procedures and the commands used to operate the system. If not sure about these procedures, the DRGS manager should be contacted for further information.

15.3.2   DRGS Communications Program

This program deals with communications to the DRGS computer. There are seven commands serving as options in the program. These commands, descriptive option statements, and explanations of each command are given below. In the commands, <CNTL> means use the terminal Control key in conjunction with the one-letter command.

         ? - PRINTS A LIST OF COMMANDS AVAILABLE:
             This command prints a list of the seven DRGS
             commands.

   <CNTL>O - OPENS A COMO FILE:
             The user is queried for a file name for the
             comoutput (como) file. The file is opened
             using the supplied name and is put in the
             directory that the user is attached to.

   <CNTL>C - CLOSES A COMO FILE:
             The como file that is currently open is
             closed.

   <CNTL>N - SENDS THE NULL CHARACTER TO THE LINE:
             The null character is sent to the DRGS computer
             communications line. This is used mainly to shut
             off a list of time blocks being transmitted over
             the line.

<CNTL>L - PRINT THE LAST BLOCK PROCESSED BY SATIN:
          The date and time of the last time block
          processed by SATIN is displayed on the screen.
          This date and time is displayed in Greenwich
          Mean Time (GMT), and is the last data block
          processed before the user entered the DRGS
          monitor program.

<CNTL>T - SETS TIME BLOCK TO LAST BLOCK PROCESSOR:
          The time-block field used by the DRGS computer
          for outputting DCP transmission blocks is set to
          a starting date and time equal to the last time-
          block data as processed by SATIN, and the ending
          date and time is set to the end of the calendar
          year.

<CNTL>E - EXITS THE DRGS MONITOR PROGRAM:
          The user is exited from the DRGS monitor
          program and a communications line is released.
          The correct logout procedure for the DRGS
          computer must be known before using this
          command. If the incorrect procedure is used,
          the user is left logged in to a line, thereby
          leaving the DRGS system vulnerable to anyone
          wishing to link to that communications
          line.

15.4   SATIN Processor Status

The SATIN_STATUS program is used to provide information on the status of the SATIN processor.

The program displays up to three items of information. The number of items displayed depends on whether (1) the user is one of the three DRGS managers, and/or (2) the site is a DRGS site (HOST node). The first item seen, if the user is a DRGS manager, is notification of any SATIN messages that were sent during the operation of the SATIN phantom. These messages generally indicate problems encountered during the processing of satellite data or system maintenance. The second item displayed is whether the SATIN phantom is running or not running and the last satellite data block processed, including the date, time (GMT), and DCP identification number of that block of data. The third item displayed is information on the DRGS transfer files waiting to go out to the remote nodes, and is only for DRGS sites.

16   SUPPORT FUNCTIONS

     This section presents the programs that are used to enter
the DD, instrument, and processor records; set the unit-values
and daily-values records flags; review and delete user-file
entries; and upload the daily values to the mainframe computer.
These are ADAPS data-base manager functions used to maintain the
system.

PROGRAM
  NAME   TASK DESCRIPTION   SECTION

  IN_EDIT ----- Update instrument file 16.1
  DD_EDIT ----- Update data descriptor/processor file ... 16.2
  SA_EDIT ----- Update satellite data transferal
                   information 16.3
  SETFLAG ----- Set unit-/daily-values record flags 16.4
  UPLOAD ------ Upload daily-values data to mainframe ... 16.5
  UPLOADPP ---- Upload postprocessing of daily-values
                   cards 16.6

16.1   Update Instrument File

     The IN_EDIT program is used to update the Instrument File.
This file is a key file in ADAPS. This section includes an
introduction to the file, and presents instructions on how to
update it.

16.1.1   Introduction

     The Instrument File records contain information about each
data item (channel) recorded by an Analog-Digital Recorder (ADR)
or by a satellite Data Collection Platform (DCP). Additional
record information consists of instrument type, an identifier
(ID) number, update dates, number of channels, and other types of
instrument-dependent information such as digital punch, event
actuated, etc.

16.1.2   Instrument Update Program

     The instrument update program allows the user to add, display, edit, list, delete, and print the instrument file records, including the associated data descriptor (DD) and processor records. These latter records are linked to the instrument records via a common key. Up to 99 instrument records can be created for a data collection site. Each instrument record can have many modifications, each of which is a new copy of the previous instrument record with the change incorporated. Examples of major changes are: adding a new data channel, changing the channel orders, or deleting a channel. Each instrument modification is dated as to its effective end date. This gives the user the ability to change the instruments to handle new conditions or requirements for recording field data. The stacking of records with each change allows for processing of old or new data without the user having to be aware of the changes, except for having made the change. The instrument updating program options are described below. Each two-letter option code is given in parentheses preceding the action to be taken.

     ● (AD) - ADD A NEW INSTRUMENT RECORD

     The user can add a new ADR or DCP instrument record for the processing of data, including either adding new DD and processor records or using existing ones. If adding an instrument record for the following types of data computations, the auxiliary computation parameter must exist in a separately created auxiliary DD record.

TYPE OF DATA COMPUTATION	AUXILIARY COMPUTATION PARAMETER
FALL STAGE	STAGE (00065)
DEFLECTION METER	VELOCITY (00055)
INTEGRATING VELOCITY	VELOCITY (00055)

● (ED) - EDIT AN EXISTING INSTRUMENT RECORD

    The user can display and edit a selected instrument record.
The edit can consist of changing or adding any instrument data,
moving instrument channels, and editing any DD or processor
records associated with the instrument. Changing certain data
will cause the automatic generation of a new instrument record;
when this happens, the user is queried for the effective date and
time of the modification. Only editing of a current instrument
record is allowed. Display of old (dated) instrument
modifications is allowed but editing of these records is not.

● (DI) - DISPLAY OF INSTRUMENT RECORD(S)

    The user can output a copy of one or all instrument records
for a site, including the associated DD and processor records.
The destination of the output depends upon the output destination
that was previously selected in the user record. The destination
can be the user's terminal, an output file, or a selected
printer.

● (LI) - LIST OF ALL INSTRUMENTS FOR A SITE

    The user can output a list of instruments and modifications
for a selected site to the output destination specified in the
user record. The destination can be the user's terminal, or an
output file, or a selected printer.

● (DE) - DELETE AN EXISTING INSTRUMENT RECORD

    The user can delete a selected instrument record and all its
modifications from the system or just delete one selected
modificaton. Care should be used in deleting an instrument
record from the system because the instrument record is
considered to be a permament record of the setup of the field
recording instrument and it allows the reprocessing of old data
when needed. The deleting of an instrument record does not cause
the deletion of the DD and processor records associated with the
instrument record.

● (DA) - DEACTIVATE A DCP IDENTIFIER

The user can deactivate a satellite DCP identifier (ID) to free it for use at another site. Deactivation of a DCP ID at a site does not mean that old data transmitted using that DCP ID for the site cannot be reprocessed. The deactivation action updates the DCP ID instrument record with an effective deactivation date, which only allows processing of data transmitted for that DCP ID at the old site up until the date and time of deactivation.

● (CH) - CHANGE TO DIFFERENT INSTRUMENT

The user can change from the current to a different instrument by selecting the desired instrument from a list of instruments available for the site. If only one instrument exists for the site, it will be automatically selected. If no instruments exist for the site, the user will be informed.

● (DC) - LOCATE A DCP INSTRUMENT

The user can select a particular DCP instrument from a list of all DCP instruments stored as part of ADAPS. The DCP selected may or may not be for the current site selected by the user. Selection of a DCP for a different site causes an automatic change to that site.

● (US) - RESTART PROGRAM AND DISPLAY USER INFORMATION

The user can restart the program and display the default information, and subsequently change any of the desired items.

16.2   Update Data Descriptor/Processor File

The DD_EDIT program is used to update the Data Descriptor/
Processor Files, both key files in ADAPS. In ADAPS, these two
files work very closely together; therefore, just one program is
used to update them. This section includes an introduction to
the files and instructions on how to update them.

As a reminder from sections 3.3 and 3.3.1, the DD record
points to a corresponding processor record, which contains
information on how to compute the unit and daily values from the
input data and, if requested, compute another DD's data using the
computed input data and, if needed, one other auxiliary DD's
data. Also, the auxiliary gage information must be entered into
the files prior to entering information for the base gage for
slope-discharge stations. For velocity-meter stations, the
velocity-meter information must be entered into the files prior
to entering gage information.

As described earlier in section 3.3.3, this program also is
used to enter DD and possibly processor record data for a station
processed based on observer data.

16.2.1   Introduction

The Data Descriptor (DD) File records contain information
consisting of a string of parameters (variables). These
parameters include a water data parameter code, a statistic code
that describes the data, an optional description of the
parameter, numerical cross-section and elevation (depth)
locations, rounding specifications, and the type of daily values
tables to produce. Associated with most DD record is a processor
record in the Processor File. The processor record information
describes: (1) unit-values computations involving the particular
DD, (2) which daily-values statistics to compute, (3) the type of
ratings to use, (4) formats (Dial or Real) of data handling for
primary processing, and (5) which data validity screening
thresholds (low values, high values, etc.) to use.

Note that the Data Descriptor/Processor files update program
prompts the user to (1) enter the format of the input data (Dial
readings or Real numbers), and (2) enter the format in which
input data are to be displayed on the primary computation sheet.
Dial/Real variables, input data conversions, and primary compu-
tations are discussed in section 3 of this manual.

16.2.2   Data Descriptor/Processor Update Program

    The DD/Processor file update program allows the user to add,
display, edit, list, and delete DD file records, and the
associated processor and possible auxiliary DD records. The
auxiliary DD records are linked to the original DD record via
pointers that relate to other DD's for possible computation of
that DD's data. Up to 9,999 DD records can be created for a data
collection site. The program options are described below. Each
two-letter option code is given in parentheses preceding the
action to be taken.

    ● (AD) - ADD A NEW DATA DESCRIPTOR RECORD

    The user can add a new DD record for the description and/or
processing of data, including adding a new processor record and
any other related DD/processor record combinations needed for
computation. If this new DD record is used to compute another DD
record, that computed DD record can also be added or an existing
DD record can be selected. The user can display and edit a
selected DD record. If adding a new DD record involves one of
the following types of data computations, the auxiliary
computation parameter must exist in a separately created
auxiliary DD record.

TYPE OF DATA COMPUTATION	AUXILIARY COMPUTATION PARAMETER
FALL STAGE	STAGE (00065)
DEFLECTION METER	VELOCITY (00055)
INTEGRATING VELOCITY	VELOCITY (00055)

    The user is prompted to supply cross-section and elevation
(depth) locations (if needed), and a statistic code during the AD
operation. Other information necessary to complete a DD record
(such as primary or work record, offset from Greenwich Mean Time
(GMT), change to daylight saving time, default rounding codes,
table summary options, etc.) is also supplied during the AD
operation.

● (ED) - EDIT AN EXISTING DATA DESCRIPTOR RECORD

If a new DD record is used to compute another DD record, the computed DD record can be added to the file or an existing DD record can be selected. Once entries are created, the user can display and edit any selected DD record. The edit can consist of changing or adding any DD record data, changing or adding any associated processor record data, or changing or adding any computed DD record data.

● (DI) - DISPLAY OF DATA DESCRIPTOR RECORD(S)

The user can output a copy of one or all DD record contents for a site, including any associated DD and processor records. The destination of this output depends upon the output destination previously selected in the user record. The destination can be the user's terminal, a specified output file, or a selected printer.

● (LI) - LIST ALL DATA DESCRIPTOR RECORDS FOR A SITE

The user can output a list of parameters for the selected site, as defined by the DD records, to the output destination specified in the user record. The destination can be the user's terminal, a specified output file, or a selected printer.

● (DE) - DELETE AN EXISTING DATA DESCRIPTOR RECORD

The user can delete a selected DD record and all other associated file records. Care should be used in deleting a DD record from the system because all Unit Values, Daily Values, Datum, Shift, and Rating file records associated with this DD record will also be deleted, effectively erasing all references to the parameter (string) defined by the selected DD record. The user is queried twice in order to verify that the selection to delete is correct. If the answers to both queries is YES, an entire and permanent deletion is made.

● (CH) - CHANGE TO DIFFERENT DATA DESCRIPTOR

The user can change from the current to a different DD record by selecting the desired DD record from a list of DD records available for the site. If only one DD record exists for the site, it is automatically selected. If no DD records exist for the site, the user is informed.

● (US) - RESTART PROGRAM AND DISPLAY USER INFORMATION

The user can restart the program and display the default information, and subsequently change any of the desired items.

16.3   Update Satellite Data Transferal Information

        The SA_EDIT program is used to update satellite data
transferal information. The section briefly discusses data relay
instrument records, and explains how to update them.

16.3.1   Introduction

        The DCP data relay instrument update program allows the user
to add, display, edit, list, delete, and output the DCP data
relay instrument file records. The DCP data relay records are
created for (1) host sites, and (2) for non-local DCP trans-
missions that are to be transferred over the national network to
other nodes. If a DCP instrument is needed to process a local
DCP transmission and also to relay it to another node, the
instrument updating program should be used.

16.3.2   DCP Data Relay Instrument Update Options

        The DCP data relay instrument update options are described
below. Each two-letter option code is given in parentheses
preceding the action to be taken.

        ● (AD) - ADD A NEW DCP DATA RELAY INSTRUMENT RECORD

        The user can add a new DCP instrument record for the trans-
fer of DCP transmissions to as many as five different nodes. This
can be for any combination of a normal relay and a host node
backup relay.

        ● (ED) - EDIT AN EXISTING DCP DATA RELAY INSTRUMENT RECORD

        The user can display and edit a selected DCP data relay
instrument record. The edit can consist of changing or adding
any DCP instrument data, or changing or adding any node relay
information.

● (DI) - DISPLAY OF DATA RELAY INSTRUMENT RECORD(S)

The user can output a copy of one or all DCP data relay instrument information to the destination specified in the user record. The output can be to the user's terminal, an output file, or a selected printer.

● (LI) - LIST OF ALL DATA RELAY INSTRUMENTS FOR ADAPS

The user can obtain a list of all data relay instruments and then output them to the user's specified output. The output can be to the user's terminal, an output file, or a selected printer.

● (DE) - DELETE AN EXISTING DATA RELAY INSTRUMENT RECORD

The user can delete a selected data relay instrument record from the file. The deletion of a data relay instrumemt record from the system stops the processing and relaying of any transmissions from the specified DCP identifier (ID) location, and releases the DCP ID to be used again.

● (CH) - CHANGE TO DIFFERENT DATA RELAY INSTRUMENT RECORD

The user can change from the current DCP data relay instrument by selecting a DCP data relay instrument from a list of all DCP data relay instruments entered into the instrument file. The list of records produced consists only of those DCP data relay records that are not processed locally. In order to see DCP records that are processed locally and are also relayed, the instrument updating program must be used.

● (US) - RESTART PROGRAM AND DISPLAY USER INFORMATION

The user can restart the program and display the default information, and subsequently change any of the desired items.

16.4   Set Unit-/Daily-Values Record Flags

The SETFLAG program is used to set record flags in the unit- and daily-values files. This section describes the flag fields, the flagging options, and how the program operates.

16.4.1   Introduction

The ADAPS unit- and daily-values file records have fields that are used to flag the record as PROVISIONAL or FINAL. Provisional data can be edited and are flagged as provisional in ADAPS tables. Final data cannot be edited and are not flagged in the tables.

The records also contain flags that affect the uploading of data from the minicomputer to the national mainframe files located at Headquarters. These flags are automatically handled by the software; however, the flags can be set by the Data Base Administrator to never upload the data, or the flag can be removed so that the data can be uploaded.

16.4.2   Flagging Options

The flagging options flag the unit- and daily-values records for a single water year for a user-specified station/data descriptor (DD) list. This includes all records for multiple statistic codes associated with each DD. The available flagging options are listed below.

1. Set daily-values record flags to FINAL.
   (Flags specified daily-values records and all associated edited and computed unit-values records in the affected water years to FINAL.)

2. Set daily-values record flags to PROVISIONAL.
   (Flags specified daily-values records only to PROVISIONAL.)

3. Set edited unit-values record flags to FINAL.
   (Flags edited unit-values records for a date range to FINAL.)

4. Set <u>computed</u> unit-values records to FINAL.
   (Flags computed unit-values records for a date
   range to FINAL.)

5. Set <u>edited</u> unit-values records to PROVISIONAL.
   (Flags all edited and computed unit-values records
   for a date range, and all associated daily-values
   records in the affected water years to PROVISIONAL.)

6. Set <u>computed</u> unit-values flags to PROVISIONAL.
   (Flags all computed unit-values records for a date
   range, and all associated daily-values records in
   the affected water years to PROVISIONAL.)

7. Set daily-values record flags to NEVER UPLOAD.

8. Set daily-values record flags to READY TO UPLOAD.

The user will use options 1 and 5 most of the time.

16.4.3   Program Operation

     The program operates as a preprocessor that submits a batch
job. Station/data descriptor (DD) information is entered through
the ADAPS startup routine and the User File. The program prompts
for the flagging option and the period to be covered. The batch
job invokes the program to perform the actual flagging of
records.

16.5   Upload Daily-Values Data to Mainframe

The UPLOAD program is used to upload daily-values data to the mainframe computer at Headquarters. To maintain a national daily-values file and provide easy nationwide retrievals, ADAPS daily values are uploaded quarterly to the national data base located on the mainframe computer at Headquarters.

This program scans all of the ADAPS daily-values files. Any daily-values records flagged as READY TO UPLOAD and flagged as "Primary Data", are formatted to WATSTORE (Hutchison, 1975) Type-2 and Type-3 data cards (80 column records). These records are then flagged as "Uploaded" and are written to a file with the name WATSAVE>DVUPLOAD.JOB.

The contents of a file

    WATSAVE>DVUPLOAD.JCL

is inserted ahead (at the top) of the data cards file. The file

    WATSAVE>DVUPLOAD.JOB

is then forwarded to the mainframe computer at Headquarters using the File Transfer Service facilities (telecommunications lines) via the DRJQ Command. The DRJQ command is a variation of the RJQ (Venne and others, 1985) command.

Note that a variable is used to determine which DD's identify data to be uploaded to the national mainframe files. This variable designates the records as primary or work records. When the DD files were originally created, there was a mixture of primary and work records based on whether the data came from DCP (satellite) sites (work records), or from the mainframe (primary records), or from the early minicomputer processing system (primary records). Presently in ADAPS, DCP sites can be flagged as primary records. Only primary records are uploaded via the UPLOAD program. Therefore, all data in the ADAPS daily-values files have to be identified as either primary or work records. This is done via the DD_EDIT program (sec. 16.2) during station setup.

16.6   Upload Postprocessing of Daily-Values Cards

The daily-values upload postprocessor program, UPLOADPP, is executed after the daily-values upload program, UPLOAD, has been run.

16.6.1   Introduction

The daily-values upload program, UPLOAD, is run to create card images of daily-values data for updating the files maintained on the mainframe computer at Headquarters in Reston, Va. There is a difference in the way missing data are treated by ADAPS and the Reston programs, resulting in a need for the UPLOADPP program.

The UPLOAD program creates card images with spaces (blanks) where data are missing. However, the Reston programs ignore blank fields and require explicit indication of missing data, that is, days for which data are to be deleted. Further complicating the issue is that the Reston system maintains two files, a current file on disk and a historical file on tape. The current file contains recent updates to the daily-values data base and is incorporated into the historical files periodically. This updating of the historical files is called a merge of data, specifically the daily-values merge.

To indicate missing data for the Reston system, one of two values must be entered in the appropriate daily-values field on the card images:

999999 - Indicates that data are to be deleted in the current file only.
999998 - Indicates that data are to be deleted from the current file, and also the historical file during the next daily-values merge.

16.6.2   Program Operation

The UPLOADPP program is invoked from the ADAPS menus and begins with the following message:

DAILY VALUES UPLOAD POST-PROCESSOR PROGRAM
Edit blank data fields in upload file.

Then, the user is prompted to enter the name of the file to be
processed. This is the file of card images created by the UPLOAD
program.

                Enter input file name: DV1

In this example, the file name was DV1.

     There are three options available for replacing blank
fields in the daily-values card images. The user may choose to
have all blank fields (for dates occurring before the merge) to
be set equal to: (1) 999999, (2) 999998, or (3) one of the two
values specified by the user. If option 3 is chosen, a display
of the previous card image, the current card image, and the next
card image will be provided whenever a blank field is found. The
blank field in question will be highlighted, the cursor will be
positioned, and the user will be able to enter 999999 or 999998,
as required. For easier entry, the program allows the user to
enter 9 for 999999 and to enter 8 for 999998. The user selection
is made as follows:

     --   Select replacement for blank data fields --

       (1)   999999   (deletes current data in Reston only)
       (2)   999998   (deletes current data immediately and
                          backfile data at merge)
       (3)   variable - You will be prompted for substitutions
                          wherever blanks appear in data.
           Enter choice (1-3): 3

In this example, option 3 has been selected.

     Since daily values occurring after the last daily-values
merge exist only in the Reston current file, those values may be
deleted with a value of 999999. There is a question of the value
to use only for dates preceding the merge. Thus, if an option
other than 1 was selected the user must indicate the date of the
latest merge --

              Enter date of last DV merge --
              ENTER DATE AS (MM DD YYYY): 11 11 1988

In this example, the merge date wa~ Nov 11, 1988.

     Processing of the user's input file will begin now. A new
file with the same name as the input file, suffixed with .01,
will be created. The edited card images will be written to this
file:

Writing output file: DV1.01 ...
Reston output will be returned to: MWHITE>RES.RETURN

In this example, the file DV1.01 is being written. The program
detected that JCL containing a destination for the Reston output
was included in the input file. In this case, the destination
was MHITE>RES.RETURN.

If options 1 or 2 had been selected, the program would
process to the end of the input file substituting 999999 or
999998 for blank fields as required. However, since option 3 was
selected the user must specify the data to be substituted --

```
Enter replacement data (8=999998, 9=999999) --
3 06127500    19871004  94   90   86   90   95   84   73
3 06127500    19871101  70        68   68   66   66   65   60
3 06127500    19871102  60   60   58   55   55   53   53   52
```

In this example, data for November 2 are missing. The program
highlights the 7-character field associated with November 2, the
cursor is positioned at the beginning of the field, and the user
enters the value desired. Processing then continues until the
next blank daily value is found. When the job is finished, the
output file is ready to transmit over the network for processing
in Reston. Since very large files can lead to problems with the
network, this program will create multiple output files if the
input file is too large for efficient network use. Whenever
1,000 card images have been processed, the program terminates the
current output file and begins a new one. If JCL was included in
the input file, that JCL will be copied to the beginning of each
output file. If a destination file was specified in the JCL,
that file name will be adjusted to ensure that the output of two
jobs is not sent to one file. The following illustrates the
process:

Continuing ...
UPLOAD FILE RECORD LIMIT EXCEEDED.
TERMINATING FILE: DV1.01

Writing output file: DV1.02 ...
Reston output will be returned to: MWHITE>RES.RETURN.02
UPLOAD FILE RECORD LIMIT EXCEEDED.
TERMINATING FILE: DV1.02

Writing output file: DV1.03 ...
Reston output will be returned to: MWHITE>RES.RETURN.03

PROCESSING COMPLETE.   3 FILES WRITTEN.

17   INTERACTION WITH MAINFRAME (AMDAHL) COMPUTER

    This section discusses the local storage of water data for
processing into finished products, and the subsequent transferal
of the data to the national files residing on the mainframe
computer.

17.1   Introduction

    Routine water data-processing is accomplished in each
District using the District's minicomputer. The data are stored
locally for processing into finished products such as the annual
State reports, project or hydrologic reports, and tables for
release to the public or cooperators. The kinds of data
processed in ADAPS that are regularly needed or requested by
water data users are unit and daily values. The final repository
for water data is not local, but on the mainframe computer
located at Headquarters.

17.2   Discussion of Mainframe Water Data Files

    The mainframe water data files are managed by WATSTORE
(Kilpatrick, 1981). The system consists of several files in
which data are grouped and stored by common characteristics and
data collection frequencies. The WATSTORE files that are
relevant to ADAPS are the Unit, Daily, and Peak Values files.
These files are part of the USGS's national repository of water
data.

    The WATSTORE files must be routinely updated for use by
approximately 300 users located in organizations outside the
Geological Survey and to fulfill data requests from across the
Nation. The frequency of updating is established by
Headquarters. Each District has the responsibility to perform
the updating. Programs documented in both ADAPS and WATSTORE are
used to accomplish the updating tasks.

18   NAMES, DESCRIPTIONS, AND SECTION NUMBERS OF ADAPS PROGRAMS

This program information is included in both the ADAPS User's and the Administrator's manuals for easy reference and complementary use.

NOTE: An * indicates that the section is located within the ADAPS Administrator's Manual. All others are within the ADAPS User's Manual.

Program Name	Task Description	Section Number
AIMS	Automated Instrument Monitoring System	15.1
CD_READ	Process ADR Card-Image Data	7.2
DC_EDIT	Update/Display Datum Corrections	8.2
DD_EDIT	Update Data Descriptor/ Processor Files	16.2
DRFILES	Review/Delete Digital Tape Temporary Files	7.7*
DRGS_MONITOR	Link to DRGS Computer	15.3
DSP_ADOC	Display Administrator's Manual on Screen	14.3
DSP_UDOC	Display User's Manual on Screen	14.1
DV_EDIT	Edit Daily Values	8.7
DVINV	Inventory Daily-Values Data	11.3
DV_MANIP	Manipulate Daily-Values Data	11.4
DVMAS	Daily-Values Monthly/Annual Statistics	11.1
DVSTAT	Daily-Values Duration/N-day Value Analysis	11.2
DV_STORE	Process Daily-Values Card-Image Data	7.6
DVTABLE	Daily-Values Tables	9.1
EMACS_ORIGIN	EMACS Explore of User's Origin Directory	13.6
EOYSUMM	End-of-Year Summary	12.3
ER_TABLE	Display SATIN Processing Errors	15.2
GR_EDIT	Update Site/Data Descriptor Groups	13.2
HYDROGRAPH	Plot Hydrographs Using Preprinted Forms	9.3

Program Name	Task Description	Section Number
IN_EDIT	Update Instrument File	16.1
INSTALL_MIDAS	Install New MIDAS Files	11.3*
MPACK_MIDAS	Perform MIDAS File Maintenance	11.1*
MS_EDIT	Update/Display Measurements	7.5
ND_EDIT	Update DIS Node Configuration File	9.2*
ND_TRANS	Transfer Data in Satellite Queue to Another Node	10.6*
NEWCOMO	Tag Current COMO File and Open New One	13.5
OUTWAT	General Retrieval of Time-Series Data	10.2
PLOTWAT	Plot Time-Series Data	9.4
PRIMARY	Primary Computations	8.6
PRT_ADOC	Spool Administrator's Manual to Printer	14.4
PRT_UDOC	Spool User's Manual to Printer	14.2
RATPLOT	Plot Ratings on Preprinted Forms	9.5
RETR_DV	Retrieve/Write Daily-Values Data	10.1
RT_COPY	Copy a Rating	12.4
RT_DATES	Display Rating Table Dates	12.5
RT_DISPLAY	Display Rating(s)	12.6
RT_EDIT	Update/Display Rating Tables	8.1
SA_EDIT	Update Satellite Data Transferal Information	16.3
SATIN_MESG	List SATIN Logs	10.1*
SATIN_STATUS	SATIN Processor Status	15.4
SE_EDIT	Update Security File (ADAPS)	9.1*
SETFLAG	Set Unit-/Daily-Values Record Flags	16.4
SHFT_TABLES	Display Expanded Shifts/Datum Corrections	12.1
SHIFT_ANLY	Shift Analysis	12.2
SHOWTERM	Display Terminal Type	13.3
START_SATIN	Start SATIN Processing Phantom	10.2*
START_TRANS	Start Transfer of Data for Another DRGS in Real-Time	10.4*
STD_STOR	Process WRD Standard Input Data	7.8
ST_EDIT	Update/Display Shifts by Time	8.3
STOP_SATIN	Stop SATIN Processing Phantom	10.3*

Program Name	Task Description	Section Number
STOP_TRANS	Stop Transfer of Data for Another DRGS in Real-Time	10.5*
SV_EDIT	Update/Display Variable Shifts	8.4
TERMNL	Change Terminal Type	13.4
TERMPRINT	Display/Print Files at Terminal	13.1
TP_EDIT	Edit/Store Translated Data	7.3
TP_READ	Translate New Data	7.1
UPLOAD	Upload Daily-Values Data to Mainframe	16.5
UPLOADPP	Upload Postprocessing of Daily-Values Cards	16.6
US_EDIT	Review/Delete User File Entries	11.4*
UV_ARCHIVE	Archive Unit Values	11.5*
UV_EDIT	Edit Unit Values	8.5
UV_ENTER	Unit-Values Entry/Edit	7.9
UV_MERGE	Merge/Replace Unit-Values Data	12.7
UV_RECOVER	Recover Unit-Values Transfer Files	11.2*
UV_RESTORE	Restore Unit Values from Archive Files	11.6*
UV_STORE	Process Unit-Values Card-Image Data	7.4
UV_TABLE	Print/Display Unit-Values Tables	9.2
VERIFY	Verify MIDAS file record links	11.7*

ATTACHMENT A - POSTPROCESSOR PROGRAMS CONTROL FILES

This attachment presents the formats of the different kinds of control records created and used by ADAPS.

A.1   Introduction

Several ADAPS programs, particularly the application programs, are developed to run in an interactive preprocessor/ batch postprocessor mode. In order for the batch postprocessor programs to run, they need information that is passed to them from the interactive preprocessor programs. This information is passed to them by records contained in control files.

All preprocessor programs first call the ADAPS Startup routine. The Startup routine is described in section 5.2 of the manual. One of the functions that the Startup program performs if batch postprocessing is required is to produce a skeleton control file containing user-supplied data. The appropriate preprocessor program then adds data to that control file according to the requirements of the particular application being run. The postprocessing action then completes the application using the control file as input.

A.2   Common Control Records

The different kinds of control records are generally created or constructed in the sequence that they are discussed. Some types of records are common to each file and some are unique to a particular postprocessor program. Each of the common control records begins with a slash (/), followed immediately by an identifying label (name). The label is followed by formats for each item in the record. The location of the unique records in the sequence is mentioned where appropriate, but descriptions for most of them are given in separate sections.

The following records appear in the order indicated in every ADAPS control file.

Col- umns	Contents/ Format	Description

● Directory Pathname Record:

1-5	/PATH	Record identification.
6	Blank	
7-102	A*96	Directory name for placement of postprocessor program produced file.

● User Record:

1-5	/USER	Record identification.
6	Blank	
7-38	A*32	ID of user who created control file.
39	Blank	
40-43	A*4	Data base number selected by the user.
44	Blank	
45-49	A*5	Agency code selected by the user.
50	Blank	
51-82	A*32	Batch postprocessor program error file name.

● Print Disposition Record:

1-5	/PRNT	Record identification.
6	Blank	

7-10	A*4	Print disposition option:
		  1 = Output to file named in positions 17-48.
		  >1 = Output to a spoolable printer (numbei to printer correspondence is site-specific).

11	Blank	
12-15	A*4	Number of copies to spool if print disposition is >1.
16	Blank	
17-48	A*32	Print file name if print disposition = 1.

● Plot Disposition Record:

Col- umns	Contents/ Format	Description
1-5	/PLOT	Record identification.
6	Blank	
7-10	A*4	Plot disposition option: 1 = Output to Meta file named in positions 17-48. >1 = Output directly to a plotter (number to plotter correspondence is site-specific).
11	Blank	
12-15	A*4	Number of copies to plot if plot disposition is >1.
16	Blank	
17-48	A*32	Plot file name if plot disposition = 1.

Following the above four records, the order and type of data included in a final control file may vary from one ADAPS application program to another. The position of the following records in the control file depends upon the needs of the individual application program.

The Site records (see below) describe the agency/site identifier/data descriptor information for the batch post-processing. The Site records may also contain site-specific data and statistic codes, depending upon the particular postprocessor program and the options specified for it.

● Site Record:

The following fields are supplied by the Startup routine. (See sec. 5.2.)

Col- umns	Contents/ Format	Description
1-5	/SITE	Record identification.
6	Blank	
7-11	A*5	Agency code, left-justified.
12	Blank	
13-27	A*15	USGS site identifier, left-justified.
28	Blank	
29-32	A*4	Data descriptor identifier.
33	Blank	

The following fields are added to the Site Record by the preprocessor program if specific retrieval periods or statistic code lists are specified. If these fields are blank, the period and statistic codes used are those contained in any previous Date, Year, and Statistic Code records (these records are described below).

Site Record (continued)

Col- umns	Contents/ Format	Description
34-41	A*8	Begin date (YYYYMMDD) or begin year/month (YYYY MM).
42	Blank	
43-50	A*8	Ending date (YYYYMMDD) or ending year (YYYY).
51	Blank	
52-56	A*5	First statistic code.
57	Blank	
58-62	A*5	Second statistic code.
63	Blank	
64-110	A*5,Blank, etc.	Third through tenth statistic codes, as indicated.

The following Date, Year, and Statistic Code records are supplied as needed by a particular preprocessor program. They define the default retrieval periods and statistic code lists used by all site combinations identified by the Site record(s) described above. Either a Date or a Year record may appear. A Statistic Code Record appears for programs that retrieve from the Daily Values File.

● Date Record:

Used primarily by Unit-Values File retrievals, but may be used in daily-values retrievals. If used for daily-values retrievals, water-year retrievals are done for the water years covered by the date period (range). Subsetting to the actual dates specified is the responsibility of the individual batch postprocessor programs.

Col- umns	Contents/ Format	Description
1-5	/DATE	Record identification.
6	Blank	
7-14	A*8	Begin date (YYYYMMDD).
15	Blank	
16-23	A*8	End date (YYYYMMDD); if blank, retrieval is for begin date only.

● Year Record:

Used primarily by Daily-Values File retrievals, but may be used by Unit-Values File retrievals. (If used for unit-values retrievals, retrieval is done for all days in the years covered by the retrieval period).

Col- umns	Contents/ Format	Description
1-5	/YEAR	Record identification.
6	Blank	
7-10	A*4	Begin year (YYYY).
11	Blank	
12-15	A*4	End year (YYYY); if blank, retrieval is for begin year only.
16	Blank	
17-18	A*2	Begin month of annual period (MM); if blank, default is 10, a water year retrieval.

● Statistic Code Record:

Col-umns	Contents/Format	Description
1-5	/STAT	Record identification.
6	Blank	
7-11	A*5	First statistic code.
12	Blank	
13-17	A*5	Second statistic code.
18	Blank	
19-65	A*5,Blank, etc.	Third through tenth statistic codes, as indicated.

A.3   Tabling Program Control Records

The daily-values tabling program control records created by the preprocessor program are described below. The other records that are in the control file are described above.

● Type of Table Record:

Defines the type of table to be produced by the tabling postprocessor program. Valid table types are:

    1 = single station/parameter code/statistic code
        combination,
    2 = two statistic codes,
    3 = three statistic codes,
    4 = discharge, sediment concentration, and sediment load
        (a computation), or
    5 = only sediment concentration and load (no computation).

Col-umns	Contents/Format	Description
1-5	/TYPE	Record identification.
6	Blank	
7-11	I5	Table type (NNNNN).

● Remarks Record:

1-5	/REMK	Record identification.
6	Blank	
7-11	I5	Remark option flag (NNNNN): 0 = Suppress remarks. 1 = Do not suppress remarks.

● Summary Option Record (Type-1 daily-values table only):

Contains a list of integer numbers, separated by commas or blanks. These numbers control monthly and annual summary options for Type-1 daily-values tables. Valid integers in the list are 1 through 11. The available summary options are: 1 = total, 2 = mean, 3 = maximum, 4 = minimum, 5 = median, 6 = acre-feet, 7 = cubic feet per second per square mile, 8 = inches, 9 = include annual summaries, 10 = include calendar year summaries, and 11 = print a skeleton table. The text string ALL selects all the available summary options (except skeleton tables). The text string NONE indicates no summaries are to be printed. Leaving the option string blank causes the program to use the summary options stored in the Data Descriptor File.

Col- umns	Contents/ Format	Description
1-5	/SOPT	Record identification.
6	Blank	
7-86	A*80	Summary option string.

● Table Suppression Record (Type-1 only):

1-5	/NTAB	Record identification.
6	Blank	
7-11	I5	Table suppression flag (NNNNN): 0 = Suppress the body of the table (summaries only). 1 = Do not suppress the table.

A.4   DVMAS Application Control Records

The DVMAS application (daily-values monthly and annual statistics) control records created by the preprocessor program are described below. The other records that are in the control file are described earlier.

● Print Options Record:

Contains a list of integer numbers, separated by commas or blanks. These numbers are the selected statistical options to be included in the printed output. Valid integers in the list are 1 through 11. The available options are described in order in Section 11.1.4 of the manual. The text string ALL selects all of the available statistical options.

Columns	Contents/ Format	Description
1-5	/POPT	Record identification.
6	Blank	
7-86	A*80	Printed statistics option string.

● Print Computation Options Record:

Contains a list of integer numbers, separated by commas and blanks. These numbers are the selected computational options for printed output. Valid integers in the list are 1 through 4. The available options are described in Section 11.1.5 of the manual. The text string ALL selects all of the available computation options for printed output.

Columns	Contents/ Format	Description
1-5	/PCMP	Record identification.
6	Blank	
7-86	A*80	Printed output computation option string.

• Disk Output Options Record (for APTRAF):

    Contains a list of integer numbers, separated by commas or blanks. These numbers control the statistical options to be included in an Application Programs Transfer File (APTRAF) on disk. Valid integers in the list are 1 through 4. These options are described in Section 11.1.7 of the manual. The text string ALL selects all of the available statistical options for APTRAF output.

Col- umns	Contents/ Format	Description
1-5	/DOPT	Record identification.
6	Blank	
7-86	A*80	Printed statistics option string.

• Disk Computational Output Options (for APTRAF):

    Contains a list of integer numbers, separated by commas or blanks. These numbers are the computational options for APTRAF output. Valid integers in the list are 1 through 4. These options are described in Section 11.1.5 in the manual. The text string ALL selects all of the available computation options for APTRAF output.

Col- umns	Contents/ Format	Description
1-5	/DCMP	Record identification.
6	Blank	
7-86	A*80	APTRAF output computation option string.

• Disk Name Record (for APTRAF):

1-5	/DISK	Record identification.
6	Blank	
7-38	A*32	Name for APTRAF disk output.

• Number No-value Days Maximum Record:

1-5	/NDMX	Record identification.
6	Blank	
7-11	I5	Maximum number of no-value days allowed in a month before that month is excluded from the computation.

A.5   DVSTAT Application Control Records

      The DVSTAT application (duration and low/high N-day value analyses) preprocessor can optionally create or construct two control files; one that drives the DVSTAT computation program and one that drives the Pearson frequency-analysis program. Both of these control files are described in this section.

      Records that appear in these control files that begin with a slash (/) are described earlier in this attachment in Section A.2. Data records that are uniquely constructed by the DVSTAT preprocessor program are preceded by an annotation line that begins with a capital C. The record description provided by the annotation helps to edit or to possibly modify control records previously constructed by the DVSTAT preprocessor program. Each data record begins with a unique sequence number which is allocated the first three columns of the record. The format designation that follows begins immediately after the sequence number.

      The following record types are uniquely constructed to drive the DVSTAT computation program.

```
C   NAME OF APTRAF FILE TO BE CREATED BY DVSTAT
1   A128
C   COMPUTE YEARLY OR PARTIAL-YEAR STATISTICS

2   L1
C   COMPUTE MONTHLY STATISTICS
3   L1
C   INCLUDE DURATION TABLE IN SPOOL FILE
4   L1
C   INTERPOLATE EXCEEDANCE PERCENTAGES FROM DURATION TABLE
5   L1
C   DO PLOTS OF DURATION DATA
6   L1
C   INCLUDE DURATION DATA IN APTRAF FILE
7   L1
C   INCLUDE HIGH-VALUE DATA IN SPOOL FILE
8   L1
C   INCLUDE HIGH-VALUE DATA IN APTRAF FILE
9   L1
C   INCLUDE LOW-VALUE DATA IN SPOOL FILE
10  L1
C   INCLUDE LOW-VALUE DATA IN APTRAF FILE
11  L1
C   INCLUDE ANNUAL-VALUES DATA IN SPOOL FILE
```

```
12 L1
C   INCLUDE ANNUAL-VALUES DATA IN APTRAF FILE
13 L1
C   INCLUDE ANNUAL SUMS OF PARAMETER VALUES IN ANNUAL-VALUES TABLE
14 L1
C   BEGIN / END YEARS FOR DURATION ANALYSIS
15 I4,',',I4
C   BEGIN / END YEARS FOR LOW-VALUE ANALYSIS
16 I4,',',I4
C   BEGIN / END YEARS FOR HIGH-VALUE ANALYSIS
17 I4,',',I4
C   MONTHS TO BE USED IN MONTHLY DURATION ANALYSES
18 12L3
C   MONTHS TO BE USED IN MONTHLY LOW-VALUE ANALYSES
19 12L3
C   MONTHS TO BE USED IN MONTHLY HIGH-VALUE ANALYSES
20 12L3
C   BEGIN / END MONTH FOR YEAR OR PARTIAL-YEAR DURATION ANALYSIS
21 I2,1X,I2
C   BEGIN / END MONTH FOR YEAR OR PARTIAL-YEAR LOW-VALUE ANALYSIS
22 I2,1X,I2
C   BEGIN / END MONTH FOR YEAR OR PARTIAL-YEAR HIGH-VALUE ANALYSIS
23 I2,1X,I2
C   USE DEFAULT CLASS LIMITS FOR DURATION ANALYSIS
24 L1
C   USER SUPPLIED CLASS LIMITS 1 THRU 11 FOR DURATION ANALYSIS
25 12(F9.2,1X)
C   USER SUPPLIED CLASS LIMITS 12 THRU 23 FOR DURATION ANALYSIS
26 12(F9.2,1X)
C   USER SUPPLIED CLASS LIMITS 24 THRU 35 FOR DURATION ANALYSIS
27 12(F9.2,1X)
C   DURATION PLOTS:1=LOG-NORMAL,2=RECTANGULAR,3=ARITHMETIC-NORMAL
28 A
C   EXCEEDANCE PERCENTAGES TO BE USED FOR INTERPOLATING FROM DURA-
C     TION TABLE
29 20(I2,1X)
C   INCLUDE INTERPOLATED VALUES IN APTRAF FILE
30 L1
C   COMPUTE SUPPLEMENTARY DURATION CURVE STATISTICAL
CHARACTERISTICS
31 L1
C   INCLUDE SUPPLEMENTARY DURATION CURVE STATISTICS IN APTRAF FILE
32 L1
C   NUMBERS OF CONSECUTIVE DAYS TO BE USED IN LOW-VALUE ANALYSIS
33 9(I3,1X)
C   NUMBERS OF CONSECUTIVE DAYS TO BE USED IN HIGH-VALUE ANALYSIS
34 9(I3,1X)
C   MAXIMUM NUMBER OF NO-VALUE DAYS ALLOWED FOR DURATION ANALYSIS
```

```
35 I3
C   NAME OF PEARSON PROCESSOR CONTROL FILE
36 A128
```

The following record types are uniquely constructed to drive the Pearson frequency analysis program.

```
C   DO LOW-VALUE PEARSON STATISTICS
1   L1
C   DO LOG TRANSFORMS OF LOW-VALUE DATA
2   L1
C   DO PEARSON PLOTS OF LOW-VALUE DATA
3   L1
C   DO HIGH-VALUE PEARSON STATISTICS
4   L1
C   DO LOG TRANSFORMS OF HIGH-VALUE DATA
5   L1
C   DO PEARSON PLOTS OF HIGH-VALUE DATA
6   L1
C   NAME OF APTRAF FILE CREATED BY DVSTAT TO BE USED AS INPUT
7   A128
C   NAME OF APTRAF FILE TO BE CREATED BY PEARSON PROGRAM
8   A128
```

ATTACHMENT B - APPLICATION PROGRAMS TRANSFER FILE

     This attachment presents the formats and descriptions of the
different kinds of transfer file records created by ADAPS appli-
cation programs. The concept of the transfer file structure is
also presented.

B.1   Introduction

                        *** Notice ***

     The APTRAF package is still under development and users
should not attempt to use it in District applications at this
time. This attachment is included in this manual for reference
purposes because some application programs presently generate or
create APTRAF records.

                    * * * * * * * * * * * * *

     There is a need to be able to store and process water data
for arbitrarily defined data elements in a self-identifying and
free-format layout that is easily interpreted. The data should
easily be transcribed from lab notebooks, reports, or other
sources for computer processing. Also, application programs
could output data in this format for further processing. This
file therefore provides a way to pass data from one program or
system to another.

     Results of a small-scale project indicate that a simple
tabular format specification called Application Programs TRAnsfer
File (APTRAF) can be used to define, store, and process tables of
data (primarily numeric data) regardless of the type. A chief
objective is simplicity in preparing and reading the file.

     The initial file implementation is restricted in scope;
nonetheless, the limited and idealized representation of
generalized numerical data tables serves as a starting point for
the development effort.

B.2   General Concept of File Structure

     The most familiar and widely used form of data structure is
a simple two-dimensional table of numerical data. A well-
designed tabular presentation is a natural "model" for a self-
defining file. The APTRAF file specification is simply a means

for describing the essential components of a two-dimensional table of numeric data. The file is conceptualized as a collection of one or more tables of numerical data.

The core of the table is a two-dimensional array or matrix (rows and columns), easily handled by computers. The rows are called observations or cases, and the columns are called variables or characteristics. At the head of each column there is a column heading containing a label (or name). Additional explanation of column headings is provided in a set of footnotes. At the left of each row there may be an identifier to identify the row. A small amount of auxiliary numerical data may be appended to the table for more complete specification of the tabular data. Finally, the table as a whole is identified and described by one or more titles. The following diagram shows a conceptualization of the table.

```
------------------------------------
|   APTRAF FILE CONCEPT            |<----
------------------------------------       |--- Titles
|   Sample Data Table No. 1        |<----
------------------------------------


------------------------------------
|          | Parm1 | Parm2 | Parm3 |<---- Column heading
|          ------------------------
| Obs-id   | Max.  | Min.  | Mean  |<---- Subcolumn heading
------------------------------------
|    A     |  3    |  1    |  2    |<----
|    B     |  5    |  3    |  4    |     |--- Numeric data with
|    C     | 7.0   | 5.0   | 6.0   |<----    optional row labels
------------------------------------


------------------------------------
| Auxiliary data  -5 0 0 11.5 7    |
------------------------------------


------------------------------------
| Explanation:                     |
|    Obs-id -- Observation label   |
|    Parm1  -- Variable no. 1      |
|    Parm2  -- Variable no. 2      |<---- Footnotes
|    Parm3  -- Variable no. 3      |
|    Max.   -- Maximum value       |
|    Min.   -- Minimum value       |
|    Mean   -- Mean value          |
------------------------------------
```

B.3   Descriptions of APTRAF Records

The format of the APTRAF records is modeled on the general tabular format shown in the above diagram. A single table or a sequence of tables may be defined in one file. Special record types are used to specify the various components of the tables. The file is a sequentially accessed file consisting of formatted records. The file can be built manually (by a text editor) or created by Fortran formatted WRITE statements in an application program. A maximum record length of 80 characters is adopted for APTRAF records. The record types and their functions and usage, placements in the file, and layouts are summmarized below. The records are discussed generally in the order that they might appear in a file created manually or by an application program.

● $INIT Record:

Function - This record initializes all table specifications to null values. It produces a null table with no rows or columns of data and just a single top-level title. The use of this record is governed by application program requirements.

Placement - This record is optional. If used, it appears before any other records or after a $END record if there are subsequent tables (and before any other records for subsequent tables).

        Layout - Columns   Contents

                  1-5 $INIT
                  6   Blank.
                  7-80   Free-format text, as required by an
                                application program.

● $HIST Record:

Function - This record provides information on the creation or history of the file and/or table. It has no computer-related function. Use of a $HIST and a $COM record (described next) is recommended.

Placement - This record is optional. If used, it appears before any other record types and before a $END record.

        Layout - Columns   Contents

                  1-5 $HIST
                  6   Blank.
                  7-80   Free-format text, as desired or as useful
                                to the particular file or table.

● $COM record:

Function - This record contains commentary information. It
has no computer-related function.

Placement - This record is optional. As many $COM records
as desired are placed anywhere before the $DATA record or after
the $END record for subsequent tables.

Layout - <u>Columns</u>   <u>Contents</u>

1-4 $COM
5-80   Any text that is useful to annotate the
           file. Always include a date and time
           for creation of the file, and a name
           of the program creating the file.

● $TITLE Record:

Function - This record supplies titles and subtitles for the
table. Up to nine levels of titles may be specified, with one
being the highest level and nine the lowest. A $TITLE record at
any level nullifies all lower-level titles that may have been
specified for previous tables. It also nullifies any auxiliary
numerical data at the same level or lower that may have been
specified for previous tables. It has no effect on other titles
or auxiliary values that are specified explicitly in the current
table.

Placement - The $TITLE record is optional. It may appear in
any order anywhere before the $DATA record. IF $TITLE records
are not supplied, titles from any previous tables remain
applicable to the current table.

Layout - <u>Columns</u>   <u>Contents</u>

1-6 $TITLE
7   Level number. One digit, 1-9, or blank.
           A blank is interpreted as 1 on the first
           $TITLE record, as 2 on the second, and
           so on.
8-80   Title information, free-format text.

● $KEY Record:

Function - This record acts as a flag or delimiter and supplies information on whether a particular table in a series of tables is accepted or rejected.

Usage - Not available.

Placement - Not available.

Layout - Not available.

● $PARM Record:

Function - This record supplies a column heading and a brief explanation for one column of the numeric data array.

Usage - One $PARM (or $STAT) record is supplied for each column in the numeric data array (body of table). The $PARM records are specified in the order corresponding to the order of the numeric data columns. The $PARM (or $STAT) records are required to define the number of columns in the numeric data array even if no heading information is supplied.

If a sequence of tables with identical column headings (and subheadings) is defined, the $PARM (or $STAT, see next section) records are supplied for the first table. If no $PARM (or $STAT) are supplied for subsequent tables, the column headings and subheadings for the first table are assumed to apply to the subsequent tables.

Placement - The $PARM records are placed anywhere before the $DATA record. If used, they are supplied in the same order as the corresponding columns in the numeric data array. The number of $PARM records need not be equal to the number of $STAT records. However, it is necessary to supply either a $PARM and/or a $STAT record for each column of the numerical data array. If the number of $PARM records is less than the number of columns, the information on the last $PARM record applies to all remaining data columns. If there are $STAT records but no $PARM records, all column headings are assumed to be blank.

Layout - <u>Columns</u>   <u>Contents</u>

       1-5 $PARM
        6   Blank.
       7-80   Column heading and explanatory text.
                      The first word in the field is the column
                      heading, and the remaining material is

the explanatory text. The first word
begins with the first nonblank character
in the field and continues to the first
delimiter (a blank, comma, or end of
line). A maximum of 16 characters is
allowed for the heading. If a blank or
comma is required in the column heading,
the heading is enclosed in apostrophes or
quotation marks. These marks are not
included in the 16-character limit.

● $STAT Record:

Function - This record supplies a column subheading and a
brief explanation for one column of the numeric data array.

Usage - Similar to usage of the $PARM record. One $STAT (or
$PARM) record must be supplied for each column in the numeric
data array. The $STAT records are specified in the order corres-
ponding to the order of the numeric data columns. The $STAT (or
$PARM) records are required to define the number of columns in
the numeric data array even if no heading information is
supplied.

Placement - The $STAT records are placed anywhere before the
$DATA record. If used, they are placed in the same order as the
corresponding numeric data columns.

Layout - <u>Columns</u>   <u>Contents</u>

  1-5 $STAT
  6   Blank.
  7-80   Column subheading and explanatory text.
            The first word in the field is the column
            subheading, and the remaining material is
            the explanatory text. See $PARM record
            Contents field for additional comments.

● $ROWID Record:

Function - This record supplies a column heading or sub-
heading and explanatory text for a column of row-identification
labels.

Usage - The $ROWID record is used only to specify a column
heading other than "ROW.ID" for a column of row-identification
labels. The $ROWID record is not supplied merely to define the
existence of row-identification labels, because the presence or

absence of these labels is determined automatically or with the aid of a $FORMAT record.

Up to two $ROWID records may be used. The first one supplies column-heading information; the second, subheading information. The second $ROWID record, if used, must immediately follow the first.

Placement - The $ROWID is placed anywhere before the $DATA record. If two $ROWID records are used, the second immediately follows the first.

Layout - <u>Columns</u>   <u>Contents</u>

    1-7 $ROWID
    8   Blank.
    9-80   Column heading (or subheading) and
             explanatory text. The first word in
             this field is the heading; the remainder
             is the explanatory text. See $PARM
             Contents field for additional comments.

● $AUX Record:

Function - This record is used to provide auxiliary numerical information for use by a program processing an APTRAF file (table).

Usage - The $AUX record supplies numerical information to identify and describe or supplement the table, much like the $TITLE record supplies textual information. For example, if a $TITLE record includes the name of a gaging station, an $AUX record might include the latitude and longitude or elevation of the station. If the data in the table represent a time series (like annual peak flows), another $AUX record might contain the generalized (regional) skew coefficient and the standard error of that coefficient.

Because the use and interpretation of auxiliary data is highly application dependent, reference is made to the documentation of individual application programs for specific instructions on preparation of $AUX records, if such instructions are warranted. The $AUX records may be mandatory for some programs and optional for others. Complete details on use of $AUX records are not presented in this manual; however, use of these records will include specific $AUX record types or identifiers that will convey standard information such as latitude, longitude, etc.

Once defined by a $AUX record, auxiliary data remains in effect for subsequent tables in the file until they are super-seded by another $AUX record with the same $AUX identification label (level) or until they are nullified by a higher-level $AUX record or a higher-or-equal-level $TITLE record (level 1 is the highest, 10 the lowest). A $AUX record at any level nullifies any lower-level auxiliary and title data that may have been specified for previous tables.

An auxiliary data item for which no value is supplied may be specified by the "missing value" codes: two commas with nothing between them, a string of one or more asterisks, a pair of minus signs, or a string consisting solely of asterisks, minus signs, and decimal points.

Placement - The $AUX records are placed anywhere before the $DATA record.

Layout - <u>Columns</u>   <u>Contents</u>

    1-4 $AUX
    5   Level number: one digit, 1-9, or a blank. A blank is interpreted as level 10.
    6   Blank.
    7-80   Free-format field containing (1) $AUX standard (not listed herein) or other supplied identifier labels, up to 16 characters in length; (2) a list of up to 10 numeric data values. These data values are supplied in accordance with instructions in individual application programs.

● **$FORMAT Record:**

Function - This record describes formatted data records that contain data from the numeric data arrays.

Usage - The $FORMAT record is used only when the numerical data are output with a format that conflicts with free-format field specifications, which are described in the next section on numeric $DATA records. The $FORMAT record is used primarily in conjunction with formatted data files that are written and stored separately from APTRAF files.

Complete details for use of the $FORMAT record are not presented in this manual. However, the format specifications are expressed by a numeric format code and a Fortran 77 format specification. One component of the code indicates whether or not alphanumeric row-identification labels are included in the records. Another component of the code indicates the number of subsequent APTRAF records that are used to define the Fortran format specification.

Placement - The $FORMAT record is optional. If used, it is placed anywhere before the $DATA record. If format-specification records are used, they must immediately follow the $FORMAT record (and precede the $DATA record).

Layout - Columns   Contents

1-7 $FORMAT
8   Blank.
9-80   A 3-digit numeric format code, of the
         form ijj, where: i = a 1-digit code
         indicating the presence (i=1) or
         absence (i=0 or is blank) of format-
         specification records in the file;
         jj = 2-digit type code. Valid type
         codes are: 00 = free format, and
         9n = format specifications contained
         on the next n records (n = 1, 2, 3, or
         4). If four format-specification records
         are used, columns 75-80 of the last
         record must be blank. All 80 columns of
         the first three format-specification
         records can be used.

● $DATA Record:

Function - This record is a delimiter between the table specification records (any previous types of records) and the numeric data records.

Placement - The $DATA record is mandatory. It is placed after all table specification records and before any numeric data records.

Layout - Columns   Contents

1-5 $DATA
6-80   Blank.

● Numeric Data Records:

    Function - These records furnish the numerical data that form the body of the table. They also may contain row-identification labels.

    Usage - The numerical data values are entered in normal row-and-column order. That is, numerical values are entered for the first through last columns of row 1, the first through last columns of row 2, and so on. Each row must begin on a new record (card-image). If there are too many columns for a data row to fit on one record, the row is continued onto as many additional records as required. Unless specified otherwise by a $FORMAT record, there is no requirement for a rigid or consistent columnar alignment of data values (although alignment makes the data easier to read). Unless a $FORMAT record is used, it is necessary for successive data values to be separated from each other by a comma, one or more blanks, or both. The end of a record also serves as a separator of values.

    Placement - These records are mandatory. The rows and columns of the data table must be arranged in the proper order. The data records must be placed between the $DATA record and the $END record.

Layout - Columns   Contents

        1-80   Free-format field containing: 1) optional row-identification label, 2) list of "n" numeric data values where "n" is the number of data columns defined by the number of $PARM and/or $STAT records. If row-identification labels are used, they must be supplied at the beginning of each row. Labels are identified and processed automatically if the label on the first row cannot be confused with a numerical value. If all numeric labels are required (like station numbers), they can be preceded by a letter, enclosed in quotes, or identified as such in a $FORMAT record. Undefined or "missing" numerical data values are represented by a string of one or more asterisks, a pair of minus signs, or an isolated decimal point (or any other string consisting only of asterisks, minus signs, and decimal points).

● $END Record:

      Function - The $END record marks the end of a table in APTRAF. It also marks the beginning of any subsequent tables.

      Placement - The $END record is mandatory. It is placed after all table-definition and numeric-data records. Additional tables may follow the $END record.

Layout - <u>Columns</u>   <u>Contents</u>

      1-4 $END
      5-80   Blank.

B.4   <u>APTRAF Reader Subroutine</u>

      The APTRAF package file format is general and flexible; however, for convenience in programming, a more rigid and predictable data structure is desirable. Therefore, several Fortran77 subroutines are used to transform the APTRAF records to a regular data structure in computer memory for use by application programs. These subroutines load each set of tabular data into a matrix (array) and returns it to the calling program.

ATTACHMENT C - STEPS FOR PROCESSING STATION RECORDS

     This attachment presents the steps involved in processing
station records for each of the different types of water-data
computation methods. The steps for each method are presented in
logical order for orderly processing of the data.

C.1   Introduction

     Water data record processing at different stations can
involve different computational methods. This is because
different hydraulic conditions occur in streams or rivers,
different instruments are used, or ground-water well data are
collected. Each computation method involves a series of steps
for processing a daily-values record from beginning to end.
Succeeding sections of this attachment present the basic steps
involved in processing station records for a regular stage-
discharge station, stage-fall (slope) station, velocity-
deflection meter station, reservoir station, rainfall station,
water-quality monitor station, and ground-water well station.

     To process records the user should, in general, be familiar
with the computation method steps discussed in ADAPS User's
Manual section 3.5, the difference between recorded (raw),
edited, and computed data as discussed in section 3.6, and the
rating types presented in section 3.7. The user should also have
a basic understanding of the interrelation of the Instrument,
Data Descriptor, and Processor files and the Startup Routine, as
discussed in sections 3.3 and 5.2 of the manual, respectively.
Discussions of most of the ADAPS programs used to process station
records are presented in sections 7 through 16 of the ADAPS
User's Manual. Those that require action only by a local ADAPS
Data Base Administrator or authorized person due to system
security (user access) are presented in the ADAPS Administrator's
Manual.

     The Site File is central to the processing of station
records. At times, the file will need updating. To update the
Site File, programs are used that are available for that purpose.
Documentation and/or instructions for updating the file are
available in the NWIS Shared Systems User's Manual (in
preparation).

     Herein, the term "Site ID" means the 8-15 character
downstream order station number or the latitude, longitude,
sequence number.

C.2   Stage-discharge Station

The basic steps to follow in setting up and processing a record for a stage-discharge station are listed below.

1. Update the Site File, if necessary, using the Ground Water Site Inventory (GWSI) NWIS software. If a Site File entry (record) for the station does not exist, then one must be created. The local ADAPS Data Base Administrator or an authorized person must make these entries.

2. Check the Instrument (IN) File and update it, if necessary, using the IN_EDIT program. If an IN File entry (ADR or DCP type) does not exist, one must be created by the local Data Base Administrator.

3. Check the Data Descriptor (DD) File and update it ,if necessary, using the DD_EDIT program. A DD record must be created for stage (gage height) along with an associated Processor (PR) File record. In addition to stage, a DD record must be created for discharge along with an associated PR File record. This process is accomplished as follows: While creating the processor record for stage (gage height), answer the prompt "Is this parameter used in calculating another parameter" with YES. This starts the processes used to build the DD and PR records for discharge. When building the discharge processor record, select the computation method Option 2 - Standard Stage-Discharge or Stage-Contents Computation. Again, the local Data Base Administrator must make the entries. The usual parameter codes involved are 00065 for stage and 00060 for discharge. Other parameter codes may be used if different units are used.

If the Site, IN, DD, and PR file entries exist and are up to date, then start with the next step. If the data are from a Data Collection Platform (DCP - satellite transmitted), go to Step 6.

4. Translate the digital recorder paper tapes using the TP_READ program. The translation is done based on Site ID/DD/IN number.

5. Edit and store the translated data using the TP_EDIT
program. The data are stored as one file entry based on
the Site ID/DD number. The data must be time-corrected and
verified before it is stored. If the HISTORIC type
primary is to be produced, the Historical Time Correction
Method (an option) should be used. NOTE: Data can also be
entered using ADR card-image data (which is the equivalent
of raw data, i.e., as if obtained from a digital tape or
choosing values at equal intervals from a strip chart) via
the CD_READ program. Of course, the UV_EDIT program allows
for direct entry (edit) of data.

6. Enter Rating File data or update, if necessary, using
the RT_EDIT program. The entry is based on the gage-height
Site ID/DD number. The applicable ratings types that are
involved in the computations are given below.

   Type 0 : For conversion of input units (usually used
            to convert gage Dial readings to stage (gage
            height) in feet).

   Type 1 : A standard discharge rating (discharge
            versus gage height).

7. Enter Datum Correction File data or update, if
necessary, using the DC_EDIT program. The entry is based
on the gage-height Site ID/DD number. Presently, datum
corrections are distributed by time only.

8. Enter shifts to be distributed by time, if any, to the
Shift-by-Time File using the ST_EDIT program. The entry
is based on the gage-height Site ID/DD number.

9. Enter shifts to be distributed by stage (V-diagrams),
if any, to Shift-by-Stage File using the SV_EDIT program.
The entry is based on the gage-height Site ID/DD number.
NOTE: If both time and stage shifts are entered or occur
for the same time period, shifts by stage take precedence.

10. Perform the Primary Computations interactively or in
batch mode using the PRIMARY program. The entry is based
on the gage-height Site ID/DD number.

11. Review the Primary Computations. If any data errors
are evident, the following ADAPS programs may be helpful:

   a) Edit the unit values using the UV_EDIT program.
   b) Display the unit values for questionable
      days using the UV_TABLE program. Usually it is
      output-computed unit values that are reviewed;
      however, input-edited values can also be viewed.
   c) Edit the daily values using the DV_EDIT program.
   d) Display the daily values for the water year of
      interest using the DVTABLE program.

12. After the water year Primary Computations are complete
and all data errors are corrected, prepare the daily-values
table using the DVTABLE program.

13. Other programs available in ADAPS that may be helpful
in processing stage-discharge records are:

   a) DRFILES   -- Review/Delete Digital Tape
                     Temporary Files.
   b) TERMPRINT -- Display/Print Output Print
                     Files at the Terminal.

14. Perform District quality-assurance process for final
review and approval of record.

15. Flag record(s) as FINAL (see ADAPS Administrator's
Manual) for transmittal (create job streams and postprocess
for missing data) to the Daily Values File on the mainframe
computer at Headquarters.

C.3   Stage-fall (Slope) Station

       The basic steps to follow in setting up and processing a record for a stage-fall (slope) discharge station are listed below.

       1. Update the Site File, if necessary, using GWSI software. All entries must be made by the local ADAPS Data Base Administrator or an authorized person. Create a Site File entry for the base gage, generally where the discharge is computed and optionally for the auxiliary gage. If the auxiliary gage is entered as a different station number, it is necessary to make a separate entry for it.

       2. Check the Instrument (IN) File and update it, if necessary, using the IN_EDIT program. Again, all entries using the IN_EDIT program must be made by the local Data Base Administrator. Use the AD (Add a new instrument record) option to create an IN, Data Descriptor (DD), Processor (PR) File entry for the auxiliary gage and then the base gage. During this process, DD (see Step 3) and PR file entries must also be created for discharge. Once the auxiliary gage entries are made, the process proceeds as follows: While creating the processor record for the base gage, answer the prompt "Is this parameter used in calculating another parameter" with YES. This starts the processes used to build the DD and PR records for discharge. When creating the discharge processor record, select the computation method option "3. Slope-discharge Computation."

       NOTE: It is important to create the auxiliary gage IN/DD/PR entry first so that proper responses to the prompts during the base-gage entries for stage and discharge will be possible. The usual parameter codes involved are 00065 for stage and 00060 for discharge. Other parameter codes may be used if different units are used.

       3. Check the DD (and Processor) File and update it, if necessary, using the DD_EDIT program. The initial entries are usually made in Step 2 above during the creation process.

       When the Site, IN, DD, and PR files exist or are up to date, a Primary Computation of discharge at the base gage is possible if the proper ratings and input-edited values exist for both gages. If the user desires to change data within the IN,

DD, or PR files later, this is accomplished (by the local Data Base Administrator) via the appropriate ADAPS program. If the IN/DD/PR entries are up to date, start with the next step. If the data are from a DCP (satellite transmitted), go to Step 6.

4. Translate the base and auxiliary gage digital recorder paper tapes for the desired period using the TP_READ program. The translation is done based on each Site ID/DD/IN number.

5. Edit and store the translated data using the TP_EDIT program. The data are stored as two file entries based on the base and auxiliary Site ID/DD numbers. The data must be time-corrected and verified before it is stored. If the HISTORIC type primary is to be produced, the Historical Time Correction Method (an option) should be used.

NOTE: Data can also be entered using ADR card-image data (which is the equivalent of raw data, i.e., as if obtained from a digital tape or choosing values at equal intervals from a strip chart) via the CD_READ program. Of course, the UV_EDIT program allows for direct entry of data.

6. Enter Rating File data or update, if necessary, using the RT_EDIT program. NOTE: All rating entries for slope stations should be entered based on the base gage-height Site ID/DD number. Applicable rating types that may be involved in the computations are given below.

Type 0 : For conversion of input units (usually used to convert base gage Dial readings to gage height in feet).

Type 1 : A standard discharge rating (discharge versus gage height).

Type 2 : Stage-fall rating. If this rating does not exist, the program assumes the rating fall is equal to 1 (unit fall).

Type 3 : Fall ratio-discharge ratio. If this rating does not exist, the program assumes that the discharge ratio is equal to the square root of the fall ratio.

Type 20: For conversion of auxiliary input units (usually used to convert Dial reading to gage height in feet).

The use of any of these ratings is optional. The user must
select the appropriate types for use with the station being
processed. Normally, rating types 0, 1, 2, 3, and 20 are
used for a slope station.

7. Enter Datum Correction File data (either or both gages)
or update, if necessary, using the DC_EDIT program. Datum
correction data are entered for both the base and auxiliary
gages if necessary,. The entries are based on the gage-
height Site ID/DD number for each of the gages (base and
and auxiliary, respectively). Presently, datum corrections
are distributed by time only.

8. Enter shifts for the base gage to be distributed by
time, if any, to the Shift-by-Time File using the ST_EDIT
program. The entry is based on the base gage-height Site
ID/DD number.

9. Enter shifts for the base gage to be distributed by
stage (V-diagrams), if any, to Shift-by-Stage File using
the SV_EDIT program. The entry is based on the base gage-
height Site ID/DD number. NOTE: If both time and stage
shifts are entered for the same time period, shifts by
stage take precedence.

10. Perform the Primary Computations interactively or in
batch mode using the PRIMARY program. The Primary
Computation for a slope station should be run using the
base gage-height Site ID/DD number.

11. Review the Primary Computations. If any data errors
are evident, the following ADAPS programs may be helpful:

    a) Edit the unit values using the UV_EDIT program.
    b) Display the unit values for questionable
       days using the UV_TABLE program. Usually it is
       output-computed unit values that are reviewed;
       however, input-edited values can also be viewed.
    c) Edit the daily values using the DV_EDIT program.
    d) Display the daily values for the water year
       year of interest using the DVTABLE program.

12. After the water year Primary Computations are complete
and all data errors are corrected, prepare the daily-values
table using the DVTABLE program.

13. Other programs available in ADAPS that may be helpful in processing slope-station records are:

    a) DRFILES   -- Review/Delete Digital Tape
                       Temporary Files.
    b) TERMPRINT -- Display/Print Output Print
                       Files at the Terminal.

14. Perform District quality-assurance process for final review and approval of record.

15. Flag record(s) as FINAL for transmittal (create job streams and postprocess for missing data) to Daily Values File on the mainframe computer at Headquarters.

C.4   Velocity-Deflection Meter Station

        The basic steps to follow in setting up and processing a
record for a velocity-deflection meter station are listed below.
These steps are also used for a point velocity or an acoustic
velocity-meter station.

        1. Update the Site File, if necessary, using GWSI soft-
        ware. If a Site File entry (record) for the station does
        not exist, one must be created. The local ADAPS Data Base
        Administrator or an authorized person must make these
        entries.

        2. Check the Instrument (IN) File and update it, if
        necessary, using the IN_EDIT program. If an IN File entry
        (ADR type) does not exist, one must be created by the local
        Data Base Administrator. Use the AD (Add a new instrument
        record) option to create IN, Data Descriptor (DD), and
        Processor (PR) File entries. If the site has two
        instruments, one for stage and one for velocity, then the
        auxiliary IN File entry for velocity must be made first.
        If both parameters are recorded by the same instrument
        (i.e., a multi-parameter instrument), then a DD File entry
        (see next step) for the velocity (auxiliary parameter),
        along with an associated PR File record, must be created
        before creating the IN File entry. When creating the PR
        record for velocity, be sure that you answer NO to the
        prompt, "Is this parameter used in calculating another
        parameter?" Next, create the stage DD and PR file entries.
        Once the stage DD and PR records are made, the process
        proceeds with the prompt "Is this parameter used in
        calculating another parameter?" Answer YES to the prompt,
        and create DD and PR entries for discharge. During this
        last process, select computation method 4 - Velocity/
        deflection discharge computation. The usual parameter
        codes involved are 00065 for stage, 00055 for stream
        velocity, and 00060 for discharge. Other parameter codes
        may be used if different units are used. The output values
        (parameters) for stream cross-sectional area and flow
        volume (millions of cubic feet) are not stored parameters;
        therefore do not attempt to create DD and PR records for
        these parameters.

        3. Check the DD File and update it, if necessary, using
        the DD_EDIT program. These entries are normally made while
        doing Step 2 above during the creation process. The DD and

PR files must contain entries for all three parameters of stage, velocity, and discharge.

If the Site, IN, DD, and PR file entries exist and are up to date, start with the next step. If the data are from a DCP (satellite transmitted), go to Step 6.

4. Translate the digital recorder paper tapes using the TP_READ program. The translation is done based on Site ID/DD/IN numbers.

5. Edit and store the translated data using the TP_EDIT program. The data are stored as two file entries based on the gage height and velocity (index) Site ID/DD numbers. The data must be time-corrected and verified before it is stored. If the HISTORIC type primary is to be produced, the Historical Time Correction Method (an option) should be used. NOTE: Data can also be entered using ADR card-image data (which is the equivalent of raw data, i.e., as if obtained from a digital tape or choosing values at equal intervals from a strip chart) via the CD_READ program. Of course, the UV_EDIT program allows for direct entry of data.

6. Enter Rating File data or update, if necessary, using the RT_EDIT program. NOTE: All ratings must be stored based on the base gage-height Site ID/DD number. The ratings include (1) stage (gage height) versus area, (2) deflection versus velocity, (3) point velocity versus cross-sectional mean velocity, (4) acoustic horizontal line velocity versus cross-sectional mean velocity, and possibly (5) stage versus velocity correction or adjustment factor. For deflection meter stations, the first two ratings are usually required, and the fifth one is used when the deflection versus velocity rating (number 2) is affected by stage. If the station is a point velocity station, the first, third, and possibly the fifth ratings are used. If the station is an acoustic velocity-meter station, the first, fourth, and possibly the fifth ratings are used. The applicable rating types that may be involved in the computations are given below.

Type 0 : For conversion of base gage-height
          input units (usually used to convert
          Dial readings to feet).

Type 20: For conversion of auxiliary input units.
          Can be used to convert any recorded

Dial readings to point or mean velocity in feet per second or to some other intermediate value.

Type 4 : Stage-area. A mandatory rating. Cross-sectional area is not stored or used in ADAPS with an assigned parameter code.

Type 5 : Stage-velocity correction factor. This rating is used to correct the output from rating Type 6 if a correction is needed. If this rating doesn't exist, the program assumes that the velocity from the deflection-velocity rating (Type 6) is the mean cross-sectional velocity.

Type 6 : Deflection-velocity rating. This rating is used to convert instantaneous deflection readings, point velocities, or velocities obtained at a vertical in the cross section to a cross-sectional mean velocity. This rating type is also used for an acoustic velocity-meter site to convert an instantaneous horizontal line velocity to a cross-sectional mean.

NOTE: The output-computed velocity stored in ADAPS is the velocity resulting from using rating Type 6 and then multiplying by the velocity factor found by using rating Type 5.

The use of any of these ratings is optional except for rating Type 4. The user must select the appropriate types for use with the station being processed.

7.   Enter Datum Correction File data for either or both gage height and velocity or update, if necessary, using the DC_EDIT program. The entries are based on the respective Site ID/DD numbers. Presently, datum corrections are distributed by time only.

8.   Enter shift data to be distributed by time for either or both gage height and velocity, if any, to the Shift-by-Time File using the ST_EDIT program. The entries are based on the respective Site ID/DD numbers.

9.   Enter shift data to be distributed by parameter value (V-diagrams of stage or velocity) for either or both gage

height and velocity, if any, to Variable-Shift file using the SV_EDIT program. The entries are based on the respective Site ID/DD numbers. NOTE: If both time and parameter value shifts are entered for the same time period, shifts by parameter value take precedence.

10. Perform the Primary Computations interactively or in batch mode using the PRIMARY program. The Primary Computations must be run based on the base gage-height (not velocity or discharge) Site ID/DD number.

11. Review the Primary Computations. If any data errors are evident, the following ADAPS programs may be helpful:

        a) Edit the unit values using the UV_EDIT program.
        b) Display the unit values for questionable days using the UVTABLE program. Usually it is output-computed unit values that are reviewed; however, input-edited values can also be viewed.
        c) Edit the daily values using the DV_EDIT program.
        d) Display the daily values for the water year of interest using the DVTABLE program.

12. After the water year Primary Computations are complete and all data errors are corrected, prepare the daily-values table using the DVTABLE program.

13. Other programs available in ADAPS that may be helpful in processing velocity-deflection meter records are:

        a) DRFILES   -- Review/Delete Digital Tape Temporary Files.
        b) TERMPRINT -- Display/Print Output Print Files at the Terminal.

14. Perform District quality-assurance process for final review and approval of record.

15. Flag record(s) as FINAL for transmittal (create job streams and postprocess for missing data) to Daily Values File on the mainframe computer at Headquarters.

C.5   Reservoir Station

        The basic steps to follow in setting up and processing a
record for a reservoir station are listed below.

        1.   Update the Site File, if necessary, using GWSI soft-
        ware. If a Site File entry (record) for the station does
        not exist, one must be created. The local ADAPS Data Base
        Administrator or an authorized person must make these
        entries.

        2.   Check the Instrument (IN) File and update it, if
        necessary, using the IN_EDIT program. If an IN File entry
        (ADR type) does not exist, one must be created by the local
        Data Base Administrator.

        3.   Check the Data Descriptor (DD) File and update it, if
        necessary, using the DD_EDIT program. A DD record must be
        created for stage or reservoir water level along with an
        associated Processor (PR) File record. In addition, a DD
        record must be created for reservoir contents along with an
        associated PR File Record. This process is accomplished as
        follows: While creating the DD/processor record for stage,
        answer the prompt "Is this parameter used in calculating
        another parameter" with YES. This starts the processes
        used to create the DD and PR records for reservoir
        contents. When creating the reservoir contents processor
        record, select computation method option "2. Standard
        Stage-Discharge or Stage-Contents Computation". Again, the
        local Data Base Administrator must make the entries. The
        usual parameter codes involved are 00065 for stage and
        00054 for reservoir storage or contents. Other parameter
        codes may be used if different units are used.

        If the Site, IN, DD, and PR file entries exist and are up
to date, then start with the next step. If the data are from a
DCP (satellite transmitted), go to Step 6.

        4.   Translate the digital recorder paper tapes using the
        TP_READ program. The translation is done based on the Site
        ID/DD/IN number.

        5.   Edit and store the translated data using the TP_EDIT
        program. The data are stored as one file entry based on
        the gage-height (stage) Site ID/DD number. The data must
        be time-corrected and verified before it is stored. If the
        HISTORIC type primary is to be produced, the Historical

Time Correction Method (an option) should be used.   NOTE:
Data can also be entered using ADR card-image data (which
is the equivalent of raw data, i.e., as if obtained from a
digital tape or choosing values at equal intervals from a
strip chart) via the CD_READ program.   Of course, the UV-
EDIT program allows for direct entry of data.

6.   Enter Rating File data or update, if necessary, using
the RT_EDIT program.   The rating data consists of reservoir
stage or water level versus reservoir capacity or contents
(usually in acre-feet or thousands of acre-feet). The entry
is based on the gage height (stage) Site ID/DD number.   The
applicable rating types are:

>   Type 0 : For conversion of input units (usually to
>   convert Dial readings to stage in feet).
>
>   Type 1 : A standard rating (reservoir contents
>   versus stage).

7.   Enter Datum Correction File data or update, if
necessary, using the DC_EDIT program.   The entry is based
on the gage-height (stage) Site ID/DD number.   Presently,
datum corrections are distributed by time only.

8.   Enter shifts to be distributed by time, if any, to the
Shift-by-Time File using ST_EDIT program.   The entry is
based on the gage-height Site ID/DD NUMBER.

9.   Enter shifts to be distributed by stage (V-diagrams),
if any, to Shift-by-Stage File using the SV_EDIT program.
The entry is based on the gage-height Site ID/DD number.
NOTE: If both time and stage shifts are entered or occur
for the same time period, shifts by stage take precedence.

10.   Perform the Primary Computations interactively or in
batch mode using the PRIMARY program.   The entry is based
on the gage-height (stage) Site ID/DD number.

11.   Review the Primary Computations.   If any data errors
are evident, the following programs may be helpful:

a) Edit the unit values using the UV_EDIT program.
b) Display the unit values for questionable days using the UV_TABLE program. Usually it is output-computed unit values that are reviewed; however, input-edited values can also be viewed.
c) Edit the daily values using the DV_EDIT program.
d) Display the daily values for the water year of interest using the DVTABLE program.

12. After the water year Primary Computations are complete and all data errors are corrected, prepare the daily-values table using the DVTABLE program.

13. Other programs available in ADAPS that may be helpful in processing reservoir records are:

a) DRFILES   -- Review/Delete Digital Tape Temporary Files.
b) TERMPRINT -- Display/Print Output Print Files at the Terminal.

14. Perform District quality-assurance process for final review and approval of record.

15. Flag record(s) as FINAL for transmittal (create job streams and postprocess for missing data) to Daily Values File on the mainframe computer at Headquarters.

C.6   Rainfall Station

The basic steps to follow in setting up and processing a record for a cumulative rainfall station are listed below.

1. Update the Site File, if necessary, using GWSI software. If a Site File entry (record) for the station does not exist, one must be created. The local ADAPS Data Base Administrator or an authorized person must make these entries.

2. Check the Instrument (IN) File and update it, if necessary, using the IN_EDIT program. If an IN File entry (ADR type) does not exist, one must be created by the local Data Base Administrator.

3. Check the Data Descriptor (DD) File and update it, if necessary, using the DD_EDIT program. A DD record must be created for cumulative rainfall along with an associated Processor (PR) File record. When creating the rainfall DD/processor record, select the computation method option "2. Difference computation". Again, the local Data Base Administrator must make the entries. The usual parameter code involved is 00045 for rainfall. Additional information is listed below.

   a) The format of the input data should be Real numbers (this involves converting Dial readings to Real) for display of HISTORICAL type primaries.

   b) The format of the input data must be Dial readings (this involves no conversion, i.e., Dial to Dial) for display of STANDARD type primaries.

If the Site, IN, DD, and PR file entries exist and are up to date, start with the next step. If the data are from a DCP (satellite transmitted), go to Step 6.

4. Translate the digital recorder paper tapes using the TP_READ program. The tra lation is done based on the Site ID/DD/IN number.

5. Edit and store the translated data using the TP_EDIT
program. The data are stored as one file entry based on
the rainfall Site ID/DD number. The data must be time-
corrected and verified before it is stored. If the
HISTORIC type primary is to be produced, the Historical
Time Correction Method (an option) should be used. NOTE:
Data can also be entered using ADR card-image data (which
is the equivalent of raw data, i.e., as if obtained from a
digital tape or choosing values at equal intervals from a
strip chart) via the CD_READ program. Of course, the
UV_EDIT program allows for direct entry of data.

6. Enter Rating File data or update, if necessary, using
the RT_EDIT program. For rainfall data from an ADR, a
rating must be entered to convert or "scale" the recorded
input Dial units to proper units (usually to correct for
the rainfall collector being of varying or "noncalibrated"
size). The rating types that may be involved in this
process are as follows:

Type 0 : For conversion of input units. Can be
         used to convert Dial readings to proper
         Real units in lieu of using a Type 1
         (see below); Real units are then used
         in the processing of the data; this
         means datum corrections (if any) are
         entered as Real units.

Type 1 : A standard rating. Normally used to
         convert input Dial readings to the
         properly scaled Real units; this means
         datum corrections (if any) are entered
         as Dial Readings.

Rating expansion for rainfall data is normally by an
EQUATION (form is Rainfall = A + B*X with X raised to C
power) with the coefficient A set to 0.00, the coefficient
B set to 0.01, and the coefficient C set to 1.00. Actually
any of the expansion types Equation linear or log can be
used, if desired. The entries are based on the rainfall
Site ID/DD number.

7. Enter Datum Correction File data or update, if
necessary, using the DC_EDIT program. The entry is based
on the rainfall Site ID/DD number. Presently, datum
corrections are distributed by time only.

8. Perform the Primary Computations interactively or in batch mode using the PRIMARY program. The entry is based on the rainfall Site ID/DD number.

9. Review the Primary Computations. If any data errors are evident, the following ADAPS programs may be helpful:

  a) Edit the unit values using the UV_EDIT program.
  b) Display the unit values for questionable days days using the UV_TABLE program. Usually it is output-computed unit values that are reviewed; however, input-edited values can also be viewed.
  c) Edit the daily values using the DV_EDIT program.
  d) Display the daily values for the water year of interest using the DVTABLE program.

10. After the water year Primary Computations are complete and all data errors are corrected, prepare the daily-values table using the DVTABLE program.

11. Other programs available in ADAPS that may be helpful in processing rainfall records are:

  a) DRFILES   -- Review/Delete Digital Tape Temporary Files.
  b) TERMPRINT -- Display/Print Output Print Files at the Terminal.

12. Perform District quality-assurance process for final review and approval of record.

13. Flag record(s) as FINAL for transmittal (create job streams and postprocess for missing data) to Daily Values File on the mainframe computer at Headquarters.

C.7   Water-Quality Monitor Station and Stage Only

The basic steps in setting up and processing a record at a water-quality monitor station are listed below. The same steps apply to a stage only site.

1. Update the Site File, if necessary, using GWSI software. If a Site File entry (record) for the station does not exist, one must be created. The local ADAPS Data Base Administrator or an authorized person must make these entries.

2. Check the Instrument (IN) File and update it, if necessary, using the IN_EDIT program. If an IN File entry (ADR type) does not exist, one must be created by the local DBA.

3. Check the Data Descriptor (DD) File and update it, if necessary, using the DD_EDIT program. A DD record must be created for each quality-of-water parameter along with its associated Processor (PR) File record. If a rating is to be used when creating the DD/processor record, select the computation method 1 - Conversion table or equation. Again, the local DBA must make the entries. The usual parameter codes involved may include 00010 for temperature, 00400 for pH, 00095 for specific conductivity, 00300 for dissolved oxygen, and 00065 for stage. Other parameters may be recorded and processed, and other parameter codes may be used if different units are used.

If the Site, IN, DD, and PR file entries exist and are up to date, start with the next step. If the data are from a DCP (satellite transmitted), go to Step 6.

4. Translate the digital recorder paper tapes using the TP_READ program. The translation is done based on Site ID/DD/IN numbers.

5. Edit and store the translated data using the TP_EDIT program. The data are stored as multiple file entries based on the Site ID/different DD numbers. The data must be time-corrected and verified before it is stored. If the HISTORIC type primary is to be produced, the Historical Time Correction Method option should be used. NOTE: Data can also be entered using ADR card-image data (which is the equivalent of raw data, i.e., as if obtained from a digital tape or choosing values at equal intervals from a strip

chart) via the CD_READ program. Of course, the UV_EDIT
program allows for direct entry of data.

6. Enter Rating File data or update, if necessary, using
the RT_EDIT program. Possible rating entries are based on
their particular parameter Site ID/DD number. The
applicable rating types that may be involved in the compu-
tations are given below.

        Type 0 : For conversion of input units
                 (usually used to convert parameter
                 Dial readings to a decimal form;
                 no conversion may be required).

        Type 1 : A standard parameter rating for
                 (further) conversion if required.

7.   Enter Datum Correction File data or update, if
necessary, using the DC_EDIT program. Each entry is based
on the particular parameter Site ID/DD numbers. Presently,
datum corrections are distributed by time only. NOTE: Datum
corrections are applied only after a conversion rating if
one is used.

8.   Enter shifts to be distributed by time, if any, to the
Shift-by-Time File using the ST_EDIT program. Each entry
is based on the particular parameter Site ID/DD numbers.
NOTE: Shifts by time are applied after application of
ratings. Shifts by time are not applicable to stage-only
sites; if entered, they will not be used.

9.   Enter shifts to be distributed by parameter value (V-
diagrams), if any, to Shift-by-Stage File using the SV_EDIT
program. Each entry is based on the particular parameter
Site ID/DD numbers. NOTE: If both time and parameter value
shifts are entered for the same time period, shifts by
parameter value take precedence. Also, application of
shifts by parameter value is done after application of
ratings. In addition, shifts by parameter value are not
applicable to stage-only sites; if entered, they will not
be used.

10. Perform the Primary Computations interactively or in
batch mode using the PRIMARY program. The entry is based
on the particular parameter Site ID/DD number.

11. Review the Primary Computations. If any data errors are evident, the following ADAPS programs may be helpful:

    a) Edit the unit values using the UV_EDIT program.
    b) Display the unit values for questionable days using the UV_TABLE program. Usually it is output-computed unit values that are reviewed; however, input-edited values can also be viewed.
    c) Edit the daily values using the DV_EDIT program.
    d) Display the daily values for the water year of interest using the DVTABLE program.

12. After the water year Primary Computations are complete and all data errors are corrected, prepare the daily-values table using the DVTABLE program.

13. Other programs available in ADAPS that may be helpful in processing water-quality monitor records are:

    a) DRFILES   -- Review/Delete Digital Tape Temporary Files.
    b) TERMPRINT -- Display/Print Output Print Files at the Terminal.

14. Perform District quality-assurance process for final review and approval of record.

15. Flag record(s) as FINAL for transmittal (create job streams and postprocess for missing data) to Daily Values File on the mainframe computer at Headquarters.

C.8   Ground-water Well Station

The basic steps to follow in setting up and processing a record for a ground-water well station are listed below.

1. Update the Site File, if necessary, using GWSI software. If a Site File entry (record) for the station does not exist, one must be created. The local ADAPS Data Base Administrator or an authorized person must make these entries.

2. Check the Instrument (IN) File and update it, if necessary, using the IN_EDIT program. If an IN File entry (ADR type) does not exist, one must be created by the local Data Base Administrator.

3. Check the Data Descriptor (DD) File and update it, if necessary, using the DD_EDIT program. A DD record must be created for water level along with an associated Processor (PR) File record. If a rating is to be used when creating the water level DD/processor record, select the computation method option "1. Conversion or equation computation." Again, the local Data Base Administrator must make the entries. Usually three types (statistic codes) of ground-water data are processed: maximum, minimum, and mean. The usual parameter code involved is 72019 for water depth below land surface. Other parameter codes may be used if different units or reference elevations are used.

If the Site, IN, DD, and PR file entries exist and are up to date, start with the next step. If the data are from a DCP (satellite transmitted), go to Step 6.

4. Translate the digital recorder paper tapes using the TP_READ program. The translation is done based on the Site ID/DD/IN number.

5. Edit and store the translated (or satellite transmitted) data using the TP_EDIT program. The data are stored as one file entry based on the gage-height (water level) Site ID/DD number. The data must be time-corrected and verified before it is stored. NOTE: Data can also be entered using ADR card-image data (which is the equivalent of raw data, i.e., as if obtained from a digital tape or choosing values at equal intervals from a strip chart) via the CD_READ program. Of course, the UV_EDIT program allows for direct entry of data.

6. Enter Rating File data or update, if necessary, using
the RT_EDIT program. The entry is based on the water level
Site ID/DD number. The rating for ground-water data is
usually a Type 1 standard rating and is usually of the
EQUATION form, but linear or logarithmic expansions can be
used. A Type 0 rating can be used, if necessary, to
convert recorded input data prior to further processing
(i.e., the addition of any datum corrections).

7. Enter Datum Correction File data or update, if neces-
sary, using the DC_EDIT program. The entry is based on the
gage-height (water level) Site ID/DD number. Presently,
datum corrections are distributed by time only.

8. Enter shifts to be distributed by time, if any, to the
Shift-by-Time File using the ST_EDIT program. The entry is
based on the water-level Site ID/DD number.

9. Enter shifts to be distributed by stage (V-diagrams),
if any, to Shift-by-Stage File using the SV_EDIT program.
The entry is based on the water-level Site ID/DD number.
NOTE: If both time and stage shifts are entered or occur
for the same time period, shifts by stage take precedence.

10. Perform the Primary Computations interactively or in
batch mode using the PRIMARY program. The entry is based
on the gage-height (water level) Site ID/DD number.

11. Review the Primary Computations. If any data errors
are evident, the following programs may be helpful:

> a) Edit the unit values using the UV_EDIT program.
> b) Display the unit values for questionable days
>   using the UV_TABLE program. Usually it is
>   output-computed unit values that are reviewed;
>   however, input-edited values can also be
>   viewed.
> c) Edit the daily values using the DV_EDIT
>   program.
> d) Display the daily values for the water year
>   of interest using the DVTABLE program.

12. After the water year Primary Computations are complete
and all data errors are corrected, prepare the daily-values
table using the DVTABLE program.

13. Other programs available in ADAPS PR menu that may be
helpful in processing ground-water well records are:

    a) DRFILES   -- Review/Delete Digital Tape
                    Temporary Files.
    b) TERMPRINT -- Display/Print Output Print
                    Files at the Terminal.

14. Perform District quality-assurance process for final
review and approval of record.

15. Flag record(s) as FINAL for transmittal (create job
streams and postprocess for missing data) to Daily Values
File on the mainframe computer at Headquarters.

ATTACHMENT D - LIST OF ADAPS MENU OPTIONS AND PROGRAMS

This attachment discusses and lists the ADAPS two-letter mnemonic main menu and associated 1- or 2-digit numeric submenu options, and gives the names of the main computer programs (Fortran 77) that are associated with each of the submenu options. This attachment is included in both the ADAPS Administrator's and User's manuals for easy reference.

The main menu is arranged so that similar or complementary work categories are grouped together.

D.1   Introduction

The water data-processing system is primarily menu-driven. The menus (and programs) are invoked interactively. The options invoke individual task-specific processing programs. The system is accessed by keying the word "ADAPS." Once within ADAPS, the user selects alternate menu options. The system also allows the user to select work tasks by entering the name of a program. In addition, the system allows the District ADAPS System Administrator to change the access levels of the programs, thereby tailoring the system to individual District's needs. The District also can rearrange the work tasks (submenu options or programs) within the main menu categories. If the District changes the access levels or rearranges the menus, the numbering of the submenu options may differ from District to District, and possibly from user access level to user access level within a District. Therefore, the system has a default arrangement. This default arrangement is presented in the following subsections.

D.2   Main Menu Options

The main menu options are arranged (by default) so that similar or complementary work categories are logically grouped together. For each of these options, there are associated task-specific submenus. This arrangement permits the user to work without having to review displays of unrelated work functions.

The main menu options and work categories that are available are:

```
MENU
OPTION                    WORK CATEGORY

IN -- TRANSLATE AND STORE INPUT DATA
PR -- PROCESS PRIMARY DATA
DI -- DISPLAY UNIT- AND DAILY-VALUES DATA
RT -- RETRIEVE/WRITE ADAPS DATA
SU -- UPDATE SUPPORT FILES/RECORD FLAGS/MAINFRAME FILES
SA -- START/STOP PROCESSING/TRANSFER OF SATELLITE DATA
MA -- MAINTAIN MODE/MIDAS/SECURITY FILES
AP -- ADAPS APPLICATIONS
LA -- LOCAL APPLICATIONS
PD -- PRINT DOCUMENTATION
UT -- MISCELLANEOUS UTILITY FUNCTIONS
HT -- HYDROLOGIC TOOLBOX
```

There are three main menu options -- SU, SA, and MA, all or part of which are not seen by all users because of system security. The SU option provides the capability to update the ADAPS support and mainframe files, and the setting of record flags. The SA option is for use of the SATIN system satellite data, and the MA option provides for maintenance of the Node, MIDAS, and Security files. Since these options deal with the maintenance and security aspects of the system, this work is handled only by a local administrator or manager. Most programs available for these three options are documented in the ADAPS Administrator's Manual; the remaining programs are documented in the ADAPS User's Manual. Note that since the Site File is central to the data processing, its documentation appears in the NWIS Shared Systems User's Manual (in preparation).

In addition to the three undisplayed menu options, some users may not see the PR and HT options. The system also can be configured to control access to the AP and LA options. This means that only users whose jobs involve records computation have access to records-computation routines, and other users have appropriate access to the facilities needed. The next section discusses the default submenu options associated with each main menu option.

D.3   Submenu Options and Programs

This section presents a brief summary about each main menu option, followed by the available default submenu options, short task descriptions, names of the computer programs that are associated with (invoked by) each main menu option, and the section numbers within the ADAPS manuals where explanations of the programs are found.

D.3.1   Input (IN) Menu

The IN Main Menu submenu options and programs are listed here. The main menu screen displays the following:

IN -- TRANSLATE AND STORE INPUT DATA

The submenu options that are available for this selection allow input of different forms of data into ADAPS. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Translate New Data ---------------	TP_READ	7.1
2 --	Process ADR Card Image Data ------	CD_READ	7.2
3 --	Edit and Store Translated Data ---	TP_EDIT	7.3
4 --	Process UV Card-Image Data -------	UV_STORE	7.4
5 --	Enter Unit Values from a Digitizer	UV_ENTER	7.9
6 --	Process DV Card-Image Data -------	DV_STORE	7.6
#7 --	Process WRD Standard Input Data --	STD_STOR	7.8

#Executed interactively or in batch mode.

D.3.2   Primary Computation (PR) Menu

     The PR Main Menu submenu options and programs are listed here. The main menu screen displays the following:

<u>PR -- PROCESS PRIMARY DATA</u>

The submenu options that are available for this selection allow operations necessary to process primary data. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Update/Display Rating Tables -----	RT_EDIT	8.1
2 --	Update/Display Datum Corrections -	DC_EDIT	8.2
3 --	Update/Display Shifts by Time ----	ST_EDIT	8.3
4 --	Update/Display Variable Shifts ---	SV_EDIT	8.4
5 --	Edit Unit Values ----------------	UV_EDIT	8.5
# 6 --	Print/Display Unit-Values Tables -	UV_TABLE	9.2
# 7 --	Primary Computations ------------	PRIMARY	8.6
8 --	Edit Daily Values ---------------	DV_EDIT	8.7
# 9 --	Daily Values Tables -------------	DVTABLE	9.1
10 --	Review/Delete Digital Tape Temporary Files ------------------	DRFILES	7.7
11 --	Display/Print Files at Terminal --	TERMPRINT ...	13.1
12 --	Merge/Replace Unit-Values Data ---	UV_MERGE	12.7
13 --	Plot Time-Series Data -----------	PLOTWAT	9.4

#Executed interactively or in batch mode.

     The steps for processing station records are presented in Attachment C of the User's Manual. The processing steps primarily involve the use of the ADAPS PR Menu, and its submenus and programs.

D.3.3   Display and Retrieval (DI) Menu

     The DI Main Menu submenu options and programs are listed here. The main menu screen displays the following:

DI -- DISPLAY/RETRIEVE UNIT- AND DAILY-VALUES DATA

     The submenu options that are available for this selection are used to prepare various types of visual displays for daily- and unit-values data. The options also allow the user to display rating tables and obtain an inventory of daily-values data. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
#1 --	Daily-Values Tables ------------------	DVTABLE	9.1
#2 --	Print/Display Unit-Values Tables -----	UV_TABLE	9.2
3 --	Plot Hydrographs Using Preprinted Forms -------------------------------	HYDROGRAPH ..	9.3
4 --	Plot Time-Series Data ---------------	PLOTWAT	9.4
5 --	Display Rating Table Dates -----------	RT_DATES	12.5
6 --	Display Rating(s) -------- ----------	RT_DISPLAY ..	12.6
7 --	Plot Ratings on Preprinted Forms -----	RATPLOT	9.5
#8 --	Daily-Values Inventory --------------	DVINV	11.3
9 --	Update/Display Measurements ----------	MS_EDIT	7.5

#Executed interactively or in batch mode.

D.3.4   Retrieve and Write (RT) Menu

        The RT Main Menu submenu options and programs are listed here. The main menu screen displays the following:

RT -- RETRIEVE/WRITE ADAPS DATA

        The submenu options that are available for this selection are used to retrieve and optionally write daily-values data or any of the time-series data (daily and unit values, and measurement/crest-stage gage data) stored in the ADAPS files. The programs are documented in this manual.


```
SUBMENU                                      PROGRAM      SECTION
OPTION           TASK DESCRIPTION            NAME         NUMBER

1 -- Retrieve/Write Daily-Values Data ------ RETR_DV ..... 10.1
2 -- General Retrieval of Time-Series Data - OUTWAT ...... 10.2
```

D.3.5   Update Support Files and Flags (SU) Menu

     The SU Main Menu submenu options and programs are listed here. The main menu screen displays the following:

SU -- UPDATE SUPPORT FILES/RECORD FLAGS/MAINFRAME FILES

     The submenu options that are available for this selection are used to update files that cannot be updated by all users. For example, cooperators are not allowed to update any files, and only designated WRD personnel are allowed to update certain files. This is necessary for system integrity and security. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Update Instrument File ----------------	IN_EDIT	.... 16.1
2 --	Update Data Descriptor/Processor Files-	DD_EDIT	.... 16.2
#3 --	Set Unit-/Daily-Values Record Flags ---	SETFLAG	.... 16.4
#4 --	Upload Daily-Values Data to Mainframe -	UPLOAD	.... 16.5
5 --	Upload Postprocessing of DV cards -----	UPLOADPP	... 16.6
* --	Update Satellite Data Transferal Information --------------------------	SA_EDIT	.... 16.3

#Executed interactively or in batch mode.

NOTE: The options (and programs) shown with an * are available only to host sites that are allowed to link to a DRGS computer. This means that these particular options and programs are not always seen by all users. The numbered options are those that are routinely displayed under the SU Menu.

D.3.6   Process Satellite Data (SA) Menu

The SA Main Menu submenu options and programs are listed here. The main menu screen displays the following:

SA -- START/STOP PROCESSING/TRANSFER OF SATELLITE DATA

The submenu options that are available for this selection perform many of the SATIN system operations, such as linking to a DRGS computer, and start and stop the processing and transfer of satellite data. These tasks cannot be done by all users for security reasons. The submenu options also allow for listing of SATIN logs and transferring of satellite data from one node to another. The programs are documented in either the ADAPS Administrator's Manual (AM) or the ADAPS User's Manual (UM), as indicated.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
* --	Link to DRGS Computer ------------	DRGS_MONITOR.	15.3(UM)
#1 --	Automated Instrument Monitoring System ----------------------------	AIMS	15.1(UM)
2 --	SATIN Processor Status ----------	SATIN_STATUS.	15.4(UM)
3 --	Display of SATIN Processing Errors ---------------------------	ER_TABLE	15.2(UM)
4 --	List SATIN Logs ------------------	SATIN_MESG ..	10.1(AM)
5 --	Start SATIN Processing Phantom ---	START_SATIN .	10.2(AM)
6 --	Stop SATIN Processing Phantom ----	STOP_SATIN ..	10.3(AM)
* --	Start Transfer of Data for Another DRGS in Real-Time --------	START_TRANS .	10.4(AM)
* --	Stop Transfer of Data for Another DRGS in Real-Time --------	STOP_TRANS ..	10.5(AM)
* --	Transfer Data in Satellite Queue to Another Node -----------------	ND_TRANS	10.6(AM)
* --	Update Satellite Data Transferal Information -----------	SA_EDIT	16.3(UM)

#Executed interactively or in batch mode.

NOTE: The options (and programs) shown with an * are available only to host sites that are allowed to link to a DRGS computer. This means that these particular options and programs are not always seen by all users. The numbered options are those that are routinely displayed under the SA Menu.

D.3.7   Maintenance (MA) Menu

The MA Main Menu submenu options and programs are listed here. The main menu screen displays the following:

MA -- MAINTAIN NODE/MIDAS/SECURITY FILES

The submenu options that are available allow the user to update the Security, Node, and User files, perform MIDAS file maintenance (MPACK), and restore Unit-Values files incrementally. These operations are performed only by the local administrator or manager, for security reasons. The programs are documented in the ADAPS Administrator's Manual.

SUBMENU OPTIONS	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Update Security File ---------------	SE_EDIT	9.1
2 --	Update DIS Node Configuration File -	ND_EDIT	9.2
3 --	Perform MIDAS File Maintenance (MPACK) ---------------------------	MPACK_MIDAS .	11.1
4 --	Review/Delete User File Entries ----	US_EDIT......	11.4
5 --	Archive Unit Values to Disk for Tape Storage ----------------------	UV_ARCHIVE ..	11.5
6 --	Restore Unit Values from Archive Files ----------------------------	UV_RESTORE ..	11.6
7 --	Recover Unit Values from Transfer Files ----------------------------	UV_RECOVER ..	11.2
8 --	Install New Midas Files ------------	INSTALL_MIDAS	11.3
9 --	Verify MIDAS file record links -----	VERIFY	11.7

D.3.8   ADAPS Applications (AP) Menu

The AP Main Menu submenu options and programs are listed here. The main menu screen displays the following:

<u>AP -- ADAPS APPLICATIONS</u>

Application programs in ADAPS permit selected analyses using hydrologic data from the time-series data files and from files created by other application programs. The programs are documented in this manual.

SUBMENU OPTIONS	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
#1 --	Daily-Values Tables ----------------	DVTABLE	9.1
#2 --	Daily-Values Monthly and Annual Statistics ------------------------	DVMAS	11.1
#3 --	Daily-Values Duration and N-day Low/High Value Analysis -----------	DVSTAT	11.2
#4 --	Daily-Values Inventory ------------	DVINV	11.3
5 --	Daily-Values Manipulation ---------	DV_MANIP	11.4
6 --	Display/Print Files at Terminal ----	TERMPRINT ...	13.1

#Executed interactively or in batch mode.

D.3.9   Local Applications (LA) Menu

The LA Main Menu screen displays the following:

LA -- LOCAL APPLICATIONS

The purpose of a local applications section is to provide a place where locally (District) developed programs can be integrated into ADAPS. Each local administrator has the responsibility for making the proper menu, program, and documentation entries for a newly developed local application. If the application has sufficient interest divisionwide, then the entries would be made at Headquarters in the master copy of the system software and would become part of ADAPS for future software releases.

The submenu option displayed as "Local Program Number 1" is a "dummy" option. This means that no programs are, nor will be invoked unless a District adds a locally developed program. The dummy program name stored in the menu/program system is LOCAL1.

D.3.10   Documentation (PD) Menu

        The PD Main Menu submenu options and programs are listed here. The main menu screen displays the following:

<u>PD -- PRINT DOCUMENTATION</u>

        The PD option queries the user whether to display documentation on the screen or spool it to a printer. If the document is put to the screen, 24 lines are displayed at a time; the user can quit viewing at any time by keying NO in response to the --More-- screen query. If the document is spooled to a printer, the user is queried for a destination and form. If the defaults are selected, the document goes to the system default printer.

        The self-explanatory submenu options are not described in individual sections, but are listed below. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Display User's Manual on Screen ----	DSP_UDOC	.... 14.1
2 --	Spool User's Manual to Printer -----	PRT_UDOC	.... 14.2
3 --	Display Data Base Administrator's Manual on Screen ------------------	DSP_ADOC	.... 14.3
4 --	Spool Data Base Administrator's Manual to Printer ------------------	PRT_ADOC	.... 14.4

D.3.11   Miscellaneous Utility (UT) Menu

        The UT Main Menu submenu options and programs are listed
here. The main menu screen displays the following:

UT -- MISCELLANEOUS UTILITY FUNCTIONS

        The submenu options available for this selection are a
collection of tasks (programs) that are either general in their
use, peripheral to the operation of ADAPS, or directly supportive
of ADAPS. The programs are documented in this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Display/Print Files at Terminal ----	TERMPRINT	13.1
2 --	Update Site/Data Descriptor Groups -	GR_EDIT	13.2
3 --	Display Terminal Type -------------	SHOWTERM	13.3
4 --	Change Terminal Type --------------	TERMNL	13.4
5 --	Tag Current COMO File and Open New One ---------------------------	NEWCOMO	13.5
6 --	EMACS Explore of User's Origin Directory -------------------------	EMACS_ORIGIN .	13.6

D.3.12   Hydrologic Toolbox (HT) Menu

     The HT Main Menu submenu options and programs are listed
here. The main menu screen displays the following:

HT -- HYDROLOGIC TOOLBOX (MEAS./SHIFTS/DATUMS AND EOY SUMMARY)

     The submenu options available for this selection are used to
update (maintain) and display several time-series related files,
perform a shift analysis, and perform an end-of-year summary
(analysis) using a year of data. The programs are documented in
this manual.

SUBMENU OPTION	TASK DESCRIPTION	PROGRAM NAME	SECTION NUMBER
1 --	Update/Display Measurements -------	MS_EDIT	7.5
2 --	Update/Display Shifts by Time -----	ST_EDIT	8.3
3 --	Update/Display Variable Shifts ----	SV_EDIT	8.4
4 --	Update/Display Datum Corrections --	DC_EDIT	8.2
5 --	Display Expanded Shifts and Datum Corrections ----------------	SHFT_TABLES ..	12.1
6 --	Shift Analysis --------------------	SHIFT_ANLY ...	12.2
#7 --	End-of-Year Summary --------------	EOYSUMM	12.3
8 --	Copy a Rating --------------------	RT_COPY	12.4
9 --	Plot Time-Series Data ------------	PLOTWAT	9.4

#Executed interactively or in batch mode.

ATTACHMENT E - RETRIEVAL FROM MAINFRAME COMPUTER

This attachment discusses the national water data files and presents generalized job streams that retrieve data from the mainframe computer to a minicomputer in a field (District or Subdistrict) office.

E.1   Introduction

The national water data files reside on the mainframe computer located at Headquarters. Districts are required to update the national files at regular intervals to keep the files up to date. The national files are used by many water-data users across the Nation. The data are used both in their time-series form and in statistical analyses.

At times, there is a need to retrieve data from the mainframe computer to store on the minicomputer located in a field (District) office. This can involve historic (past records) data, recovery of data, or data provided by another agency. To retrieve the data, job streams are created on a local minicomputer (using a line or text editor) and then submitted to the mainframe computer via the network facilities (DRJQ command). Example job streams are presented in the next several sections. They contain Job Control Language (JCL) statements (Brown, 1977) used by the mainframe system. In addition, there are statements that contain information required by the minicomputer such as pathnames. These pathnames are where the data (job print file and retrieved data) will reside within the tree (directory) structure on the minicomputer after the data are retrieved from the mainframe computer.

E.2   Unit-Values Data

Unit values are the data stored in one record for one day both on the mainframe computer and minicomputers. An example job stream (JCL statements) to retrieve 1 or more days of unit data from the mainframe computer to the minicomputer is given below. Refer to WATSTORE, volume 5, Chapter III, Section B (Hutchison, 1977).

This example job stream retrieves unit discharge for one station. The dates (M card), parameter and statistic codes (R and F cards), and station identifiers (D cards) are changed as desired. Note that on the /*JOBPARM card, (print) lines are in thousands, and cards are a multiple of six (i.e., 6 x 8000 = 48,000 card-image records).

```
//jobno JOB (accountno,G490,05,10,8000),'username',
// CLASS=C
/*LOGONID logonid
/*PASSWORD password
//*$$FILE printfile
/*JOBPARM LINES=10,CARDS=8000
/*SETUP     tapeno/H
//PROCLIB DD DSN=WRD.PROCLIB,DISP=SHR
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD DUMMY
//SYSUT1 DD *
$$FILE card-image-file
/*
//SYSUT2 DD SYSOUT=B,DCB=BLKSIZE=80
//SYSIN DD DUMMY
//S2 EXEC UNRETR,AGENCY=USGS,VOL1=tapeno
//HDR.SYSIN DD *
M3   1979100119820930                      XX
R00060
F00011
D 08156700
/*
//
```

where   jobno = valid mainframe job number,
                 accountno = valid mainframe account number,
                  username = user's name,
                   logonid = valid mainframe logon identifier,
                  password = valid mainframe password,
                 printfile = job printfile directory pathname
                             on minicomputer,
                    tapeno = historic magnetic tape volume-
                             serial number, and
           card-image-file = data card-image directory pathname
                             on minicomputer.

NOTE: XX on the M card in Columns 47 and 48 means get
      Station Header and unit-values data in card-image
      form.

E.3   Daily-Values Data

Daily values are the data stored in one record for 1 water year (October 1 through September 30) both on the mainframe and minicomputers.   An example job stream (JCL statements) to retrieve one or more years of daily data from the mainframe computer to the minicomputer is given below. Refer to WATSTORE, Volume 1, Chapter IV, Section B (Hutchison, 1975).

This example job stream retrieves daily mean discharges for two stations. The dates (M card), parameter and statistic codes (R and F cards), and station identifiers (D cards) are changed as desired. Note that on the /*JOBPARM card, (print) lines are in thousands, and cards are a multiple of six (i.e., 6 x 8000 = 48,000 card-image records).

```
//jobno JOB (accountno,G490,05,10,8000),'username',
// CLASS=C
/*LOGONID logonid
/*PASSWORD password
//*$$FILE printfile
/*JOBPARM LINES=10,CARDS=8000
/*SETUP    tapeno/H
//PROCLIB DD DSN=WRD.PROCLIB,DISP=SHR
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD DUMMY
//SYSUT1 DD *
$$FILE card-image-file
/*
//SYSUT2 DD SYSOUT=B,DCB=BLKSIZE=80
//SYSIN DD DUMMY
//S2 EXEC DVRETR,AGENCY=USGS,VOL1=tapeno
//HDR.SYSIN DD *
M3  1922100119860930                           XX
R00060
F00003
D 09180500
D 09267500
/*
//
```

where   jobno = valid mainframe job number,
                     accountno = valid mainframe account number,
                      username = user's name,
                       logonid = valid mainframe logon identifier,
                      password = valid mainframe password,

```
     printfile = job printfile directory pathname
                 on minicomputer,
        tapeno = historic magnetic tape volume-
                 serial number, and
card-image-file = data card-image directory pathname
                 on minicomputer.
```

NOTE: XX on the M card in Columns 47 and 48 means get
      Station Header and daily-values data in card-image
      form.

ATTACHMENT F.   STANDARD FORMAT FOR TRANSFERRING AND ENTERING
                        UNIT AND DAILY VALUES

        The standard format for transferring and entering unit and daily
values consists of two parts: (1) an envelope for transferring unit
and daily values in the recorded data format, and (2) a standard data
format that is accepted by all of WRD's hydrologic data bases. The
envelope for transferring data consists of information that identifies
the destination of the data and its format (i.e., whether it is in the
standard data format or has not yet been converted). Collection of
unconverted data is necessary since data are sometimes acquired by one
computer and processed by another, (e.g., data acquired by means of
satellite telemetry). The standard data format consists of a sequence
of records that contain all information needed to store unit or daily
values for a WRD station. Both the transfer and data formats consist
of different types of records that contain logically related
information. Each record is identified by a record type field which
consists of the first two bytes (columns) of each record.

        The following record types have been defined for the transfer
format:

Record Type	Content	Remarks
BE	Begin Envelope	Begins Data Envelope and defines type of envelope.
DB	Data Base	Contains the data-base number to be used for storing data in this envelope.
DE	DEstination	Defines destination of the data from this instrument as a list of DIS nodes (used primarily by DCP's).
MG	MessaGe	Contains a message to be sent to the user responsible for this station (used primarily by telemetry systems).
RE	REmark	Contains a remark to be archived with the data.
EE	End of Envelope	End of data envelope.

The following record types have been defined for the data format:

Record Type	Content	Remarks
SD	Station Data	Defines station at which instrument is located and any station-dependent information needed for decoding and storing data.
SE	SEnsor Information	Defines sensor information.
TM	TiMe Information	Defines starting date and time for fixed-interval data.
UF	Unit Values -- Fixed Interval	Contains unit values stored at a fixed recording interval.
UV	Unit Values -- Variable Interval	Contains unit values stored at variable recording intervals.
UA	Unit Values -- Archive	Contains unit values retrieved from the unit-values file for archiving.
DF	Daily Fixed Time	Contains values stored daily at a fixed time.
DV	Daily Variable Time	Contains values stored daily but at variable times.
AL	ALert Signal	Signals that data from a sensor should receive alert processing (used primarily by telemetry systems).

A data envelope begins with a BE record and ends with an EE record. An envelope contains information about the envelope (DE, MG, RE, and DB records) and one or more groups of station data. A data envelope structure, is shown in the following example.

```
                        - BE
                          DB
                          DE (OPTIONAL)
                          MG (OPTIONAL)
                          RE (OPTIONAL)
         Data             SD {FIRST SET OF STATION DATA}
                          ...
         Envelope         SD {SECOND SET OF STATION DATA}
                          ...
                          ...
                          SD {LAST SET OF STATION DATA}
                          ...
                        - EE
```

A group of station data begins with an SD record and ends with either another SD record or the EE record. Each group of station data consists of one or more groups of sensor data. A station data group structure is shown in the following example.

```
                        - SD
                          SE {FIRST SET OF SENSOR DATA}
                          ...
         Station          SE {SECOND SET OF SENSOR DATA}
                          ...
         Data             ...
                          SE {LAST SET OF SENSOR DATA}
                          ...
                        - SD or EE
```

A group of sensor data begins with an SE record and ends with either another SE record, an SD record, or an EE record. Each group of sensor data must have a TM record to define the date and/or time of that group of data. For fixed interval data (UF and DF records), the TM record defines the date and time of the beginning time of the first data value on the next data record. Thus, any time there is a missing value, a new TM record must be included. For variable interval data (UV, UA, AND DV records), the TM record defines the date of the data on the following data records. Thus, a TM record must appear whenever the date changes. A sensor data group structure is shown in the following example.

```
                         ┌─ SE
                         │  TM
                         │  UF or UV or UA or DV or DF
                         │  ...
                         │  UF or UV or UA or DV or DF
        Sensor           │  ...
                         │  TM
        Data             │  UF or UV or UA or DV or DF
                         │  ...
                         │  UF or UV or UA or DV or DF
                         │  ...
                         │
                         │  AL (OPTIONAL)
                         └─ SE or EE
```

RULES:

(1) Each envelope must contain data obtained from one recording instrument only.

(2) A SD record must preceed a SE record.

(3) A SE record must preceed a TM record.

(4) After an SE record has been encountered, the data records (UF, UV, UA, DF, or DV) must not change type befor the next SE record is encountered. (E.g., A UV record must be followed by another UV record and not a UF, UA, DF, or DV record until the next SE record.) The data record type may be changed after supplying a new SE record.

(5) If telemetry data are to be processed by an alert routine, an AL (alert) record must FOLLOW the sensor data for which that AL record is associated.

Several examples of data envelope record streams are presented below.

DATA FORMATTED IN THE STANDARD FORMAT --


```
BE STDEDL
DB  7
SD USGS 02191500
SE    1STAGE          65     11 72F010000
TM 19861203010000
UF   08    8.16    8.05    7.93    7.82    7.70    7.59    7.48    7.35
UF   08    7.03    6.94    6.85    6.76    6.70    6.64    6.58    6.53
UF   04    6.41    6.38    6.36    6.33
SE    2DO            400    11 70F030000
TM 19861203010000
UF   24C  2176
EE
```


DATA FROM A DCP THAT IS BEING TRANSFERRED TO QVARSA UNCONVERTED --


```
BE DCPDCP
DE QVARSA
   DUR-CK 16CBC09A 86/338 0?15?20 5/129 20 0 +46.6 -06.6 -238 +17.4 21

   D@@UG@_]@Xm@vl@W\sLL
   &
EE
```

F.1   Record Types for the Transmission Envelope

RECORD TYPE: BE   DESCRIPTION: BEGINNING OF ENVELOPE

Columns	Length	Description
1 - 2	2	Record Type = BE.
3	1	BLANK.
4 - 6	3	Type of Message.

    SCF - Site configuration information.
    DCF - Device configuration information.
    STD - Message in standard format.
    RAW - Raw data along with conversion
          information.
    EU - DRGS engineering units format.
    DCP - Unconverted DCP message.

Columns	Length	Description
7 - 9	3	Data Source Type.

    ADR - 16-channel paper tape recorder.
    ARC - Unit values archived from ADAPS.
    CHA - Stripchart.
    DCP - Data collection platform.
    EDL - Electronic data logger.
    OBS - Observer.
    RAD - Radio telemetry.
    TEL - Dial-up telephone telemetry.

RECORD TYPE: DB   DESCRIPTION: DATA-BASE NUMBER
                                      (Must be supplied for DCP
                                      data; otherwise optional.)

Columns	Length	Description
1 - 2	2	Record Type = DB.
3	1	BLANK.
4 - 5	2	Data-Base Number used by ADAPS for data-base identification.

RECORD TYPE: DE   DESCRIPTION: DESTINATION

Columns	Length	Description
1 - 2	2	Record Type = DE.
3	1	BLANK.
4 - 39	36	Destination nodes.

Up to six 6-character nodes used to
distribute data in this envelope.

RECORD TYPE: MG   DESCRIPTION: MESSAGE

Columns	Length	Description
1 - 2	2	Record Type = MG.
3	1	BLANK.
4 - 80	77	Message to be sent to operational contact (used in telemetry systems to report problems or system status).

RECORD TYPE: RE   DESCRIPTION: REMARK

Columns	Length	Description
1 - 2	2	Record Type = RE.
3	1	BLANK.
4 - 80	77	Remarks about the data that should be archived with the data.

RECORD TYPE: EE   DESCRIPTION: END OF ENVELOPE

Columns	Length	Description
1 - 2	2	Record Type = EE.

F.2   Record Types for the Standard Data Format

RECORD TYPE: SD   DESCRIPTION: STATION DATA

Columns	Length	Description
1 - 2	2	Record Type = SD.
3	3	BLANK.
4 - 8	5	Agency.
9 - 23	15	Station number.
24 - 26	3	UTC offset used.
27 - 27	1	Daylight savings flag.

'Y' - recording times have been converted to daylight savings time for this station.

RECORD TYPE: SE   DESCRIPTION: SENSOR

Columns	Length	Description
1 - 2	2	Record Type = SE.
3	1	BLANK.
4 - 7	4	Data Descriptor Number
		Connects this sensor with a data
		descriptor record in ADAPS.
8 - 15	8	Sensor Name.
16 - 20	5	Parameter code.
21 - 25	5	Statistic code.
26 - 27	2	Length of data field.
28 - 28	1	Precision of data.
29	1	Recording mode.
		F - Fixed interval recording.
		V - Variable interval recording.
30 - 35	6	Recording interval of this sensor
		(Used when RMODE = 'F') in the format
		HHMMSS where:
		HH - Hours (Range: 0-24)
		MM - Minutes (Range: 0-59)
		SS - Seconds (Range: 0-59)
		(At least one of these field must be
		greater than zero.)
37	1	Unit-values type code for unit-values
		archival, where C = computed or E = edited.

RECORD TYPE: TM   DESCRIPTION: DATE-TIME RECORD

Columns   Length   Description
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 1 - 2   2   Record Type = TM.
   3   1   BLANK.
 4 - 11   8   Date of first value in the format
                        YYYYMMDD where:

                            YYYY - Year
                            MM   - Month
                            DD   - Day

12 - 17   6   Time of first recording in the format
                        HHMMSS where:

                            HH - Hour
                            MM - Minute
                            SS - Second

  18   1   Unit-Values finalization flag where:

                        F = Unit values for this date are
                            finalized, otherwise blank
                        (used only for unit-values archive records).

RECORD TYPE: UF   DESCRIPTION: UNIT VALUES - FIXED INTERVAL

Columns	Length	Description
1 - 2	2	Record Type = UF.
3	1	BLANK.
4 - 6	3	Number of unit values in this record. For uncompressed data, must be less than or equal to 124 / field length. For compressed data, must be less than 1000.
7	1	Compression flag.
		'C' indicates that this record contains 1 value that represents the number of values specified in columns 4-7.
8 -132	125	Unit values with length of each value determined by the length specified in sensor record.

RECORD TYPE: UV   DESCRIPTION: UNIT VALUES - VARIABLE
                                                   INTERVAL

Columns	Length	Description
1 - 2	2	Record Type = UV.
3	1	BLANK.
4 - 6	3	Number of unit values in this record.
7 - 132	126	Unit Values repeated the number of times specified in columns 4-6 in the format HHMMSSDDDD...D where:

HH	- Hour value was recorded.
MM	- Minute value was recorded.
SS	- Second value was recorded.
DDDD...D	- Unit value whose length is specified in the associated SE record.

RECORD TYPE: UA   DESCRIPTION: UNIT VALUES -- VARIABLE
                                                   INTERVAL
                                                   (ARCHIVE)

Columns	Length	Description
1 - 2	2	Record Type = UA.
3	1	BLANK.
4 - 6	3	Number of unit values in this record.
7 - 132	126	Unit Values repeated the number of times specified in columns 4-6 in the format HHMMSSDDDD...DXYZZZ...ZB where:

HH	- Hour value was recorded.
MM	- Minute value was recorded.
SS	- Second value was recorded.
DDDD...D	- Unit value whose length is specified in the associated SE record.
X	- Write protect code.
Y	- Rounding code.
ZZZ...Z	- UV source and screening codes.
B	- Blank space indicating end of codes.

RECORD TYPE: DF   DESCRIPTION: DAILY VALUES -- FIXED
                                                   INTERVAL

Columns	Length	Description
1 - 2	2	Record Type = DF.
3	1	BLANK.
4 - 6	3	Number of daily values in this record. For uncompressed data, must be less than or equal to 124 / column length. For compressed data, must be less than 1000.
7	1	Compression flag.

'C' indicates that this record contains
1 value that re⁻ ⁻sents the number
of values specified in columns 4-6.

8 -132	125	Daily values with length of each value determined by the length specified in sensor record.

RECORD TYPE: DV   DESCRIPTION: DAILY VALUES -- VARIABLE
                                                       INTERVAL

Columns	Length	Description
1 - 2	2	Record Type = DV.
3	1	BLANK.
4 - 6	3	Number of daily values in this record.
7 - 132	126	Daily Values repeated the number of times specified in columns 4-6 in the format YYYYMMDDHHMMSSDDDD...D where:

YYYY	- Year value was recorded.
MM	- Month value was recorded.
DD	- Day value was recorded.
HH	- Hour value was recorded.
MM	- Minute value was recorded.
SS	- Second value was recorded.
DDDD...D	- Daily value whose length is specified in the associated SE record.

RECORD TYPE: AL   DESCRIPTION: ALERT   -- IDENTIFIES DATA
                                                 TO BE PROCESSED
                                                 FOR ALERT CONDITIONS.

Columns	Length	Description
1 - 2	2	Record Type = AL.
3	1	BLANK.
4 - 5	2	Alert number - identifies ADAPS alert routine to invoke.
6 - 37	32	User id - user-identifier to notify when an alert condition is detected.

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