USER'S MANUAL FOR THE NATIONAL WATER INFORMATION SYSTEM OF THE U.S. GEOLOGICAL SURVEY

AUTOMATED DATA PROCESSING SYSTEM (ADAPS)

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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 (NWIS) developed by the U.S. Geological Survey. NWIS is a distributed water database in which data can be processed over a network of computers at U.S. Geological Survey offices throughout the United States. NWIS comprises four subsystems: ADAPS, the Ground-Water Site Inventory System (GWSI), the Water-Quality System (QWDATA), and the Site-Specific Water-Use Data System (SWUDS).

This section of the NWIS User's Manual describes the automated data processing of continuously recorded water data, which primarily are surface-water data; however, the system also allows for the processing of water-quality and ground-water data.

This manual describes various components and features of the 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) ADAPS menus and programs, (3) command line functions, (4) steps for processing station records, (5) postprocessor programs control files, (6) the standard format for transferring and entering unit and daily values, and (7) relational database (RDB) formats.

1 INTRODUCTION

by Scott D. Bartholoma, James R. Kolva and Joseph P. Nielsen

The U.S. Geological Survey (USGS) is the principal Federal water-data agency in the United States and as such collects data on the occurrence, quantity, quality, distribution, and movement of surface and ground water that constitute the Nation's water resources. The USGS collects and disseminates data to state, local, and other Federal agencies, who use the data to develop and manage the Nation's water resources. For example, data are used to determine the adequacy of water supplies; design dams, bridges, and flood control projects; allocate irrigation water; locate pollution sources; and plan for energy development. Most water data collected by the USGS are in the public domain.

The USGS developed a large-scale computerized system, collectively known as the National Water Information System (NWIS), to process, store, and disseminate the water data collected by the agency. NWIS is a distributed database in which data are processed on the network of USGS computers throughout the United States. The NWIS system comprises the Automated Data Processing System (ADAPS), the Ground-Water Site Inventory System (GWSI), the Water-Quality System (QWDATA), and the Site-Specific Water-Use Data System (SWUDS). ADAPS, GWSI, and QWDATA are all built on the UNIX operating system. SWUDS is built on a personal-computer operating system. The entire NWIS system is interconnected using local-area network and wide-area network technology.

This manual describes ADAPS. The manual provides an overview of the data processing steps including transmitting data to the computer, editing the data, and storing the data in the database. This manual explains the capabilities and provides step-by-step instructions for using the various components of ADAPS. The system is available, with limitations, to other Federal agencies and to selected cooperators of the USGS who are authorized to use ADAPS.

1.1 System Overview

ADAPS consists of a collection of computer programs, files, and a relational database that comprises a comprehensive system of standardized water-data procedures. This manual addresses version 4.3 of the ADAPS software.

In each office of the USGS where ADAPS is used, there is a designated local administrator and/or database manager. These people usually are responsible for installing and maintaining the 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.

ADAPS operates day-to-day as an online system. The system is large enough to accommodate data processing capabilities including graphics, various types of application programs, and routine water-data record computations. 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. Information or commands generally are entered through the terminal keyboard.

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 operation of ADAPS programs. The manual is divided into sections that discuss or describe the system framework, data collection and processing, and the menus and associated programs.

The principal components and features described in this manual are (1) data collection and processing, which include requirements to establish and configure a data collection site for processing, entry, and computation of data, and explanation of system concepts; (2) ADAPS menus and programs, which include a common startup when entering any program in the system; (3) command line functions; (4) steps for processing station records; (5) postprocessor programs control files; (6) the standard format for transferring and entering unit and daily-values; and (7) relational database (RDB) formats.

1.3 Changes for ADAPS Versions 4.2 and 4.3

A number of changes and enhancements have been made to the ADAPS software. New features in ADAPS versions 4.2 and 4.3 include the following:

Data Organization

- Most of the data are in a relational database and are stored in **tables** rather than files. The data in these tables can be queried from outside the ADAPS menus using Structured Query Language (SQL).
- There are new types of Unit Values (UVs) in addition to the Edited and the Computed values, and include:
  - **Measured** – the raw data as initially entered. These UVs cannot be edited.
  - **Edited** – the UVs used for records computation. The UVs can be edited by the user using Hydra (TS_EDIT) or UV_EDIT.
  - **Data correction**– the UV of the correction applied to each Edited Unit Value. These UVs are interpolated from the data corrections.
  - **Shift correction**– the UV of a stage shift correction used to compute discharge. These UVs are interpolated from the entered shift corrections.
  - **Computed**– the UVs after the data corrections and/or shifts are applied in the records computation process.

  For data that are stored using a conversion of input rating, measured UVs are available both with the rating applied or without ("raw"). The measured UVs themselves are stored in the "raw" form.

Time

- All data are stored in Coordinated Universal Time (UTC) but are retrieved, by default, in the local time for the site as specified in the site file.
- Midnight now conforms to International Standard (ISO) and is stored at time 0000 of the following day rather than 2400 of the preceding day.

Transport Codes

- All UVs have a transport code associated with them based on the type of instrument used to collect the values and how the UVs were entered into the database. There may be several ***measured*** data streams for a single data descriptor, each designated by a different ***transport code***. Thus, data for a given instrument that is sent via the Data Collection Platform (DCP), downloaded via telephone, or manually recovered from the instrument memory, can all coexist under the same data descriptor differentiated by the transport code.
- One transport code is given precedence as the default source of Edited Unit Values for a given data descriptor and is referred to as ***preferred input***.

Location

- The ***Location*** of each data source at a site can be specified.

Data Descriptors (DD)

- All data descriptors (DDs) have a ***location*** associated with them.
- There can only be one data descriptor flagged as primary for each parameter at each location.
- Processors are stored under the data descriptor of the computed data descriptor, not the input data descriptor (i.e., discharge, and not gage height).
- Processors are marked as ***working***, ***in-review***, and ***approved***.
- User-specified, data descriptor-specific text has been added to the screening thresholds.

Editing Unit Values

- Bulk editing of UVs in Hydra using the Zoom Window has been disabled as a data protection measure. UV editing is allowed only through the control window.
- New UV remark codes that emphasize marking UVs as affected or erroneous, instead of changing or deleting them, have been added. These remark codes screen data from further processing and/or flag daily value flags as appropriate.
- A new UV flag has been added that indicates when USGS personnel have screened the data. This flag can be set in Hydra or in a Web-flag editing utility.
- Hydra can restore original edited UVs using the ***"revert to measured"*** option.
- Numerous Hydra bugs have been corrected.

Data Corrections

- Data correction curves can have one, two or three points.
- Up to three sets of data corrections can be defined and applied simultaneously.
- Data corrections have end dates that can be turned off without the entry of a null correction.
- Data corrections can include comments.

Ratings

- Ratings are stored under the computed parameter data descriptor, and not the input parameter data descriptor (i.e. discharge, and not gage height).
- Ratings have both starting and ending dates. Multiple sets of dates are possible.
- Rating dates can include comments.
- Ratings are now protected by data aging.

Shifts

- Shifts are used only for stage-discharge computation.
- Shifts are tied to a specific rating.
- Shift curves can have one, two or three points.
- Shifts have end dates that can be turned off without the entry of a null period.
- Shifts can include comments.

Primary Computation

- The Primary computation program and Primary reports have been improved.
- Tide computations are now part of the Primary program.
- A new diagnostic report is available for more detail on UV processing within Primary.
- Primary can be run using a ***report only*** option that does not save the recomputed record.

Editing of Daily Values

- Hydra can directly access the original computed daily values as a reference curve even after the values have been edited (estimated) or deleted.
- Daily values are flagged as ***affected*** if they are computed from UVs flagged with one of the ***affected*** remark codes.

Data Aging

- Records are now set as ***working***, ***in-review***, or ***approved*** rather than as ***provisional*** or ***final***.
- In addition to daily and UVs, the new ***data aging*** system also locks down data corrections, shifts, rating dates, peaks, and statistics. Rating approval is handled separately.
- Upon approval, consistency between the unit and daily values, correction tables, and ratings in ensured.

Program and Menus

- All menus have been rearranged to better follow data processing flow.
- There is a new program to produce a Station Analysis Report using the information and comments stored within ADAPS.
- End-of-year summary can be run from either the input or the output parameter.
- Graphics have been improved.
- ADAPS documentation is available via a Web interface.

Transfer Issues

- Rounding unit and daily-values may change on transfer from ADAPS version 4.1 to versions 4.2 and 4.3.
- Data corrections in version 4.1 transfer to Data Correction, Set 1 in version 4.2.
- Shifts in version 4.1 for parameters other than those used for the stage/discharge computation transfer to Data Correction, Set 2 in version 4.2.
- Base datum corrections in version 4.1 transfer to Data Correction, Set 3 in version 4.2.

1.4 Acknowledgments

The material presented in this manual is based on the work of many hydrologists and computer programmer/system analysts, each of whom have contributed to the current state-of-the-art in computer programming and system development for the automated processing of data.

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2 ADAPS FRAMEWORK

by Timothy C. Stamey

This section describes the basic framework of ADAPS. General information is presented on system access, database structure, and programs and processing application categories and attributes.

2.1 General Information

ADAPS is available on the USGS servers, and can be accessed by various workstations. ADAPS is used to process, compute, store, and display hydrologic data. Most ADAPS processing is interactive; however, some applications may submit long-running jobs to the batch environment. Batching primarily allows processing tasks to execute independently of a terminal. This independence is called a background process.

Database information used and/or maintained by ADAPS is structured as INGRES tables. The tables are managed by INGRES utilities and user-written software. The tables allow rapid and efficient retrieval of records on the basis of selected data elements defined as key indexes (elements).

A multilevel access and security system are used in ADAPS to restrict access to the data files and to limit the ability of some users to perform certain program operations in the system. User classes of ADAPS Database Administrator (adba), System Administrator (syst), User (user), and Cooperator (coop) have been established, and record-level protection is also provided. Security measures are implemented by the local administrator or manager in consultation with USGS supervisory personnel, and in some instances, in consultation with Headquarters personnel.

Hydrologic data stored in ADAPS results from the processing of data collected or recorded at field installations operated by USGS offices. The field data are processed by USGS personnel using ADAPS and following established methodologies and procedures. The data are reviewed for validity and correctness, and subsequently are published in USGS State annual water-data reports. The various methods of data collection and processing are discussed in detail in Chapter 3 and other selected chapters or sections of this manual.

2.2 Program Categories

Several different categories of programs make up the hydrologic data processing system. The major categories are:

- System utility programs
- General-purpose programs
- General-application programs
- General-graphics programs

- UNIX shell scripts

The programs in each of the above categories are 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) tables that make up the database. 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. The application programs are used primarily to compute statistical information about the hydrologic data. The graphics programs are used for preliminary viewing of the data, for comparison purposes, for graphical editing of the data, and for report purposes. The UNIX shell scripts may be used in any of the programs, depending on the application.

2.3 Common Program Attributes

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

The system programs are designed to be run using most character-based terminals. The graphics programs require terminals that will support the various graphical packages.

1. The programs can be run using either uppercase or lowercase letters, if the terminal supports this feature.
2. The programs in most instances can be exited (break out) due to a problem or emergency, and files are not damaged or lost. However, arbitrarily breaking out for no reason should be avoided. Keying EX in response to any query in any program will exit the user to the operating system (UNIX) level.
3. Most data processing programs are run interactively. However, the long-running jobs are set up interactively and 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 this enables the postprocessor program to run as a background job. If processing is not too lengthy, the user may have the choice to either run interactively or in batch mode.
4. Many ADAPS programs use a common set of routines to handle startup of the individual programs and to handle queries within the individual programs. Use of these common routines standardizes this phase of the processing. The startup routines initialize ADAPS.
5. Some programs use a screen input form for entry of data. The layout of the form is similar for those programs that use it. Entry of data to the form is controlled by similar options that control page (screen) and cursor movement.

6. 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) specific application programs. Therefore, outside users' selections through the system menus are limited. Update or maintenance activity by outside users is not allowed.

3 OVERVIEW OF DATA PROCESSING

by Edward E. Fischer

This section provides a general description of how ADAPS is configured to receive, process, and store data from USGS data-collection stations and of the computational procedures that are available in ADAPS to process these data. Information also is provided on types of variables and ratings used, data corrections and shifts, and computation of daily mean values.

3.1 Levels of Database Access

Four levels of database access are available in ADAPS. The highest level (code SYST) has access to all NWIS databases and programs. The levels of access are listed in table 1.

Table 1: ADAPS Access Levels

Code	Description	Level of access
SYST	System Database Administrator (DBA)	All NWIS databases and programs
ADBA	ADAPS Database Administrator (ADBA)	ADAPS processing records
USER	User	Data processing capabilities
COOP	Cooperator	Read-only capabilities

3.2 Site and Data Type Records

At each site (station), the data types that will be collected, the data processing steps, and the data storage formats must be established in ADAPS before any data can be entered. This information is maintained within ADAPS with the following records.

3.2.1 Site (Station) Record

The site record is maintained in the NWIS Site File. It must be created before any data-specific information can be established in ADAPS. The site record is created and updated by the DBA. Information about creating and updating records in the Site File is provided in the GWSI manual.

3.2.2 Location Record

Sites where a single data type is measured at two or more points require a location record for each measuring point. For example, if temperature is measured at three depths in a single horizontal location in a lake, the station requires three location records. Other data types measured at the same locations (for example specific conductance) do not require additional location records. Location records are created and updated by the ADBA using program LOC_EDIT or program DD_EDIT.

3.2.3 Data Descriptor (DD) Record

Each data type that is collected requires a Data Descriptor (DD) record. The DD record contains information about processing and storing the data. It references other data that may be required for data processing such as data correction tables, shift tables, and rating tables. If the data are automatically collected, the DD record also references a processor record (next section). DD records are created and updated by the ADBA using program DD_EDIT. Only data types that are included in the NWIS parameter code dictionary, PARMFILE, can be stored in ADAPS.

3.2.4 Processor Record

A processor record corresponding to the DD record may be required depending on the type of data being collected. The processor record contains site-specific information on how to compute unit and daily values from the input data and, if required, how to compute data that serve as input for a different data type. Processor records are created and updated by the ADBA using program DD_EDIT.

3.2.5 Device Conversion and Delivery System (DECODES) Record

Data collected by Data Collection Platforms (DCP) and Electronic Data Loggers (EDL) require a Device Conversion and Delivery System (DECODES) record. The DECODES record defines the data types and their respective positions in the data stream. The record references the DD record that was created for the data type. The DECODES record is used by the DECODES program and by the Satellite Telemetry Input (SATIN) program. The record is created by the ADBA using the DECODES program.

3.2.6 Relation Between DD, Processor, and DECODES Records

A schematic of the relation between the DD, processor, and DECODES records is shown in figure 1. Stage/discharge data from a single-channel instrument are used as an example. The discharge processor record references the gage-height DD record. It also controls the daily values statistics computations of the gage-height data. For a multiple-channel instrument, the DECODES record references a separate DD record for each channel. Each DD record references its own processor record.

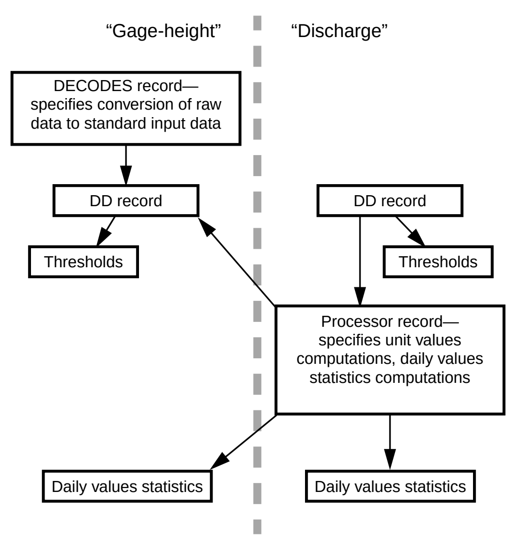


Figure 1. Relation between data descriptor, processor, and DECODES records.

3.3 Data Storage Formats

Data for a single data type are stored in several formats that correspond to the various processing steps. The values at each step are stored in case it is necessary to reprocess the data. There are also three special storage formats: discharge measurements, peak flow values, and summary statistics. Up to 2,880 values per unit-value-format type can be stored for a single day.

3.3.1 Measured Unit Values

Measured unit values are the “raw” values measured by the data collection instruments and entered into the ADAPS database. They can be entered using one of several entry programs. Measured unit values cannot be altered within the ADAPS system. When a mistake occurs, they must be deleted and the correct values entered.

During normal processing measured unit values are displayed after the conversion-of-input rating has been applied. Measured unit values can be viewed without the conversion-of-input rating applied by selecting the “view raw measured unit values” option available in programs that process them.

3.3.2 Edited Unit Values

Edited unit values are measured unit values that have been converted to the engineering units specified for the data type using a conversion-of-input rating. They are available for modification, deletion, or the addition of remark codes. For example, stage unit values may have spurious peaks or missing values that can be changed (edited) using the data editing program, HYDRA, and data from other sources. Any modifications to the edited unit values are saved back into the edited unit values.

3.3.3 Correction Unit Values

Correction unit values are added to edited unit values to correct systematic errors in the data such as datum corrections or instrument-bias corrections. For example, a 6-week period of stage unit values might require that a 10-foot datum correction be added to each value. Correction unit values are calculated from data correction curves.

3.3.4 Computed Unit Values

Computed unit values are edited unit values that have had correction unit values added to them.

3.3.5 Shift Unit Values

Shift unit values are added to stage computed unit values prior to computing discharge unit values. If the processing is a velocity-discharge computation, shift unit values are added to velocity computed unit values prior to computing discharge unit values. Shift unit values are calculated from shift curves.

3.3.6 Output-Computed Unit Values

Output-computed unit values are calculated by the primary computations program from other unit values. For example, discharge unit values are computed from stage unit values.

3.3.7 Computed Daily Values

Computed daily values are calculated by the primary computations program from unit values. For example, daily mean discharge is computed from discharge unit values.

3.3.8 Final Daily Values

Final daily values are computed daily values that have been reviewed and, if necessary, edited. For example, computed daily discharge values may be edited to account for an anomalous backwater situation. Final daily values can only be edited manually using HYDRA.

3.3.9 Discharge Measurements

Data from discharge measurements are stored in “Form 9-207” format in the Discharge Measurements File. They are entered into ADAPS manually.

3.3.10 Peak Discharges

Peak discharges are stored in a separate peak flow file. They are entered manually.

3.3.11 Summary Statistics

Summary statistics are stored as a distinct data format. They are stored automatically when they are computed.

3.4 Date and Time Conventions

Every piece of time-series data in ADAPS is tagged with a date and time. The tags conform to ISO (International Organization for Standardization) standards. **NOTE: The convention of designating midnight as 00:00:00 hours of a new day and of storing data with respect to UTC (see following) is different from that used in previous versions of ADAPS.**

3.4.1 Dates

Dates are stored in ADAPS according to the Gregorian calendar. Years are entered using four digits. Months are entered with numbers; “1” equals January. Leap years are automatically taken into account during data processing.

3.4.2 Times

The time of day runs from 00:00:00 (midnight, read as “zero hours, zero minutes, zero seconds”) to 23:59:59 in 1-second intervals. If midnight is entered as 24:00:00, it is converted to 00:00:00 of the next day. Midnight 24:00:00 is used for certain purposes such as reporting the times of minimums and maximums on primary reports; 0000 is the beginning-of-day midnight and 2400 is the end-of-day midnight.

3.4.3 UTC, Local Time, Time Zones, Daylight Savings Time

All data in ADAPS are stored with respect to UTC (Universal Time Coordinate). Local time is calculated from time zone information stored in the site record. Whether local time is calculated as standard time or daylight savings time depends on how the site is configured to use daylight savings time.

3.4.4 Data Processing in Local Time

All data processing in ADAPS is done with respect to local time. Data corrections, shifts, ratings, etc., are entered using local time. Daily values are computed for data collected from midnight to midnight local time. When a site is configured to use daylight savings time, in most cases ADAPS automatically switches between standard time and daylight savings time as appropriate during data processing and printing of unit values tables.

3.5 Data Rounding Convention

The rounding of ADAPS numerical data for printing (the number of significant digits that are printed) is governed by codes stored in a rounding array that is part of the parameter code definition. The rounding array comprises 10 digits. The first nine digits specify the number of significant digits to which a value is rounded based on its magnitude, and the tenth digit specifies the maximum number of decimals that can be printed. The rounding array specifications are presented in table 2 along with four example arrays.

Table 2: Data Rounding Array

		Number of significant digits to print (first nine digits of rounding array) and maximum number of decimals that can be printed (tenth digit)			
Position in rounding array	Magnitude of data value, x	Water temperature, in degrees Celsius (00010) “0012333331”	Solar radiation, incidental, intensity, in cal./cm^2/day (00030) “3222234443”	Discharge, in ft^3/s (00060) “0222233332”	Stage, in feet (00065) “0223456782”
1st	$x < 0.01$	0	3	0	0
2nd	$0.01 \le x < 0.1$	0	2	2	2
3rd	$0.1 \le x < 1.0$	1	2	2	2
4th	$1.0 \le x < 10$	2	2	2	3
5th	$10 \le x < 100$	3	2	2	4
6th	$100 \le x < 1,000$	3	3	3	5
7th	$1,000 \le x < 10,000$	3	4	3	6
8th	$10,000 \le x < 100,000$	3	4	3	7
9th	$x \ge 100,000$	3	4	3	8
10th	Maximum number of decimals to display	1	3	2	2

Consider for example the default rounding array for discharge data (parameter code 00060). The array is “0222233332.” The first digit, “0,” means that if the stored value is less than 0.01, the value will be printed as “0.00 ft^3/s”—the number of decimal places is determined from the last digit, “2,” in the array. The second digit, “2,” means that if the value is greater than or equal to 0.01 ft^3/s and less than 0.1 ft^3/s, then it will be printed to two significant figures; for example, if the stored value is 0.076, it will be printed as “0.08.” The third digit, also a “2,” means that if the value is greater than or equal to 0.1 and less than 1.0, it will be printed to two significant figures; a stored value of 0.1548 will be printed as “0.15 ft^3/s.” The fourth through ninth digits work in a similar fashion: a stored value of 92.355 will be printed as “92 ft^3/s” and a stored value of 5,758.66 will be printed as “5,760 ft^3/s.” The default rounding array for solar radiation is “3222234443.” In this case, if the stored value is less than 0.01 calories/cm^2/day, it will be printed with three significant figures using 3 decimal places—”3” in the last position. For example, if the stored value is 0.0093, it will be printed as 0.009 calories/cm^2/day; if the value is 0.0097, it will be printed as 0.010 calories/cm^2/day. The rounding specifications are entered at the time the DD record is established in the site file. If a rounding array is not entered, ADAPS uses the rounding specifications stored in the parameter code dictionary.

3.6 Ratings

Ratings define the relationship between two parameters. They are entered into ADAPS using program RT_EDIT and are stored in the Rating Tables File either as equations or as tables. Ratings are in effect during the time periods specified with the rating. Discharge ratings are developed according to the methods presented in *Discharge Ratings at Gaging Stations* (Kennedy, 1984).

3.6.1 Rating Types

The types of ratings used in ADAPS and a brief description of each are given in table 3 below. The description indicates the measuring method for which the rating type is used.

Table 3: Rating Types

Rating Code	Rating Name	Dependent Variable – must ascend	Independent Variable - Minimum	Dependent Variable - Minimum	Rating Description
STGQ	stage-discharge	True	N/A	0.00	A rating used to compute the discharge of a stream on the basis of stage.
FALL	fall	False	N/A	0.00	A rating used to determine the adjusted fall as it relates to the mean gage height observed at the base gage in a reach where the fall in stage (slope of water surface), between auxiliary and base gages is affected by backwater.
FLFC	Fall-factor	False	0.00	0.00	A rating used to determine the factor value needed to compute an adjusted discharge on the basis of measured fall in the reach between auxiliary and base gages, and measured discharge.
STCO	stage-coefficient	False	N/A	N/A	A rating used to determine a velocity adjustment coefficient from its relation to stage, for the index velocity method.
STAR	stage-area	True	N/A	0.00	A rating used to determine the cross-sectional area of a stream on the basis of stage.
PARM	dependent, parameter	False	N/A	N/A	A rating used to compute one parameter on the basis of its relational parameter.
STOR	storage-correction	False	N/A	N/A	A rating used to determine the variable Sc/J from its relation to gage height.
VELO	velocity	False	N/A	N/A	A rating used to determine the mean velocity on the basis of the index velocity.
MEAS	input conversion	False	N/A	N/A	Conversion of input rating for measured unit values.

3.6.2 Equation Ratings

Equation ratings are of the form

$$y = a(b + x)^c + d$$

where y = output value (dependent variable),
x = input value (independent variable), and
a,b,c,d = coefficients.

Conversions are exact; that is, interpolation is not used to calculate intermediate values. Only the coefficients are stored in the Rating Tables File.

3.6.3 Table Ratings

Table ratings are stored as ordered input/output pairs. Generally input/output pairs are not stored for every possible input value. Instead, intermediate values are interpolated from the tabled values. Interpolation is either linear or logarithmic, depending on the rating type. The method of logarithmic interpolation is described in Kennedy (1984).

3.6.4 Rating Dates

A rating is in effect according to the starting date and time specified with the rating. It is used until it is superseded by the starting date of another rating. A rating may have more than one starting date because it can become valid again as environmental conditions change. Ratings used for a single DD are numbered sequentially as they are developed. Ratings that are used again at a later date are not renumbered.

3.7 Data Corrections and Shifts

Data corrections are applied to edited unit values to correct systematic errors. Shifts are special data corrections that are applied to corrected stage unit values to adjust the relationship between stage and discharge; the stage values are otherwise correct but the stage/discharge relationship has changed because of changes in the river environment. Data corrections are stored as computed unit values; shifted stage (or index-velocity) unit values are not stored after the discharge has been determined because shifts are automatically calculated. Shifts and their application are discussed in *Computation of Continuous Records of Streamflow* (Kennedy, 1983).

3.7.1 Starting/Ending Dates and Times

Data corrections are applied only between the starting and ending dates specified with the correction. Shifts are linked to stage-discharge ratings and are in effect only within the time frame of the ratings. Data corrections and shifts are carried across water-year boundaries. Explicit zero data corrections and shifts are not required for time periods during which corrections are not necessary.

3.7.2 Constant Data Corrections and Shifts

A constant data correction or shift is a single value that is added to each input value to produce the output value. The value is added only during the period between the starting and ending dates of the correction. No proration of any kind is performed. The most recent correction and (or) shift is applied during real-time data processing if an ending date was not specified with the correction. Note that, conceptually, a constant data correction or shift is a “single-point” variable shift diagram (next section).

3.7.3 Variable Data Corrections and Shifts

Shifts can be varied with the input value. (In this section “data correction” and “shift” are synonymous, as are “input value” and “stage.”) A variable shift is defined by a shift diagram comprising two or three points (figure 2). The input variable (stage in the figure) is the independent variable and the output (dependent) variable is the shift. Interpolation between the points is linear. A constant shift equal to the closest end point value is returned if the input value lies outside the defined domain of the shift diagram.

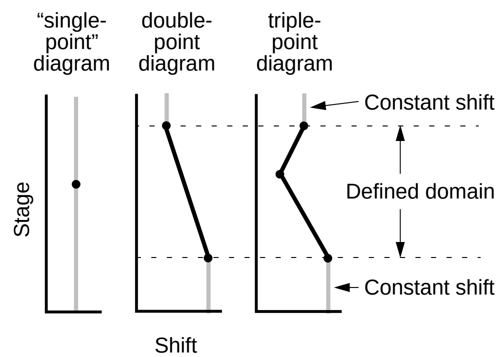


Figure 2. Variable shift diagrams. The shift is interpolated linearly in the defined domain and is constant above and below the defined domain. [Stage, input variable; shift, output variable.]

3.7.4 Data Correction and Shifts with Time Proration

Shifts can also be varied with time. (In this section also, “data correction” and “shift” are synonymous.) Time proration is based on the starting times of two consecutive shift diagrams (figure 3). First, the shifts corresponding to the stage measured at time, t, are determined from each shift diagram. Then, using the two shift values as endpoints, the shift is interpolated with respect to time, t. Shift-with-time proration also is linear.

Shift-with-time proration is not performed if an end date is explicitly entered with the shift diagram or if the shift diagram is the most recent one in use and does not have an explicit end date. In these cases the shift is that determined from the diagram.

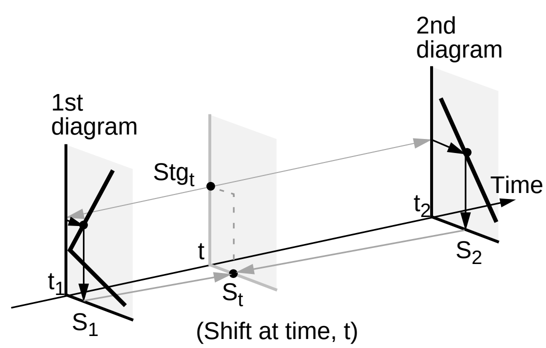


Figure 3. Schematic of proration of shift at time t between two variable-shift diagrams. [t_1, start time of 1st diagram; t_2, start time of 2nd diagram; Stg$_t$, stage at time t; S_1, shift from 1st diagram for Stg$_t$; S_2, shift from 2nd diagram for Stg$_t$; S_t, prorated shift at time t.]

3.8 Data Aging

Data in ADAPS are in one of three status levels: “Working,” “In-Review,” and “Approved.” Data aging is the process by which data are moved from one status level to the next. Each status level is called a data aging code. The codes and the database access levels associated with each code are listed in table 4.

Table 4: Data Aging Codes

Code	Description	ADAPS access level	Permitted actions at access level
Working	Data can be computed, edited, and deleted	USER	Process records and change data-aging code to “In-Review”
In-Review	Data are locked against further modification pending review	ADBA	Review records, change data-aging code to “Approved” or back to “Working”
Approved	Data are considered final and locked against any modifications	SYST	Change data-aging code back to “Working”

Data aging applies to most aspects of data processing: processor records, ratings, rating dates, shift curves, correction curves, unit values, daily values and summary statistics. Prior to NWIS version 4.2, data were flagged either “Provisional” or “Final.” Provisional data could be manipulated and edited, while final data could not be altered. With version 4.2, this concept was expanded to provide a more comprehensive method of controlling alterations to data and of preserving this status not only for the actual data items, but also for related items involved in processing the data. Also in 4.2, the “Provisional” and “Final” flags were replaced by the data aging codes. When data are marked “In-Review” and “Approved,” all of the pieces are marked the same. Similarly, when “Approved” data must be reset to “Working,” all of the associated pieces must be reset to “Working.” Discharge measurements/gage inspections are not included in the data aging process.

Data aging is handled slightly different in each of three categories: processor records, ratings, and data (rating dates, correction curves, shifts, unit values, daily values, and summary statistics. ADAPS programs for managing processor records (DD_EDIT) and ratings (RT_EDIT) also manage data aging. A utility program (SETSTATUS) allows users at different database access levels to manage data aging for the rest of the data. The utility program (STATUS_REPORT) lets users check on current data aging status.

3.8.1 Data Aging of Processor Records

Processor records are protected from modification by setting them to “Approved.” Data aging of processor records is managed using program DD_EDIT. The status level of a processor record does not affect the status of the data it processes, nor does changing the status of a processor record affect any data that were previously processed by it. If a processor record that has been used for approved data must be modified, it is recommended that a new version be created rather than changing the status back to “Working.”

3.8.2 Data Aging of Ratings

Ratings must be set to “Approved” before any data computed using the ratings can be set to “Approved.” Data aging of ratings is managed using program RT_EDIT. While the system allows an “Approved” rating that was used to compute “Approved” data to be set back to “Working” without also resetting the data, this is strongly discouraged. Instead, it is recommended that a new rating be created using the “copy” or “extend” options in RT_EDIT. Note that data aging of *rating dates* is managed separately (next section).

3.8.3 Data Aging of Data

Data correction curves, shift curves, rating dates, unit values, daily values and summary statistics pertaining to a single DD are data aged as a single unit. Other DDs may be included in the unit. For example, discharge data (one DD) are computed from gage-height data (a different DD); the data for both DDs are aged together. Data aging in this category is by water year and is managed using program SETSTATUS. Data in this category cannot be set to “Approved” if any ratings associated with the processing are not set to “Approved.”

3.9 Unit Values Screening Thresholds

Unit values are checked against several thresholds during processing to identify erroneous values (critical thresholds) and to specify warning levels (non-critical thresholds). Values that fail one or more threshold tests are flagged for review. Unit values that exceed any of the critical thresholds are blocked from display to the public on the NWISWeb pages. The threshold types and their descriptions are listed in table 5.

Table 5: Unit Values Screening Thresholds

Threshold	Flag	Description	Description editable?
		Magnitude thresholds	
Very high value	H	Critical. Value is impossibly high.	Yes
Very low value	L	Critical. Value is impossibly low.	Yes
High value	h	Non-critical. Value exceeds specified high warning level.	Yes
Low value	l	Non-critical. Value exceeds specified low warning level.	Yes
		Rate-of-change thresholds	
Very rapid increase	I	Critical. The rate of increase between this value and the immediately preceding value is impossibly large.	No
Very rapid decrease	D	Critical. The rate of decrease between this value and the immediately preceding value is impossibly large.	No
Rapid increase	i	Non-critical. The rate of increase between this value and the immediately preceding value exceeds the specified warning level.	No
Rapid decrease	d	Non-critical. The rate of decrease between this value and the immediately preceding value exceeds the specified warning level.	No
		Standard difference threshold	
Standard difference	T	Non-critical. The absolute value of the difference between this value and the immediately preceding value exceeds the specified warning level.	Yes

Unit values screening thresholds are specified using program DD_EDIT or THRESHOLD_EDIT. Some of the threshold descriptions are editable so that more specific messages can be included in printouts. Whether a description can be edited is indicated in the column labeled “Description editable.” Thresholds are not data-aged.

Unit values are screened in several places during data processing according to the unit value type. If a threshold is not established for a DD, the respective unit values are not screened. The threshold types and the situations under which unit values are screened are discussed in the following sections.

3.9.1 Magnitude Thresholds

Magnitude thresholds test whether each unit value exceeds a specific value.

3.9.2 Rate-of-Change Thresholds

Rate-of-change thresholds test whether the rate of change between successive unit values is reasonable as determined for the data type. The rate of change is calculated by subtracting the previous unit value from the current unit value and dividing by the time interval between the two values. Rate-of-change thresholds can be specified for up to three ranges of unit-value magnitudes.

3.9.3 Standard Difference Threshold

The standard difference threshold tests whether the absolute value of the difference between successive unit values is exceeded. The difference is calculated by subtracting the previous unit value from the current unit value.

3.9.4 Screening of Input-DD Unit Values

Input-DD unit values that are entered using SENTRY or STD_STOR are screened in the following situations:

1. When they are designated as “preferred input.”
2. When they are saved after editing (HYDRA).
3. When a re-computation is performed after adding or modifying data corrections (DC_EDIT).
4. When a re-computation is performed after adding or modifying shifts (only for slope-discharge and velocity-discharge type computations) (SV_EDIT).
5. When a primary computation is performed (PRIMARY).

3.9.5 Screening of Computed-DD Unit Values

Computed-DD unit values, such as discharge, are screened when they are computed by program PRIMARY.

3.10 Data Processing Steps

Data are processed and stored in ADAPS according to the data type. The various steps are described in the following sections. Data that are processed as they arrive at the server are often called real-time or near-real-time data.

3.10.1 Transferring Unit Values

Unit values data are transferred from the data collection site by any of several transport methods. The transport method is identified by a data transport code. Automatically-collected data generally are transported to the ADAPS system by telemetry or other digital media, whereas manually-collected data are entered into ADAPS manually.

Data transport code

The data transport method is identified by a transport code. The code is automatically added as a suffix to the DD by the transfer process. The data transport codes are listed in table 6.

Table 6: Data Collection and Transport Method Codes

Code	Description
S	GOES DCP (Data Collection Platform) data. Data are collected and stored onsite in the DCP. They are transferred to ADAPS by satellite technologies, typically once every 4 hours.
E	EDL (Electronic Data Logger) data. Data are collected and stored onsite in the EDL. They are transferred to ADAPS by land-line telephone, cellular telephone, line-of-sight radio, or by downloading to a portable computer. Data typically are transferred once per day, or in the case of a portable computer, once per site visit.
A	ADR (Analog to Digital Recorder) punched paper tape data. Data are collected and mechanically stored onsite on punched paper tape. The punches are converted to electronic digital values prior to entry into ADAPS. Data typically are transferred once per site visit after the paper tape is retrieved.
C	Chart (graphical recorder paper chart, also known as “strip chart”) data. Data are collected and mechanically stored onsite as a line drawn on a moving paper chart. Data typically are transferred once per site visit after the chart is retrieved. The line is digitized prior to entry into ADAPS.
O	Observation data. Data are collected manually and entered into ADAPS by typing at a keyboard.

The transport code is the means by which data for a single DD that are transported by more than one method are differentiated in ADAPS. For example, stage data may be collected and transported by both a DCP and an EDL. The suffixes S and E differentiate the data.

Automatically-collected data

Automatically-collected data are collected onsite by continuously-operating sensors without manual (human) intervention. The data are stored in the data-collection instruments as digital values. Presently (2002), the most common onsite data storage medium is computer memory. The values are transferred to the ADAPS server by telemetry or by downloading to a portable computer.

Some automatically-collected data are stored at the data-collection site by mechanical media such as digital paper-tape recorders. Methods for transferring mechanically-recorded digital data to ADAPS servers are discussed in an appendix.

Transfer by satellite telemetry (DCP data)

Many automatically-collected data are transferred to ADAPS by satellite telemetry. Satellite telemetry comprises three major components: (1) on-site instrumentation called Data Collection Platforms (DCPs) that collect, store, and transmit the data; (2) geostationary satellites that relay the transmissions; and (3) a ground station where the data transmissions are combined and rebroadcast to local receive sites around the country. DCPs transmit the data at preset intervals, typically once every 3 or 4 hours. A schematic of the DCP data flow path to an ADAPS server is shown in figure 4.

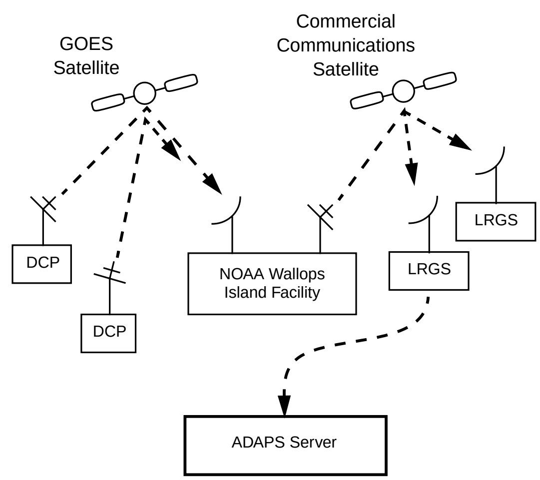


Figure 4. Data flow path from DCP sites to an ADAPS server

The relay satellites are part of the Geostationary Operational Earth Satellite Data Collection System (GOES), which is operated by the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA). The data are received by NOAA at its Wallops Island facility in Virginia where they are merged into a single data stream. The single data stream is transmitted via a commercial communications satellite to Local Readout Ground Stations (LRGS) that store it locally until programs on the ADAPS servers retrieve the data over the Internet or by telephone. The Puerto Rico District receives data directly from the GOES satellite and the Alaska and Hawaii Districts receive data via the Internet after it has been retrieved from a LRGS by the Washington District.

DCP data are retrieved from LRGS computers using a program on the ADAPS server called Satellite Telemetry Input (SATIN). SATIN processes the data into ADAPS standard input format for input to program SENTRY. SENTRY reads the data from the standard input file, adds the data transport code, and writes the data to ADAPS as measured unit values. The SATIN and SENTRY programs are automated processes that process data as they are received by the ADAPS server.

Transfer by other telemetry methods or portable computer (EDL data)

Automatically-collected data also are transferred to ADAPS by telemetry methods that include land-line telephones, cellular telephones, and line-of-sight radio. In some situations they are transferred by downloading to a portable computer. On-site instrumentation called Electronic Data Loggers (EDLs) collect and store the data. Data are transferred at less frequent intervals than DCP data, typically once per day, or in the case of a portable computer, once per site visit.

Transferred EDL data are processed by program DECODES, which converts the data to ADAPS standard input format, and by program Standard Store (STD_STOR), which adds the data transport code and writes the data to ADAPS as measured unit values. The DECODES and STD_STOR programs are initiated manually.

Transfer of a single data-type by multiple methods

Occasionally, data for a single data-type (typically stage) are transferred by more than one method. The additional data stream(s) serve as backup data. The data are differentiated in ADAPS by the data transport code.

Preferred-input data processing stream

When data are transported by more than one method, one of the methods is designated as the preferred-input data processing stream. The preferred-input data stream is processed automatically as the data arrive at the server. Data from the other data streams are kept as backup data. A schematic of a preferred-input stream is shown in figure 5.

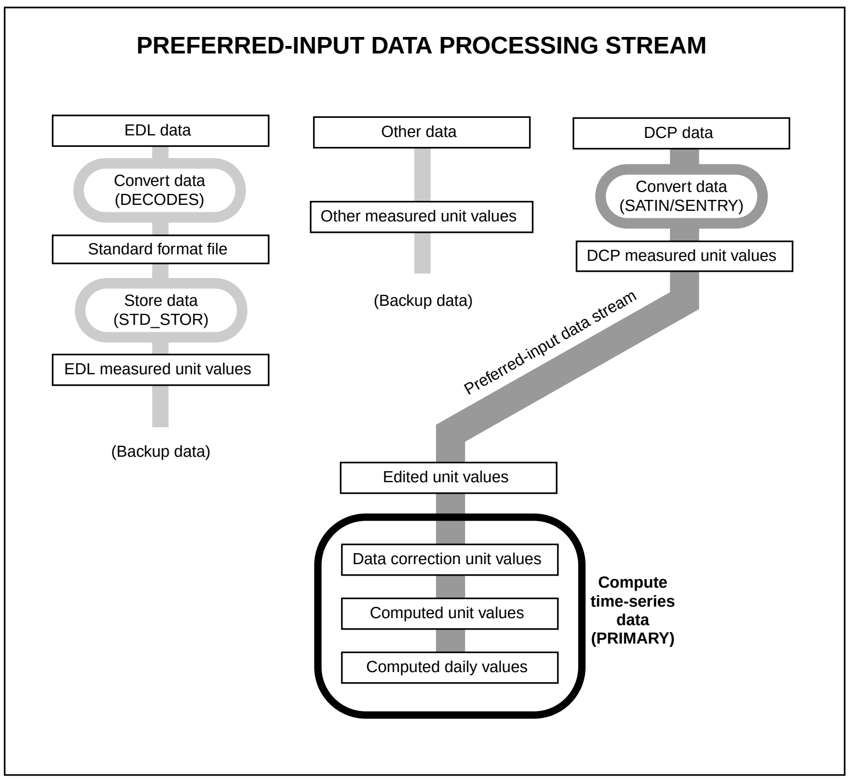


Figure 5. Schematic of preferred-input data processing stream. One data stream is chosen as the preferred input and is automatically processed to computed unit values and computed daily values.

Manually-collected data

Manually-collected data are collected onsite by humans and the data entered into ADAPS using various unit-values-entry or daily-values-entry programs. Manually-collected data typically are collected to verify automatically-collected data and in situations where it is not feasible or cost-effective to use automatic data-collection equipment. For example, discharge measurements are made to validate stage-discharge rating curves. The discharge measurement data are manually entered into ADAPS.

Some automatically-collected data stored on mechanical media may be manually transcribed. For example, stage data recorded by pen-and-ink strip chart recorders are digitized and the digitized values entered into ADAPS.

3.10.2 Editing Unit Values (HYDRA)

Measured unit values are reviewed and edited using HYDRA, a graphical editing program, and are stored as edited unit values. HYDRA has the capability of importing measured unit values from backup recorders, displaying data from other stations as reference curves, changing or deleting values, and flagging values. If edited values are later re-edited, HYDRA reloads them automatically. HYDRA also has the capability of reverting to the original measured unit values.

Unit values flags are used by ADAPS to track the status of each unit value. The flags are set ("turned on") automatically according to the data type, the thresholds set up for the data type, and the type of data processing acting upon the data. Multiple flags can be set for a single data value. The flags used in ADAPS are listed in table 7.

Table 7: Unit Values Flags

Flag	Description
	Flags indicating thresholds
	[See table 4 for threshold explanations]
I	Value exceeds "very rapid increase" threshold
i	Value exceeds "rapid increase" threshold

Table 7: Unit Values Flags

Flag	Description
D	Value exceeds "very rapid decrease" threshold
d	Value exceeds "rapid decrease" threshold
L	Value exceeds "very low" threshold
l	Value exceeds "low" threshold
H	Value exceeds "very high" threshold
h	Value exceeds "high" threshold
T	Value exceeds "standard difference" threshold
	Flags indicating processing status
@	Value was reviewed by USGS personnel
*	Value was edited by USGS personnel
	Flags indicating data source
o	Value was observed in the field
a	Value is from paper tape
s	Value is from a DCP
~	Value is a system interpolated value
e	Value was recorded by a data logger
c	Value was recorded on a strip chart
p	Value was received by telephone transmission
r	Value was received by radio transmission
f	Value was received by machine readable file

Unit values remarks codes

Remarks codes can be assigned to unit values during review and editing in HYDRA. The codes are assigned by the user or automatically by the program. The remarks codes used in ADAPS are listed in table 8.

Table 8: Unit Values Remarks Codes

Code	Description
	Codes assignable by user
A	Value is affected by backwater from ice at the measurement site
B	Value is affected by backwater at the measurement site
R	Rating is undefined for this value
&	Value is affected by unspecified causes
K	Value is affected by instrument calibration drift.
X	Value is erroneous and will not be used
<	Value is known to be less than the reported value
>	Value is known to be greater than the reported value
	Code assignable by system
F	Value was modified by automated filtering

The following rules govern the processing of unit values that have been assigned remarks codes:

1. Remarks codes are initially stored with the edited unit values.
2. Corrected unit values inherit all remarks codes from edited unit values except "X". Unit values assigned "X" are filtered out (not included in the set of corrected unit values).

3. Computed unit values inherit all remarks codes from corrected unit values.
4. Daily values computed from unit values that were assigned one or more “value is affected” codes are flagged “&.”

Display hierarchy of unit values flags and remarks codes

Unit values flags and remarks codes are displayed with the values on unit values tables and during editing. Up to three flags/codes can be displayed at once for a single value. If there are more than three flags, the additional flags are included at the bottom of the page with a note indicating that these flags have also been set. The display hierarchy of the codes/flags is shown in table 9.

Table 9: Display hierarchy of unit values flags and remarks codes

[Multiple codes on a line are mutually exclusive; larger internal priority level values have higher priority]

Code	Internal priority level	Short description [See tables 6 and 7 for details]
A,B,R,&,K,X,<,>,F	99	Remarks codes
T	7	Standard difference threshold flag
H,h,L,l	6	Magnitude threshold flags
D,d,I,i	5	Rate-of-change threshold flags
*	4	Processing status (edited) flag
~	3	Interpolated value flag
c,e,r,f,p,o,a,s	2	Data source flags
@	1	Processing status (reviewed) flag

3.10.3 Correcting Unit Values (DC_EDIT)

Edited unit values are corrected for systematic errors using program DC_EDIT and are stored as final corrected unit values. Also available as output is the set of data correction unit values. Systematic errors comprise situations such as datum changes, instrument drift, and instrument calibration. For example, input gage-height unit values may have to be corrected both for a datum change and for an error in the sensing instrument. Up to three separate corrections using various algorithms (Section 3.7) can be made and each of the corrections can be prorated over time. Time proration is automatically applied when multiple starting dates are present in the corrections data. Time proration is not applied during real-time data processing.

3.10.4 Computing Time-Series Data (PRIMARY)

Time-series computations are performed using corrected unit values as input to calculate other (second-parameter) unit values and (or) to compute daily values. The program is called PRIMARY and the outputs are called primary computations or primary reports.

Primary computation codes

Eleven types of time-series computations are produced by PRIMARY. Each type is denoted with a primary computation code and has its own primary report format. Three processing types (NONE, STGO, and TIDE) compute daily values only. The other types entail processing steps that compute additional unit values as well as daily values. The primary computation codes are listed in table 10, grouped by principal processing method (following section).

Table 10: Primary computation codes

Code	Description
	Single-parameter computations
NONE	Compute daily values only. Primarily used for ground water and water quality processing.
STGO	Compute stage daily values only.
TIDE	Compute tidal daily values only.
ELEV	Compute reservoir/lake surface-elevations.
DIFF	Compute difference between successive unit values for parameters other than rainfall.
RAIN	Compute difference between successive rainfall unit values. Negative differences are ignored (set to zero).
	Two-parameter computations
GENR	Compute second parameter from input parameter using a rating.
RCNT	Compute reservoir contents.
	Stage-discharge computation
STGQ	Compute discharge from stage.
	Slope-discharge/velocity-discharge computations
SLPQ	Compute discharge from stage and water-surface slope.
VELQ	Compute discharge from stage and index velocity.

Processing methods

There are four principal processing methods. Listed in order of increasing complexity, they are: single-parameter processing, two-parameter non-discharge processing, stage-discharge processing, and slope-discharge/velocity-discharge processing. Note that stage-discharge processing is a special variation of two-parameter data processing. The methods are outlined in the following sections. Many steps within each method, particularly those related to transferring and processing unit values, are the same.

Single-parameter processing

Single-parameter data processing entails processing and storing data in the units in which they are received by ADAPS. The measured unit values are edited using HYDRA and corrected using correction curves. Single-parameter processing is used for primary computations denoted by codes NONE, STGO, TIDE, ELEV, DIFF, and RAIN. A schematic of the processing steps is shown in figure 6.

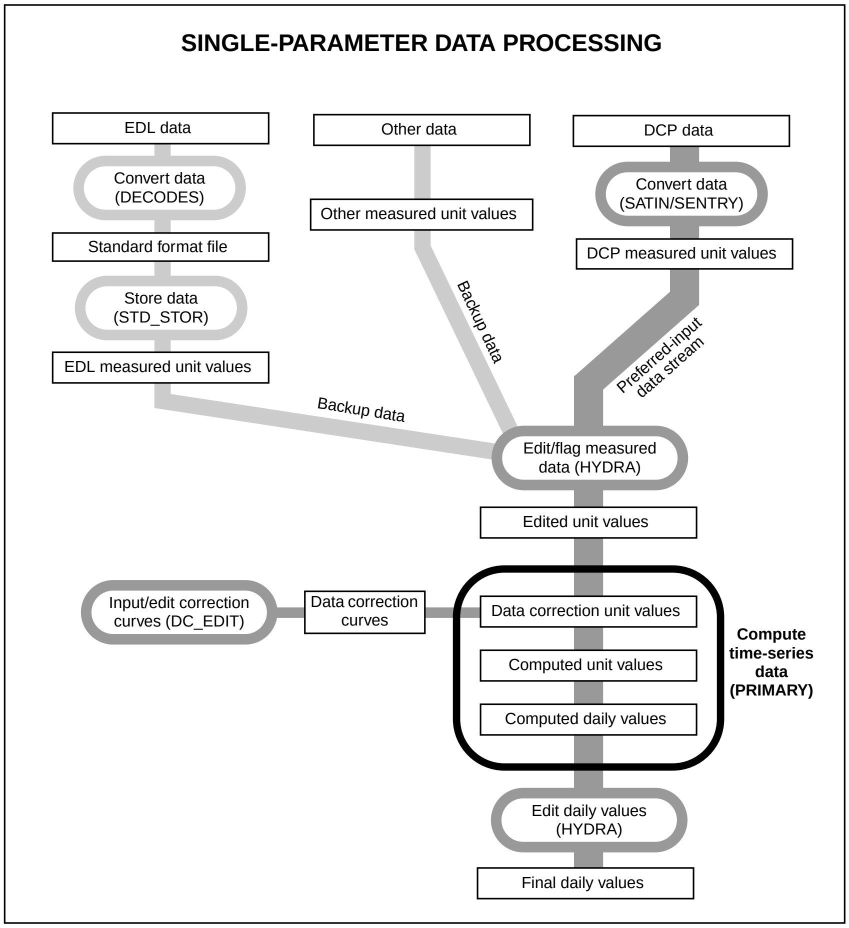


Figure 6. Schematic of processing steps for single-parameter data

Two-parameter processing (non-discharge)

Two-parameter non-discharge data processing entails computing a second parameter from the input parameter using rating curves. The input parameter is first processed as for single-parameter processing. Two-parameter processing is used for primary computations denoted by codes RCNT and GENR. A schematic of the processing steps is shown in figure 7.

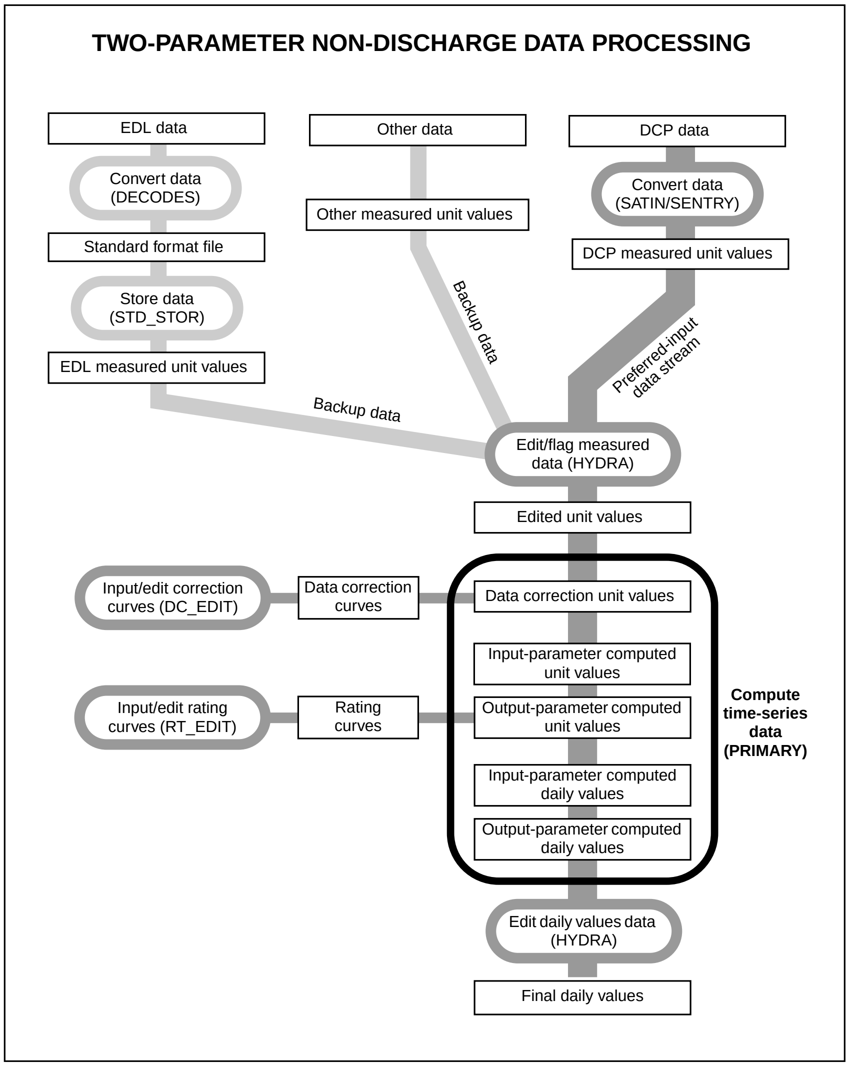


Figure 7. Schematic of processing steps for two-parameter non-discharge data

Stage-discharge processing

Stage-discharge data processing is a special type of two-parameter data processing. In addition to the steps for two-parameter processing, shifts can be applied to the stage values prior to computing discharge. The primary computations code for stage-discharge processing is STGQ. A schematic of the processing steps is shown in figure 8.

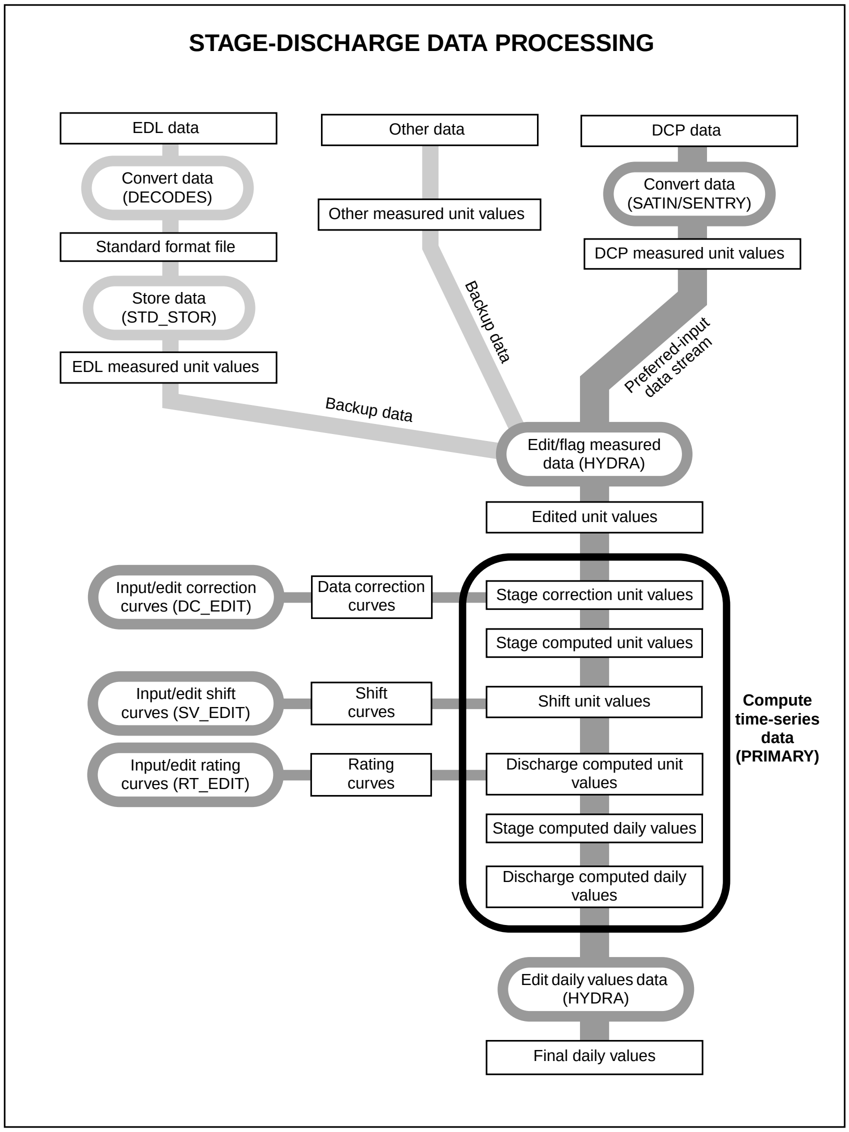


Figure 8. Schematic of processing steps for stage-discharge data

Slope-discharge/velocity-discharge processing

Slope-discharge and velocity-discharge data processing are the most complex types of processing in ADAPS. The output parameter, discharge, is computed from two input parameters, either the stages measured at two sites (one downstream of the other), or stage and velocity measured at the site. Shifts can be applied to the stage or velocity values. The primary computations code for slope-discharge processing is SLPQ; for velocity-discharge processing it is VELQ. A schematic of the processing steps is shown in figure 9.

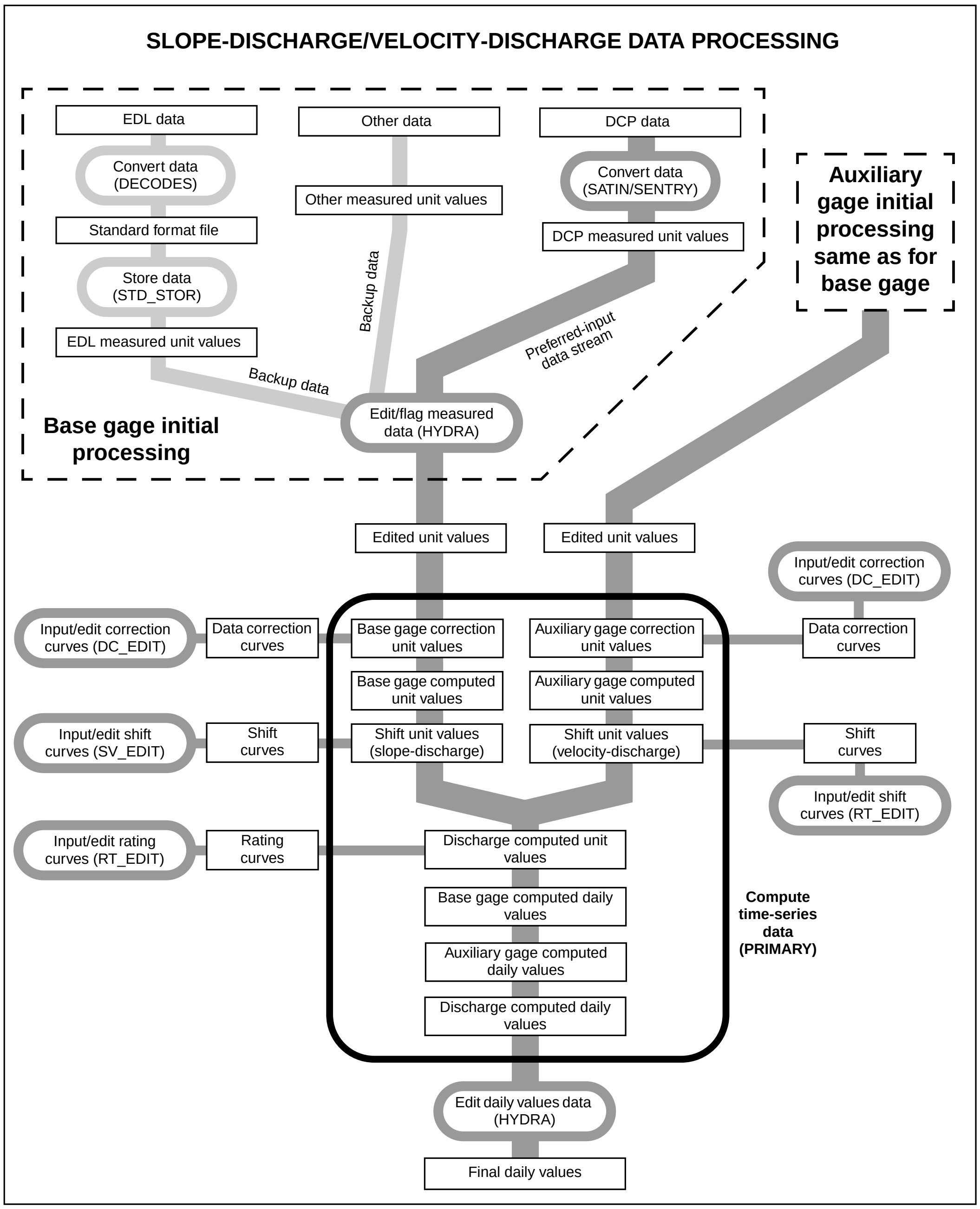


Figure 9. Schematic of processing steps for slope-discharge/velocity-discharge data

Primary computations

Each of the primary computation types listed in table 9 is described in the following paragraphs.

Compute daily values only (NONE)

PRIMARY computes only daily values from corrected unit values. It is used principally for processing water quality and ground water data. Output consists of computed daily values and a standard primary report.

Compute stage daily values only (STGO)

PRIMARY computes only stage daily values from corrected unit values. Output consists of computed daily values and a stage primary report.

Compute tide daily values only (TIDE)

PRIMARY computes special tide daily values. Output consists of high high-tide, low high-tide, high low-tide, and low low-tide daily values and a tide primary report.

Compute reservoir/lake surface elevations (ELEV)

PRIMARY computes water-surface elevations. If necessary, stage values are converted to elevations in the data correction processing step. Output consists of computed elevation unit values, computed daily values, and a water-surface-elevation primary report.

Compute accumulative differences (DIFF)

PRIMARY computes new unit values by calculating the difference between successive input unit values and computes daily values by accumulating the differences. Output consists of the difference unit values, the daily sum of the difference unit values, and a standard primary report.

Compute rainfall amounts (RAIN)

PRIMARY computes rainfall unit value amounts by calculating the difference between successive input unit values. It computes daily values by accumulating the differences. If specified in the computation instructions, the unit values are filtered for “noise,” that is, negative differences are set to zero. Output consists of the filtered unit value rainfall amounts, the daily sum of the amounts, and a rainfall primary report.

Compute second parameter using a rating (GENR)

PRIMARY computes generic output unit values from input unit values using a rating table or equation. This computation type is used for all two-parameter computations except reservoir contents and discharge. Output consists of computed unit values, computed daily values for both the input and output parameters, and a standard primary report.

Compute reservoir contents (RCNT)

PRIMARY computes reservoir contents unit values from elevation unit values using an elevation-contents rating, and it computes daily values of both elevations and contents. Output consists of computed contents unit values, computed elevation daily values, computed contents daily values, and a reservoir contents primary report.

Compute discharge from stage (STGQ)

PRIMARY computes discharge unit values from stage unit values using a rating table or equation. Shifts may be applied to the stage values prior to computing discharge to compensate for changes in the river environment. It computes daily values for both stage and discharge. Output consists of computed discharge unit values, stage daily values, discharge daily values, and a stage-discharge primary report.

Compute discharge from stage and water-surface slope (SLPQ)

PRIMARY computes discharge unit values from stages measured at two sites, one downstream of the other. One site is designated the base gage and the other site the auxiliary gage. Discharge is based on the stage at the base gage and the slope (fall) of the water surface between the two sites. The calculations require three ratings: the base discharge curve (rating type STGQ), the fall curve (FALL), and the discharge factor curve (FLFC). Shifts can be applied to the base gage height, but only to obtain a value from the base discharge curve. Shifts are not used when computing fall or when obtaining a value from the fall curve. Output consists of computed discharge unit values, base stage daily values, auxiliary gage daily values, discharge daily values, and a slope-discharge primary report.

Compute discharge from stage and index velocity (VELQ)

PRIMARY computes discharge unit values from the stage and index velocity measured at the site. The gage measuring index velocity is designated the base gage and the gage measuring stage the auxiliary gage. The discharge calculations are made using one of two methods. The first method uses up to three ratings: the index velocity versus mean velocity curve (rating type VELO), the stage versus cross-sectional-area curve for a standard cross section (STAR), and the stage velocity factor curve (STCO). The second method uses an equation that calculates mean velocity from the index velocity and stage. The equation is of the form

$$\bar{v} = C_x v + C_y v s + C_0$$

where $\bar{v}$ = mean velocity,
v = index velocity,
s = stage, and
C_x, C_y, C_0 = coefficients.

The coefficients are determined from a regression analysis of mean velocity, index velocity, and stage data. The equation replaces the VELO and STCO ratings. The type of calculation that is performed is specified in the processor record. When used, the equation coefficients also are stored in the processor record.

Shifts can be applied to the index velocity, but not to the gage height. Output consists of discharge unit values, stage daily values, mean velocity daily values, and a velocity-discharge primary report.

Daily values computations

Daily values are computed by all primary computations types. A daily value summarizes the unit values collected during the day into a single value according to the statistics code(s) assigned for computation. The daily interval is measured from midnight to midnight. Unit values from which daily values are computed must meet various relational criteria, depending on the data type.

Daily values primary computations statistics codes

The ADAPS statistics codes that can be processed during primary computations are listed in table 11. The statistic code 32400 denotes end-of-day midnight observations.

Table 11: Statistics codes processed by PRIMARY

Code	Name	Description
00001	Maximum	Maximum values
00002	Minimum	Minimum values
00003	Mean	Mean values
00006	Sum	Sum of values
00007	Mode	Modal values
00008	Median	Median values
00009	STD	Standard deviation values
00010	Variance	Variance values
00021	Tidal high	High high-tide values
00022	Tidal low-high	Low high-tide values
00023	Tidal high-low	High low-tide values
00024	Tidal low	Low low-tide values
3hhmm	Observation at hhmm	Instantaneous observation at time hhmm where hhmm runs from 0001 to 2400.

Daily values time interval

Daily values are computed using unit values collected between midnights local time. Both beginning and ending midnight values are used in the calculation of all statistics except sum (statistics code 00006), whereupon only the ending midnight value is used. Because both midnight values are used in the interval, it is possible (for example) that one day’s maximum value is the next day’s minimum value. Similarly, if a maximum value occurs at midnight the value can be the same maximum value for the two adjacent days.

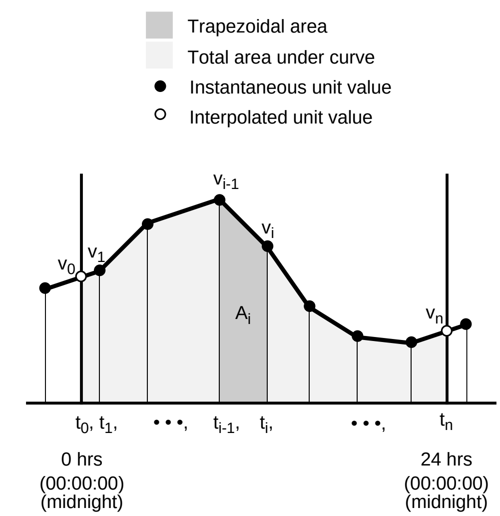
Daily values computations criteria

Daily values are computed only from unit values that meet these relational criteria: (1) the maximum difference between any two adjacent unit values is less than or equal to a preset threshold, and (2) the maximum time interval between any two adjacent unit values is less than a preset time interval. When a threshold is exceeded during daily values computations, a message describing the failed threshold is displayed in the primary report and a daily value is not computed for the day. The thresholds are established individually for each DD.

Daily mean values computations

Daily mean values are computed for parameters that have instantaneous unit values (statistics code 00011). They are computed using the trapezoidal method of approximate integration: the daily mean value is equal to the total area under the unit-values curve divided by 24 hours (or 1,440 minutes or 86,400 seconds). The total area is the sum of the trapezoidal areas defined by the unit values. A schematic of the trapezoidal method is shown in figure 10.

The instantaneous values can be irregularly spaced, that is, the time interval between values can be of varying lengths. If an instantaneous value is not measured at a day boundary (00:00:00, or midnight), a value is interpolated from the two values measured before and after midnight. The values and the time interval between the values from which the interpolated midnight values are computed must satisfy the criteria established for computing daily values.



Trapezoidal area: $A_i = \frac{(v_i + v_{i-1}) \cdot (t_i - t_{i-1})}{2}$, $i = 1, 2, ..., n$

Daily mean value: $\overline{DV} = \frac{1}{t_n} \cdot \sum_{i=1}^{n} A_i$

Figure 10. Schematic of computation of daily mean values. [v_0, value at midnight; v_i, i^{th} value after midnight; t_i, elapsed time since midnight of i^{th} value; n, number of trapezoids; t_0, starting time (= 0 hrs); t_n, ending time (= 24 hours).]

Daylight savings computations

Mean daily values are computed as follows on days when the time changes to (“spring forward”) or from (“fall back”) daylight savings time: On the spring forward day, the mean daily value is computed for a 23-hour day; on the fall back day, it is computed for a 25-hour day.

Partial-day computations

Mean daily values are computed for days that do not have a complete set of unit values, but the values are not stored in ADAPS. They are computed only for display in the primary report.

Daily values editing (HYDRA)

Computed daily values are edited using HYDRA. Just as for editing unit values, HYDRA has the capability of importing other data as reference curves, changing or deleting values, and flagging values. Daily values also can be estimated using the estimation routine MISTE.

Daily values that have been edited can be flagged and write-protected. Write-protected values are called final daily values. They can no longer be altered within ADAPS unless the write-protect flag is explicitly removed. The daily values remarks codes are listed in table 12.

Table 12: Daily values remarks codes

Code	Description
e	Value was edited or estimated by USGS personnel and is write protected
&	Value was computed from affected unit values
<	Value is known to be less than the reported value and is write protected
>	Value is known to be greater than the reported value and is write protected
1	Value is write protected without any remark code to be printed
(blank)	No remark

3.10.5 Preparing Final Records

The following paragraphs describe procedures that are done after the unit and daily values have been processed.

Summary statistics computation

Summary statistics are computed and stored as separate data in ADAPS. The procedure to compute and store them is initiated manually.

Peak above base computations

Unit values for a particular DD may be analyzed for peaks occurring above a threshold value. This computation is generally performed on discharge data, but it can be used for other parameters.

Peak flow file

Annual peak discharges are stored manually in the peak flow file.

Station analysis

A preliminary station analysis report may be generated to list for a year all of the data corrections, ratings, and shifts with comments that were used, the periods of missing daily values, and the periods of estimated daily values. The procedure is initiated manually.

3.10.6 Approving Data

Data that have been processed must be officially approved. The initial status of all data is “Working.” After they have been processed, the status is changed to “In-Review,” and after they are reviewed, to “Approved.” Only persons with ADBA or SYST access (table 1) can change the data status level to “Approved.” If data marked “Approved” must be subsequently re-edited, the status must be changed back to “Working.” Only persons with SYST access can change the status of “Approved” data back to “Working.” The section on data aging (Section 3.8) describes the three status levels of data in ADAPS.

3.10.7 Publishing State Annual Water-Data Reports

Water data are published annually in State water-data reports. Each District is responsible for publishing the data collected within its jurisdiction. The reports are produced using guidelines recommended by the U.S. Geological Survey and guidelines specific to the needs of each State. Generally the data that are published include for each site: site information (location, drainage area, period of record, and other facts), a daily values table for each data type, and current-year and period-of-record statistics about the unit and daily values for each data type as appropriate. Some States also include hydrographs. Most States use the daily values tables in the format produced by ADAPS.

4 ADAPS MENUS AND PROGRAMS

by Colleen A. Babcock and James F. Cornwall

This section describes the standard ADAPS menu system and associated program modules, which are invoked by the menu options. The system is designed to group the ADAPS programs into categories which reflect the normal workflow patterns associated with processing, reviewing, and publishing data. The menus are also designed to allow for modification by local administrators to add or rearrange menu options as needed to meet local requirements. This function is described in the ADAPS Database Administrator Manual. The following sections describe the usage of the menus and the programs associated with each menu option selectable by the user.
Once in ADAPS, the user can perform work tasks either by (**1**) selecting menu options in the main menu and submenus to invoke the programs associated with the selections, or (**2**) by directly entering the name of the ADAPS program module that performs the desired task. This dual mode of operation allows the novice user to make menu choices in an organized fashion that follows the usual processing methods for taking water data from input to final publication, while allowing more advanced users to go directly to specific programs without having to navigate a menu hierarchy.

4.1 Introduction

The ADAPS software is designed to be primarily menu-driven, with interactive menus offering the user choices appropriate to system access level and the functional tasks required to process water data. The software is also designed to allow more experienced users to bypass the menus by entering program names directly on the command line or by "stacking" command options to navigate several menu steps in one command.

The ADAPS menu is invoked simply by entering (at the UNIX command prompt) the command "**adaps**". If this command does not start up ADAPS and bring up the menus, see the Site Administrator to verify access and permissions to run ADAPS and the correct environment settings to do so.

The ADAPS menu system consists of the main menu and a number of associated submenus, invoked by selecting a two-letter code for the desired choice. Each of the main menu options describes a separate functional category in processing water data. For example, the command "**IN**" will invoke the "Data Input" submenu and present the user with a list of programs used to bring data into ADAPS for processing, while the "**PR**" command will invoke the "Primary Data Processing" submenu with a list of programs to actually perform the processing of the data. When invoked, the submenus for each functional category will have their own numeric menu options for selecting specific tasks/programs. When a specific submenu option is selected, ADAPS will execute the program associated with that task and transfer control of the screen to that program until it exits back to the ADAPS menus. Further menus, prompts, or questions may be displayed by the individual programs. The processing performed by the program modules may be interactive or may be completed later as a batch job (no terminal communication required).

A set of additional menu options are provided for the main menu and all submenus that provide for common tasks, such as movement within the menus, exiting from ADAPS, listing individual programs by name, and getting online documentation for ADAPS. The "**QU**" command will take the user back to the previous menu (i.e. from a submenu to the main menu, or from a program query to a submenu), and the "**EX**" command will take the user out of ADAPS back to the UNIX command prompt. The command "**PGM**" will provide a list of all the ADAPS program names and a brief description of each. When the user enters "**doc nn**" (where "**nn"** is the 1- or 2-character menu option) or "**doc name**" (where "**name**" is the actual program name as listed from the "**PGM**" command), an online description for each main menu's or program's options and functions is displayed.

Experienced users may speed up operation of ADAPS tasks by stacking commands. For example, a user may enter "**PR 7**" in the command line to go directly to the 7th task/program listed in the "Primary Data Processing" submenu (the PRIMARY program). If desired, the user may even enter "**adaps PR 7"** from the UNIX command line to go directly to the program. The main menu 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 only. For example, after completion of the PRIMARY program from the "PR" menu, the user may enter "**DI**" in the command line of the "PR" submenu and be taken directly to the Data Display "DI" menu without going through the main menu.

Programs may be invoked by selection from more than one submenu. For example, the program to produce tables of Unit Values (uv_table) may be found in both the "DI" and "PR" submenus, as it serves a function utilized in both work task categories. 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 of the ADAPS menu system is the capability to select tasks by entering in the command line the actual name of the program, rather than invoking the program via a submenu option. The program name may be entered at any ADAPS command prompt, and does not require the program to be listed in the menus. For example, the user could enter "**uv_table**" from the main menu and be taken directly to the Unit Values tabling program. Entering "**pgm**" in the command line will produce a list of all the ADAPS program names and a brief description of each program's function.

The options a user will see on the ADAPS menus depend upon access level in the system. ADAPS has four levels of user access: System Administrators ("SYST"), ADAPS Database Administrators ("ADBA"), Standard Users ("USER"), and Cooperators ("COOP"). "SYST"-level users will be able to see all menus and all options within the menus. "ADBA"-level users see all menus, but certain menu options are blocked (those programs coded for access only by "SYST" users in the menu definition files). "USER"-level users cannot see the menus for maintaining the database and support functions, and within the remaining submenus they see options related to records processing and data retrieval (programs coded for "USER" or "COOP" access). "COOP"-level users will only see options for retrieval of data (programs coded for "COOP" access only).

Capabilities are provided to allow District ADAPS System Administrators to change the ADAPS access levels 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 NWIS Administrator's Manual.

Since the submenus under the main menu may vary from District to District, they may differ from those shown here. The emphasis in this manual is to group the different work tasks by their functional work task category, and to refer to the actual program names (uv_table, dd_disp, etc), rather than by the two-letter main menu and numeric submenu options.   The menus presented in the following sections are the standard default menus provided with the ADAPS software.

4.2 Functional Categories

Sections 4.4 through 4.11 of this manual contain documentation for the various ADAPS programs arranged by functional category. Only those programs coded for use by “COOP” and “USER” users are presented in this manual; “SYST” and “ADBA” access-level programs are described in the ADAPS Database Administrator's Manual. The table below lists the functional categories and a brief description of each one.

Option	Functional Category	Description	Section
IN	**DATA INPUT**	**Bring data into the ADAPS system**	**4.4**
PR	**PRIMARY PROCESSING**	**Perform primary processing of data**	**4.5**
AP	**APPLICATIONS**	**ADAPS Statistical Applications**	**4.6**
DI	**DATA DISPLAY**	**Display and print UV and DV data**	**4.7**
RT	**DATA RETRIEVAL**	**Retrieve and write ADAPS data**	**4.8**
SU	**SUPPORT FUNCTIONS**	**Updating site/location information**	**4.9**
MA	**MAINTAIN DATABASE**	**Manage DB & Users, data archival**	**4.10**
UT	**UTILITIES**	**Miscellaneous Utility functions**	**4.11**

The following section shows screen shots of the default ADAPS menus. The screen shots are arranged in the order shown in the table above.

```
************************************************************************
| US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)       |
| REVISION NWIS_4_2_0-20020402         Jun 03, 2002 14:24:12 Monday    |
|             MAIN MENU - WATER DATA PROCESSING OPTIONS                |
|                                                                      |
************************************************************************
     IN -- Data Input
     PR -- Primary Data Processing
     AP -- ADAPS Statistical applications
     DI -- Data Display
     RT -- Data Retrieve/Write
     SU -- Update Support Files/Record Flags
     MA -- Maintain Database
     UT -- Miscellaneous Utility Functions
     LA -- Local Applications

     DOC menu_opt -- Display documentation PGM -- Display program_names
     QU -- Exit to previous menu           EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

ADAPS Main Menu

The user may select submenus using the two-letter options for the functional categories, enter program names directly, or display program names or documentation using the appropriate command. All menu options are shown in this display, but users at access levels “USER” and “COOP” will not be able to see the “SU” and “MA” menu options.

```
************************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)   |
| REVISION NWIS_4_2_0-20020402          Jun 03, 2002 15:11:23 Monday   |
|                        (IN) SUB-MENU : Data Input                    |
|                                                                      |
************************************************************************
 1 -- Read ADR Tape Data
 2 -- Process ADR Card-Image Data
 3 -- Edit And Store ADR Tape Data
 4 -- Review/Delete Digital Tape Temp. Files
 5 -- Process UV Card-Image Data
 6 -- Enter Unit-Values from Digitizer/Keyboard
 7 -- Process Daily-Values Card-Image Data
 8 -- Process WRD standard input data
 9 -- Enter/Update/Display Measurements

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation   PGM -- Display program_names
 QU -- Exit to previous menu             EX -- Exit to UNIX
  Select desired menu option or program_name ([CR] for menu):
```

Data Input Submenu (IN)

The user may select programs from the Data Input submenu (IN), to bring data into the ADAPS database for processing. Each program name is listed in the description. This menu is visible to access levels "USER" and higher.

```
***********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS_4_2_0-20020402          Jun 04, 2002 11:48:06 Tuesday |
|                  (PR) SUB-MENU : Primary Data Processing             |
|                                                                     |
***********************************************************************
 1 -- Update Data Descriptor Thresholds 10 -- Print/Display Unit-Values Tables
 2 -- Edit Time-Series Data using Hydra 11 -- Daily Values Tables
 3 -- Update/Display Data Corrections   12 -- End-of-Year Summary
 4 -- Update/Display Rating Tables      13 -- Peak Flow Entry and Retrieval
 5 -- Shift Analysis and Error Bars     14 -- Manage Record Data Aging Status
 6 -- Update/Display Shifts             15 -- Plot Time-Series Data
 7 -- Primary Computations              16 -- Show Site Information
 8 -- Edit DV Statistical Summary       17 -- Station Analysis Report
 9 -- Daily-Values Manipulation

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

DOC menu_opt -- Display documentation      PGM -- Display program_names
QU -- Exit to previous menu                EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

Primary Data Processing Submenu (PR)

The user may select programs from the Primary Data Processing submenu (PR) to perform the actual data editing, validation, correction, and manipulations required to produce published data. This menu is visible to users at access levels "USER" and higher.

```
***********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS_4_2_0-20020402         Jun 04, 2002 12:01:43 Tuesday  |
|             (AP) SUB-MENU: ADAPS Statistical applications            |
|                                                                     |
***********************************************************************
 1 -- Daily-Values Monthly and Annual Statistics
 2 -- Daily-Values Duration and N-day Low/High Value Analysis
 3 -- Daily-Values Daily Summary Statistics
 4 -- Daily-Values Tables
 5 -- Daily-Values Inventory

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation     PGM -- Display program_names
 QU -- Exit to previous menu               EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

Statistical Applications Submenu (AP)

The user may select programs from the Statistical Applications submenu to perform statistical analysis of processed daily-values data. This menu is visible to users at all access levels.

```
**********************************************************************
|      US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS) |
|   REVISION NWIS_4_2_0-20020402        Jun 04, 2002 12:08:18 Tuesday |
|                       (DI) SUB-MENU : Data Display                   |
|                                                                      |
**********************************************************************
 1 -- Daily-Values Tables          9 -- Display Ratings
 2 -- Unit-Values Tables          10 -- Plot Ratings
 3 -- Plot Hydrographs            11 -- Display Data Corrections
 4 -- Plot Time-Series Data       12 -- Display Variable Shifts
 5 -- Display Instrument          13 -- Display Exp Shifts/Corrections
 6 -- Display Data Descriptor     14 -- Primary Status Report
 7 -- Display Measurements        15 -- Daily-Values Inventory
 8 -- Display Rating Table Dates  16 -- Display Data Aging Status

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

  DOC menu_opt -- Display documentation    PGM -- Display program_names
  QU -- Exit to previous menu              EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

Data Display Submenu (DI)

The user may select programs from the Data Display submenu to view and print ADAPS tables, reports and other formats.

```
**********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS-4_2_0-20020617         Jul 11, 2002 08:24:47 Thursday |
|                   (RT) SUB-MENU : Data Retrieve/Write                |
|                                                                      |
**********************************************************************

 1 -- Retrieve ADAPS data in RDB format
 2 -- Retrieve/Write Daily-Values Data
 3 -- Retrieve DV/UV/Measurement/Shift/Rating/Site Data
 4 -- Retrieve Interpolated Unit-Values at specified times
 5 -- Retrieve Rating in crohms format
 6 -- Retrieve Data Quality-Assurance report

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation   PGM -- Display program_names
 QU -- Exit to previous menu             EX -- Exit to UNIX

 Select desired menu option or program_name ([CR] for menu):
```

Data Retrieval Submenu (RT)

The user may select programs from the Data Retrieval submenu to retrieve data from ADAPS in various formats. The programs will allow the user to display or print the data, or to export data for use in other applications outside ADAPS. This menu is visible to users at all access levels.

```
**********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS_4_2_0-20020402        Jun 04, 2002 12:34:12 Tuesday   |
|             (SU) SUB-MENU : Update Support Files/Record Flags       |
|                                                                     |
**********************************************************************

 1 -- Manage Record Data Aging Status
 2 -- Update Location information
 3 -- Update Data Descriptor information
 4 -- Update ADR Instrument information
 5 -- Manage preferred input

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation   PGM -- Display program_names
 QU -- Exit to previous menu             EX -- Exit to UNIX

 Select desired menu option or program_name ([CR] for menu):
```

Update Support Files/Record Submenu

The user may select programs from the Update Support Files/Record submenu to manage data aging, update sensor location information, update data descriptor information, update ADR instrument information, and to manage preferred input identification. This menu is visible only to users at access level "ADBA" and "SYST".

```
**********************************************************************
|  US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)    |
|  REVISION NWIS_4_2_0-20020402     Jun 04, 2002 12:40:44 Tuesday    |
|                    (MA) SUB-MENU : Maintain Database               |
|                                                                    |
**********************************************************************

 1 -- Manage Record Data Aging Status
 2 -- Update DIS Node Configuration File
 3 -- Review/Delete User File Entries
 4 -- Archive Unit-Values to disk for tape storage
 5 -- Restore Unit-Values from ARCHIVE files
 6 -- Split a UV sub-file in two
 7 -- Delete Measured Unit Values For SENTRY reload

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation   PGM -- Display program_names
 QU -- Exit to previous menu             EX -- Exit to UNIX

 Select desired menu option or program_name ([CR] for menu):
```

Database Maintenance Submenu (MA)

The user may select programs from the Database Maintenance submenu to manage data aging, update database configurations and user information, archive and restore data, and manage the distribution of Unit Values into subfile tables for load balancing. This menu is visible only to users at access level "ADBA" and "SYST".

```
***********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS-4_2_0-20020617        Jul 11, 2002 08:38:06 Thursday  |
|              (UT) SUB-MENU : MISCELLANEOUS UTILITY FUNCTIONS        |
***********************************************************************

 1 -- Update Site/Data Descriptor Groups
 2 -- Edit Unit Values
 3 -- Merge/Replace Unit Values Data
 4 -- Set Edited UV "checked" Status Flags
 5 -- Edit Daily Values
 6 -- Edit public access flags
 7 -- DCP Performance Reports

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation  PGM -- Display program_names
 QU -- Exit to previous menu            EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

Miscellaneous Utilities Submenu (UT)

The user may select programs from the Miscellaneous Utilities submenu to perform a variety of tasks that are not directly involved in processing the data. The menu is visible to all users, but "COOP" users will see only the first option to handle ADAPS Groups. Users at access level "USER" and higher will see all options as shown here:

```
***********************************************************************
|     US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)  |
| REVISION NWIS_4_2_0-20020402         Jun 04, 2002 13:48:41 Tuesday  |
|              (LA) SUB-MENU : LOCAL APPLICATIONS                     |
***********************************************************************

 1 -- Local Program Number 1 (Dummy Entry)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, UT, LA,

 DOC menu_opt -- Display documentation  PGM -- Display program_names
 QU -- Exit to previous menu            EX -- Exit to UNIX

Select desired menu option or program_name ([CR] for menu):
```

Local Applications Submenu (LA)

If the local Site Administrator has installed any local application programs, they will be listed in the Local Applications submenu. The default menu supplied with an ADAPS installation will appear as shown, and is visible to all users.

4.3 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.

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 in detail in the program-specific sections discussed later in the manual.

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 INGRES tables. 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 Chapter 6 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: 05-07-2001    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.020.20010405.1323  <-- (See below)
OF - OUTPUT FILE  - OUTPUT TO USER-SUPPLIED FILE NAME

TR - TAPE READER  - MITRON
-----------------------------------------------------------------
DB - DATABASE     - ADAPS TEST DATABASE
AG - AGENCY        - USGS   GEOLOGICAL SURVEY
ST - STATION(S)    - 12345678  TEST STATION
DD - DATA DESCR    - INSTANTANEOUS GAGE HEIGHT IN FEET
IN - INSTRUMENT    - ADR #1 TEST FOR ADAPS
SC - STATISTIC     - 00003 MEAN
YR - PERIOD        - 2000 TO 2001 Water Years
DT - DATES         - 05-05-2001 TO 05-05-2001
BA - JOB MODE      - BATCH MODE USING A TEMPORARY CONTROL FILE
BQ - BATCH QUEUE  - NIGHT1
*****************************************************************
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:
```

Display from Startup Routine

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.

- **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 access rights to this directory.

- **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 configured on the user's NWIS Host is displayed when the printer option is chosen.

- **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 the startup screen above) 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 ADAPS 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 it must be changed each time the program is invoked. The stored file name is overwritten (updated) with each new invocation of a program.

- **TR - TAPE READER Option**

  This option queries for the desired type of digital tape reader. A list of readers configured on the NWIS Host is displayed if more than one reader is available.

- **DB - DATABASE Option**

  This option queries for the name of the desired database. Most systems will have only one database, but the capability is available to have several. For example, some districts have configured a database specifically for use by a cooperator. A list of databases is displayed if more than one is available.

- **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.

- **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.

- **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.

- **IN - INSTRUMENT Option**

  This option queries for an instrument and is applicable only for programs accessing ADR records. A list of available instruments for the selected station is displayed if more than one is available.

- **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.

- **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 2001 is the 2001 Water Year. If begin month is 10, year 2001 is the start of the 2002 water year (i.e., year beginning October 2001).

- **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.

- **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 background process 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 NWIS Host 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.

- **BQ - BATCH QUEUE Option**

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

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 UNIX command from within an ADAPS program, are discussed below.

- **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.

- **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 re-answer 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.

- **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.

- **EXIT Routine**

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

- **Execute a UNIX Command Routine**

  An additional query routine provides for execution of a UNIX command from within an ADAPS program. The command is formed by an exclamation point and a space (!) followed by the UNIX command and its options (up to 160 characters long). Entry of "! Command," where Command is the UNIX 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.

4.4 Data Input

This section presents the programs which may be used to bring water data into ADAPS from a variety of sources and methods. Data may be unit values, daily values, measurements (discharge measurements, site inspections, groundwater calibration levels, etc.), and card-image data from other sources.

PROGRAM NAME	TASK DESCRIPTION	SECTION
TP_READ	Read in ADR Tape data	4.4.1
CD_READ	Read in ADR card-image data	4.4.2
TP_EDIT	Edit and store ADR Tape data	4.4.3
DRFILES	Review/delete digital tape temporary files	4.4.4
UV_STORE	Converts unit-values card-image data files into Standard Format files	4.4.5
UV_ENTER	Manually enter Unit-values data using Keyboard/Digitizer	4.4.6
DV_STORE	Read in daily-values card-image data	4.4.7
STD_STOR	Read in WRD Standard Format input data	4.4.8
MS_EDIT	Update/display measurements	4.4.9

These programs allow users to bring in data from a variety of sources and store it into ADAPS. These are generally used for non-real time data sources or to provide backup data (for example, downloading the data from a DCP and reading it into the database under a separate transport code to serve as a backup for the real-time satellite transmissions of the same data). Users may bring in data from an electronic data logger (EDL), digital recorder (ADR) paper tapes, from card-image data files stored on disk in several different formats, or from digitized strip charts, or even keyboard entry. The data can subsequently be edited for correctness and stored into the database for further processing. Also, users may enter, update, and display discharge measurements, site inspection data, groundwater measurements, and other types of information, to be used in developing and calibrating the automated processing handling of water data within ADAPS.

4.4.1 Read ADR Tape Data (TP_READ)

The TP_READ program is used to translate, or read into ADAPS, data from ADR digital paper tapes. The program first checks to see if there are any tape readers defined in the ADAPS installation. If there are none, the user is informed and the program stops. If there are tape readers configured, the program will check for (and prompt the user if necessary) the Agency, Site, and Instrument. 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 read from the tapes. Up to 20,000 punch values can be translated from one tape. During the translation, 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.

4.4.2 Process ADR Card-Image Data (CD_READ)

The CD_READ program is used to read files of unit value data that are in the format of 80-column ADR cards. The data from these card images are translated and stored into a temporary tape file. The temporary file of ADR card-image data can then be time-checked, screened, and verified by using the TP_EDIT program, which will store the Unit Values into the measured unit values table in the ADAPS database. Once the data from the ADR card images have been stored in ADAPS and the temporary files are no longer needed, the temporary files may be reviewed and deleted using the **drfiles** program.

ADR Data Format

The unit value data processed in CD_READ is in 80-column ADR card images, as described below. Each data file consists of one header record followed by data records.

Header Record Format

Columns	Description of field
1 - 3	Readings per day (002, 004, 006, 008, 012, 024, 048, 096, 144, 240*, 288, 440**) * 240 valid only for tide records ** coding of 440 represents 1440 readings per day (1 minute punch interval)
4 - 11	Rightmost 8 digits of the Station ID number. If latitude/longitude is used for the station number, use the lower 2 digits of longitude degrees, the 2 digits of longitude minutes, the 2 digits of longitude seconds, and the 2 digit sequence number.
12	Number of items (channels) per punch interval. For QW monitor 10-channel data, use 0 (zero), otherwise use actual number of QW monitor channels. For multiple-channel gate-opening data, this value is the first digit of a 2-digit number.
13 - 18	Starting Date of the tape (YYMMDD) - Calendar year
19 - 22	Starting time of the tape (HHMM) - Use local Standard time regardless of time shifts during summer months.

Header Record Format (Continued)

Columns	Description of field
23	Record type code 0 = Stage record on a separate recorder tape 1 = 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 recorder tape with the stage record the first of the two items/channels 2 = Stage and deflection record as sets of readings on the same recorder tape with the deflection record the first of the two items 3 = Digital monitor record
24 - 29	Ending date of the tape (YYMMDD) - Calendar year
30 - 33	Ending time of the tape (HHMM)
34	This is the second digit of a 2-digit number indicating the number of items (channels) on the tape for multiple-gate opening data. If not used for this type data, it is 0 (zero).
35 - 40	Ending Watch date of the tape (YYMMDD) - Calendar year
41 - 44	Ending watch time of the tape (HHMM)
45 - 72	Blank
73 - 80	Optional sequence number. Blank if not used.

Data Record Format

Columns	Description of field
1 - 72	Punch readings (values) - Up to 18 4-digit numbers, right-justified with leading zeroes. All records except the last will be packed to a full 18 values, the last record may have fewer than 18 values and is blank-filled to column 72.
73 - 80	Optional sequence number. Blank if not used.

<u>Sample Data File</u>

The following sample data file contains hourly data (24 readings per day) from station 04095101, one channel, starting on 2002/06/03 at 1100 local and ending on 2002/08/19 1100 local, with a watch time of 2002/08/19. The fields in the header record are shown in alternating colors to distinguish the fields more easily.

```
02404095101102060311000020819110000208191100
701770177017701770187018701870187018701970207020702170227022702270237023
702370237023702470247025702570257025702570257025702570257025702570257025
702570257025702570257025702570257025702570257025702570257025702570257024
702370227021702170207020702070207019701770167016701570157015701570147014
.
.
.
704070407040704070407040704070407040704070407040704070397038703770357033703270 31
```

4.4.3 Edit and Store Translated Data (TP_EDIT)

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

The temporary files created by use of either program described previously (TP_READ, CD_READ), 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 into the ADAPS database. The Unit Values are stored as type "measured" with a transport code of "ADR". If the DD was set up with the ADR as Preferred Input, then the unit-values will also be copied into the "edited" unit values tables. 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 UNIX level

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

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 two ways. The first is called the 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.

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 ADR Instrument record. 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 the ADR Instrument record) in the proper units for the kind of data being tested. For item 2, the test difference is units per reading or per punch.

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 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
----------------------------------------------------------------------
```

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.

Create ADR Cards

This option is used to write the unit-values data to a disk file in ADR card-image format rather than storing the data into ADAPS. This is intended to allow transfer to other computers or applications.

Store Unit Values

This option is used to store the data into the ADAPS Unit Values tables. Data cannot be stored unless they have first been time-adjusted and verified. If there is existing ADR unit values data in ADAPS which has been set to “In-Review” or “Approved”, the data will not be stored, because the existing data is protected from being overwritten. If the new data are needed, the user must have the existing data set back to “Working” status and then store the ADR data.

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.

4.4.4 Review/Delete Digital Tape Temporary Files (DRFILES)

The **drfiles** program displays a list of the available temporary files created by the TP_READ or CD_READ programs in the process of translating or processing new ADR data for the user-selected agency, station, and instrument. The user is given the option to delete any temporary files that are no longer needed.

4.4.5 Process UV Card-Image Data (UV_STORE)

The UV_STORE program is used to import unit-values data into ADAPS from data files using card images in the old Watstore B-Cards format. Previous versions of this program stored the data directly into the ADAPS Unit Values tables. The program has been revised for NWIS 4.2 and now serves as a filter to convert data files in the B-Cards format into WRD Standard-Format data files. The data files are then stored into ADAPS using the program STD_STOR in a separate processing step. This section explains the options and how the program runs.

The unit values stored within ADAPS may be retrieved and stored into data files in card-image format. Data files of unit values may also be produced in other computer programs and applications which process data (from recording devices such as digital punch recorders) into a format which can be used as input to ADAPS. These files may then be processed using the UV_STORE program as the initial step in getting the unit values stored into ADAPS. The data files contain card images in the old Watstore B-cards format described below. Previous versions of the UV_STORE program processed the data and stored it directly into ADAPS. With the release of NWIS 4.2, the program has been modified to act as a filter or conversion module which will read the input Watstore card images and create an output data file in the current WRD Standard Format (see Section 6.3). The user will then be required to run the STD_STOR program to store the unit values data into the ADAPS database. The UV_STORE program does not store the data into the database because it is intended to serve as a transition to the use of the more modern and more capable Standard Format rather than an old data format which has been superseded and is obsolete. The data file created as the output from UV_STORE may be retained by the user and used for future data inputs into ADAPS, eliminating the need to run UV_STORE again.

The data files to be processed by UV_STORE must contain 80-column card images in the Watstore Type-2 and Type-B data format. The type-2 card (record) contains the card type (“2”), the station identifier (ID), parameter code, and statistic code. The type-B card contains the card type (“B”), the date/time (YYYYMMDDHHMMSS) of the first unit-values reading on the card, the number of readings per day (rpd), and the data (up to six values per card). The data file may contain optional Type-Z cards, which allow the user to specify an agency code other than the default value set in the ADAPS startup routines. Other types of card images may be present but are ignored. The program processes multiple stations and parameter codes.

The agency code defaults to whatever is set in the ADAPS start-up menu. However, the agency code is replaced by the agency code from a type-Z card (record) if one is found in the data file.

Program Operation

This interactive program goes through the standard ADAPS startup routine after presenting a warning that the data file will be converted to a new format, not stored into the database as in previous versions of the program. It will then prompt the user for the names of the input unit-values card file and the output file for the converted card images. The input file name is the name of the file that contains the type-2 and type-B card unit values data. This file must already exist or the software will display an error when attempting to open it. The output file name is the name of the file to which the card images will be written in the format specified for STD_STOR. If the output file does not exist, it will be created. If it does exist already, the user will be asked if he or she wants to overwrite the existing data. When the file names have been entered and the files opened, the user will be prompted for several further options. These options are discussed below.

Option 1 is the Type of Unit Values to store. The user must select the type of data being processed for storage into the ADAPS database.

The available choices are:

1. Measured Unit Values: This option is the default. These data are to be stored as the actual measurements from a recording device.

2. Computed Unit Values: These data have been previously computed or processed such as discharge, rainfall, 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 2 is the Data Conversion Flag to be used. The user has the choice to perform no conversion, multiply each Unit Value by 100, or to multiply each UV by 0.01.   The default is no conversion.

The user must be aware of how the use of the conversion flag may affect the results of any computations involving the unit values. The UV_STORE program merely takes the specified flag and applies the multiplication to each UV read from an input card before storing the result into an output card image.

Option 3 is the Transport Method to attach to the data. This option allows the user to specify the source of the unit values data, which is stored into the ADAPS database along with the data itself. There is no default value, the user must select from the list below:

1. None ('UNS' - unspecified) -- This option does not specify a source.
2. 'ADR' -- This data originated from an ADR paper tape recorder.
3. 'DCP' -- This data was transmitted by DCP through satellite relay operations.
4. 'EDL' -- This data was recorded by an Electronic Data Logger unit.
5. 'OBS' -- This data originated from Field Observations.

Option 4 is the Time Zone code (the "time datum") to apply to the data. This code determines how the time-stamp for each Unit Value will be processed when the data is stored into the ADAPS database by STD_STOR. The default value for this option is "Local". The user is first prompted to answer "Yes" if wanting to use the default code, or "No" if wanting to specify a time datum for the data. If the answer is "No", the user is prompted to enter the time datum to apply to the data (for example, "MST" for Mountain Standard Time).

Once all options have been specified, the UV_STORE program will begin processing the input file. Each time there is a change in the input station ID or parameter code during processing (signaled by use of a type-2 card in the data file), the program pauses and prompts for a new data descriptor (DD) selection; therefore, there must be DDs for all data that are to be processed. After the DD selection is made, the program continues to process the card data for the new station. If the station changes in the data file without finding a type-2 card, the program will close the output file with all valid data processed so far, and will display an error message to warn the user to correct the data file. During processing, the program displays the station and parameter. When processing of all cards in the input file is finished, the program summarizes the processing by listing the counts of total input cards of each type that have been processed. If any errors are encountered during processing, an entry is made to an error file and the user is given the information and the name of the file. This error file, named "UVS.ERRORS" resides in the directory the user specified in the Path command in the ADAPS startup menus.

Once the UV_STORE program has completed processing, the user must load the reformatted data file into the ADAPS database using the program STD_STOR, which can be found in the IN Input menu as Option 8 (for the default menus supplied with NWIS).

WATSTORE Card Formats Used

This section describes the formats of the old WATSTORE card formats which are used by the UV_STORE program. Other programs may use these formats to produce output data files for input to ADAPS, or other ADAPS programs may be used to create data in this format (notably OUTWAT). Data input and output using the WATSTORE cards formats provides backward compatability to existing programs outside NWIS.

Z-card format

This card format is used to identify the Agency code for the station. Most ADAPS programs use "USGS" as the default value for the agency code. The Z-card is used when the agency code must be set to some other value. It is an optional input to UV_STORE.

Columns	Variable Name	Contents
1	Record Type	"Z"
2 - 32	(reserved)	blank
33 - 37	Agency Code	5-character agency code (i.e. "USGS")
38-80	(reserved)	blank

2-card format

This card format is used in UV_STORE to identify the station and specific type of data (by parameter and statistic codes) for unit values data. The ADAPS program **outwat**, or other programs outside of ADAPS, may be used to create these records as output.

Columns	Variable Name	Contents
1	Record Type	"2"
2 - 16	Station Identifier	15-digit station number
17 - 22	Cross Section Location	The distance in feet from left bank (as determined by facing downstream). Blank indicates that the location was not stored.
23 - 28	Depth Locator	Sampling Depth, in feet, from water surface. Blank indicates the field was not stored, "111111" indicates top samples, "888888" indicates bottom samples.
29 - 33	Parameter Code	5-digit parameter code
34 - 38	Statistic Code	5-digit statistics code
39 - 54	(reserved)	blank
55 - 57	Operation Code	UV processing: Leave blank.
58 - 80	(reserved)	blank

B-card format

The ADAPS program OUTWAT may be used to retrieve Unit Values data from NWIS and create records in the B-Card format. Other programs outside of ADAPS may also be used to create files of Unit Values data in this format, which can be loaded into NWIS databases using the UV_STORE program. Generally, one Type-2 card and a series of Type-B cards are created for each time-series retrieved. The contents and format of Type-2 cards are described above. Unit-values are sometimes stored in ADAPS at unequal time intervals due to time corrections or missing data. The contents and format of Type-B cards (80 bytes each) are described below:

Columns	Variable Name	Contents
1	Record Type	"B"
2 – 16	Station Identifier	15-digit station number
	Date:	
17 – 20	Calendar Year	YYYY
21 – 22	Month Number	01 – 12
23 – 24	Day Number	01 – 31
	Time of First Reading (00:00:00 – 23:59:59)	
25 – 26	Hour (24-hour clock)	00 - 23
27 – 28	Minutes	00 – 59
29 – 30	Seconds	00 - 59
31 – 35	Number of Readings per Day	(1440 Maximum)
36 – 38	(reserved)	blank
39 – 80	Unit Values	**(a)** up to 6 Unit Values

(a) Unit values. Six 7-column fields that contain the unit values for successive time increments for the designated date and starting time. Time increments are not specified, instead they are computed based upon the starting time and the Readings per Day value. Blank fields indicate no data are available for that day and time.

4.4.6 Enter Unit Values from a Digitizer (UV_ENTER)

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, but use of the HYDRA (TS_EDIT) programs is recommended instead, as the UV_ENTER software will be phased out in a future release of NWIS. Note that the daily values calculated from the associated unit values are not automatically updated, but the user may perform the recalculation as an option.

Specify Default Values

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

1. Transmit status - status of transmission
2. Data status - whether data are PROVISIONAL (stored as "Working") or FINAL (stored as "Approved")

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

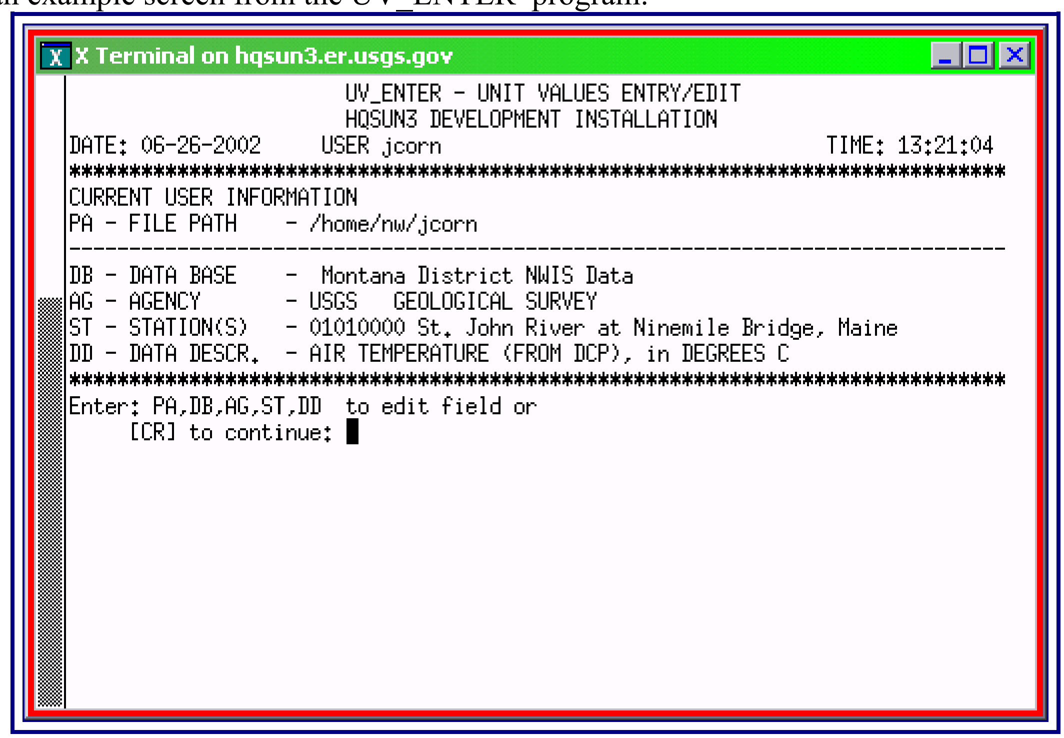
There are default values for these codes which, unless overridden, are stored with new days and new unit values created during a session. At the start of the program the user may review and/or change these default values. By specifying the codes on a day-by-day or value-by-value basis during processing, the user can override the default values.
The preliminary startup of the program allows the user to set the station, DD, and output specifications for the program, then asks if the user wants to change 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. After this query is answered, the ADAPS startup screen is displayed again.

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:



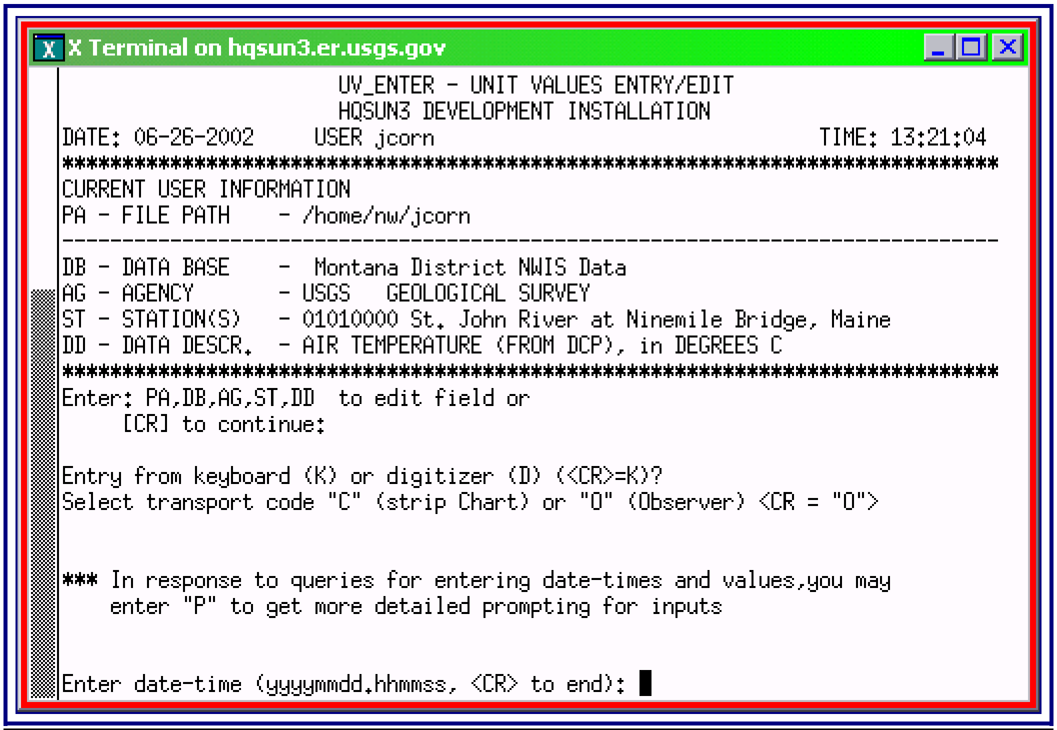
Select Keyboard/Digitizer Entry

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 below. If a D is entered, processing continues as discussed in Digitizer Entry.

Keyboard Entry



After the user selects a station and a data descriptor (DD), the program prompts for the desired Transport Code to assign to the Unit Values being entered. Options are “C” (digitized strip Charts) or “O” (Observer). The default is “O”. Once the Transport Code has been specified, the program will prompt the user for a specific date-time, and then a value for that date-time. The available options for automatically entering date-time sets and/or values are available and discussed in the following two sections.

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 the response to this query is “P,” individual prompts with detailed individual helps are available for each option.

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 one hour. If the user chooses this option, he or she will not be prompted to again enter date-time until the generated date-time exceeds the ending date-time (see E=yyyymmdd.hhmmss 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 (000000) and the last possible time of day (235959).

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, the user need not enter those elements of the date which are the same as the date entered for the initial date-time, and the user 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. The user 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: The status code cannot be changed 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.

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 the user responds to this query with “P”, individual prompts and detailed individual “helps” are available for each option.

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. The user 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= yyyymmdd.hhmmss 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=dd.hhmmss 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 the user needs 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.

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.

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 /usr/opt/nwis/data/auxdata/digitizer.def. This file is described later in this section. 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 also discussed next in the next sections.

First, position the chart on the digitizer. It is not necessary to place the chart parallel with the edge of the digitizer. The program adjusts 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, the user is 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 the setup:

DEVIATION FROM RIGHT ANGLE IS: xx.x DEGREES

The user is also notified of the scaling, as defined by the following 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 the 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, the user is notified and prompted to specify an option for merging the newly digitized data with the existing data. See the M=m paragraph of Date-Time Entry Options for more information about the available merge options.

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, described next. 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.

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

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 /usr/opt/nwis/data/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                                                    xxxxxxxxxxxxxxx
```

4.4.7 Process Daily-Values Card-Image Data (DV_STORE)

The DV_STORE program is used to store daily-values data within the ADAPS Daily-Values database tables. This section describes the card-image data formats, and indicates how the program runs.

Introduction

The retrieved daily-values data must be formatted as 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 cards (such as Z, H, or N) are encountered in the retrieved file. The program processes multiple stations, parameter codes, and statistic codes.

Program Operation

This interactive program goes through the standard ADAPS startup routine and prompts for the input daily-values card file name. This is the name of the input file that contains the type-2 and type-3 card data that were retrieved. 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. 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 a value that indicates “missing data” within ADAPS. Also, if card fields are equal to 999999 or 999998, they are set to the missing value as well.

If there is a change in the input station ID or parameter code during processing, the program prompts the user to select a new data descriptor from the list of DDs defined for the appropriate station; therefore the DDs must be defined 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. A count of records not written to the file is also given.

4.4.8 Process WRD Standard Input Data (STD_STOR)

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 the DECODES User Manual.

The STD_STOR program is used to load data into the ADAPS database from disk files produced by programs such as UV_STORE or DECODES, which convert different formats of electronic field-recorder data into the standard data-input format. The STD_STOR program may be run as a batch job or as an interactive program, loading the data into the database and producing a log file showing details of the processing. If no errors are found during the processing, the input file is archived and deleted.

Program Operation

The STD_STOR program begins with the ADAPS startup routine used for specifying the user's work directory, the database, and whether the program should be run as a 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, the program will store the data from the input file into the database, overwriting the existing data. The warning message and query may be repeated during processing of each input file if data is found in the database. If the user answers NO to the query, the program stops processing the input file; however, any data processed prior to the warning message stays in the database. If the program is being run in batch mode, the process depends upon the answer given by the user before submitting the batch job. If the user specified “Yes” to the prompt about overwriting existing data, the program will store the data over the existing data and log the occurrence. If the answer was “No”, the program will skip processing of the input file, log the occurrence, and proceed with the next input file.

NOTE: If using STD_STOR to reload data for reprocessing, or whenever significant amounts of data are to be overwritten, the program should be run in batch mode. This will prevent the user from having to answer the query about overwriting data over and over again. If the program is being run in interactive mode, it will query for the proper action every time data is found in the database. The only other way to avoid this repeated query is to use the UV_DELMEAS program to delete the measured Unot Values and recompute the record to wipe out other values derived from the measured UVs.

If the processing is completed without errors, the input file is copied to the archive directory named /usr/opt/nwis/data/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. If running in interactive mode, 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.

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 displayed. These messages are displayed to the user's screen and written to the log files as well.

4.4.9 Enter/Update/Display Measurements (MS_EDIT)

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

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 - Manually enter measurement/inspection data.
2 - AquaCalc enter measurement/inspection data.
3 - Update measurement/inspection data.
4 - Delete measurement/inspection data.
5 - List measurement/inspection data.
6 - Retrieve/print measurement/inspection data.

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

Change Setup Specifications

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

Manually Enter Measurement/Inspection Data

This option allows the user to enter new discharge 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. Only non-blank characters 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 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 are stored along with the input CSG inspection data for later use. (They are not stored in site file anymore.)

The table below is a list of minimum, maximum, and missing values used for measurement/inspection data.

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.

Minimum, maximum, and missing measurement/inspection file values

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.

AquaCalc Enter Measurement/Inspection Data

This option is used to automatically enter most new discharge measurement data by reading a download file from an Aquacalc* discharge measuring device. The AquaCalc 5000 is a streamflow computer used to automate the making and computation of discharge measurements. It can store nine measurements (transects), which can be downloaded to separate files with the provided software or other communications software. These measurement files can then be used as input for the ADAPS MS_EDIT program. The user is prompted for a file name, and then measurement data contained in the file is extracted. Any data that can be stored in the measurement file that is not contained in an Aquacalc download file is prompted for, as in the section above.

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

Update Measurement/Inspection Data

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

Enter 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.

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.

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.

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 three 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 the 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 are used. After all printing is finished, the user is returned to the program menu level.

4.5 Primary Data Processing Menu (PR)

This section presents the programs used for primary data processing of records. These programs provide for the entry and update of all elements necessary to process a record of hydrologic data. The programs are presented in the order that they generally would be used in the record computation process, including the edit of time-series data, entry and update of data corrections, ratings and shift corrections, primary computations, and editing and tabling programs to complete the record. The programs can be accessed from the ADAPS menu as well as from outside ADAPS by using the program name.

PROGRAM NAME	TASK DESCRIPTION	SECTION
THRESHOLD_EDIT	Update Data Descriptor Thresholds	4.5.1
TS_EDIT	Edit Time-Series Data using Hydra	4.5.2
MISTE	Missing Streamflow Estimation	4.5.3
DC_EDIT	Update/Display Data Corrections	4.5.4
RT_EDIT	Update/Display Rating Tables	4.5.5
SHIFT_ANLY	Shift Analysis and Error Bars	4.5.6
SV_EDIT	Update/Display Shifts	4.5.7
PRIMARY	Primary Computations	4.5.8
DVTABLE_EDIT	Edit Daily-values Statistical Summary	4.5.9
DV_MANIP	Daily-values Manipulation	4.5.10
UV_TABLE	Print/Display Unit-Values Tables	4.5.11
DVTABLE	Daily-values Tables	4.5.12
EOYSUMM	End-Of-Year Summary	4.5.13
PEAKFLOW	Peak-flow Entry and Retrieval	4.5.14
SETSTATUS	Manage Record Data Aging	4.5.15
PLOTWAT	Plot Time-Series Data	4.5.16
SHOWSITE	Show Site Information	4.5.17
STATION_ANALYSIS	Station Analysis Report	4.5.18

4.5.1 Update Data Descriptor Thresholds

by Glenn B. Engel

The Update Data Descriptor Thresholds program, THRESHOLD_EDIT, allows the user to set screening threshold flags on the data which are used to control the display of the data by NWISWeb. The advantage of setting screening flags in ADAPS, unlike setting thresholds in DECODES, is that the data are not changed or deleted from the database, only withheld from display on the Web (masking of the data). Screening flags can be set on the data to either mask it from being shown on the Web, considered erroneous data caused by gage malfunction or transmission errors, or just flagged as a warning needing further checking.

After choosing the THRESHOLD_EDIT program from the ADAPS menu or from the command line, the standard ADAPS startup routine is used, allowing the user to select the database, agency, and the station ID to which the thresholds are to be assigned. In this program, the data descriptors (DD) for which the thresholds are going to be set are chosen from the second menu. After the startup routine, the following screen appears:

```
                UNITED STATES GEOLOGICAL SURVEY

          05016000 Swiftcurrent Creek at Sherburne MT
                   No DD currently selected

      EDIT/UPDATE PROGRAM FOR DATA DESCRIPTOR THRESHOLDS

                   ED – Edit a Data Descriptors Threshold
                   CH – Change to different Data Descriptor
                   US – Re-start program, display user information
                   QU – Quit this program
                   EX – Exit adaps programs

                   Select an option or [CR] for menu:
```

At this point, the user is given the opportunity to choose the DD to which thresholds will be assigned, by selecting the option CH. When a DD has been chosen, the screen is redisplayed, and the user will enter ED to edit the thresholds. The following screen shows the options available to the user:

```
X Terminal on hqsun3.er.usgs.gov
        PRIMARY PROCESSING DATA SCREENING AND VERIFICATION INFORMATION
                                Gage height, in feet

VHI - Very High Condition (units) *           ---   LVH - Label: very high condition threshold

HI  - High Condition (units)                  ---   LHI - Label: high condition threshold

LO  - Low Condition (units)                   ---   LLO - Label: low condition threshold

VLO - Very Low Condition (units) *            ---   LVL - Label: very low condition threshold

SD  - Value To Value Test Difference          ---   LSD - Label: standard difference threshold

 * identifies thresholds that are used to screen data from the public for the WEB display


BK  - Define zone breakpoints (units)
VI  - VERY RAPID INCREASE (UNITS/MINUTE) *      ---
RI  - RAPID INCREASE (UNITS/MINUTES)            ---
RD  - RAPID DECREASE (UNITS/MINUTES)            ---
VD  - VERY RAPID DECREASE (UNITS/MINUTE) *      ---

Enter code of field to change, or [CR] to continue:
```

The threshold values, which can be set, are divided into two groups. The first group is based upon the actual value of a measurement for the specified DD. The second group is known as "zone" thresholds, and is based upon the rates of change of the measurements.

The values in the upper group of thresholds in the screen above are set in terms of the units that are being transmitted for that DD. For example, a gage height DD may have units of "feet," and a threshold value would be entered accordingly, (i.e. – the user would put in a value of "100" if the threshold is going to be a measurement of 100 feet). For the thresholds in this group, the user may also enter an alternate text label, which is stored in the NWIS database with the threshold value. This alternate description will be used whenever the threshold is "triggered" during the screening of data and the data is being displayed or printed in the Unit Values tabling program (UV_TABLE) or in the Primary report generated in processing the data.

Threshold values in the lower group in the screen above are set in terms of "rates-of-change" rather than absolute measurement of the data values. These thresholds are set in terms of data units per minute, which allow the thresholds to be correctly applied over different time intervals or missing measurements. For example, a 0.15 foot change over 15 minutes would be expressed as "0.01" (0.15ft/15min). Thresholds for the rates-of-change can also be assigned for three different zones in the range of expected values, lower zone, middle zone, and upper zone. The breakpoints (in units) separating the zones can be set if different rates-of-change for different levels are desired. It also is possible to set just one breakpoint to create two zones of thresholds if the user wishes.
Select BK and then assign the low breakpoint or <CR> if that breakpoint will not be used. If only two zones are desired, the breakpoint between the zones will be set at the low-breakpoint entry; therefore, if the low breakpoint entry is bypassed, the <CR> will put the user back to the threshold menu and the query for a high breakpoint will not appear. If a low breakpoint has been entered, assign the high breakpoint or <CR> if that breakpoint will not be used. If either one or two

breakpoints are assigned to create two or three zones respectively, the "rates-of-change" portion of the menu will then change to look like the following to allow assigning thresholds for the various zones:

```
xterm
                              Gage height, in feet

VHI - Very High Condition (units) *           ---   LVH - Label: very high condition threshold

HI  - High Condition (units)                  ---   LHI - Label: high condition threshold

LO  - Low Condition (units)                   ---   LLO - Label: low condition threshold

VLO - Very Low Condition (units) *            ---   LVL - Label: very low condition threshold

SD  - Value To Value Test Difference          ---   LSD - Label: standard difference threshold

 * identifies thresholds that are used to screen data from the public for the WEB display


BK  - Define zone breakpoints (units):         ZONE 1   23.00     ZONE 2   53.00     ZONE 3
                                               (LOW)              (MID.)             (HIGH)
VI# - VERY RAPID INCREASE (UNITS/MINUTE) *      ---                ---                ---
RI# - RAPID INCREASE (UNITS/MINUTES)            ---                ---                ---
RD# - RAPID DECREASE (UNITS/MINUTES)            ---                ---                ---
VD# - VERY RAPID DECREASE (UNITS/MINUTE) *      ---                ---                ---
 # = zone number

Enter code of field to change, or [CR] to continue:
```

There are nine possible thresholds that can be set in ADAPS. As data is processed within ADAPS and prepared for display on the World Wide Web, it is screened to determine if any measurements exceed these thresholds. When thresholds are exceeded, the screening process attaches codes to the Unit Values to indicate the results. The NWISWeb software reads these codes and handles them as two distinct types: critical or warning.

Critical thresholds	**Warning thresholds**
* Very High Condition	High Condition
* Very Low Condition	Low Condition
* Very Rapid Increase	Rapid Increase
* Very Rapid Decrease	Rapid Decrease
	Value-to-Value Test Difference

Critical thresholds - When data exceed ***critical*** thresholds, the NWISWeb software blocks it from display and view for both internal and external users.
Warning thresholds - When data exceed ***warning*** thresholds, NWISWeb will display it to both internal and external users. For internal users, however, the data will be flagged in both the graphic and tabular displays to indicate it needs checking.

The ***critical*** thresholds should be set to values which are not possible for the site. This will ensure that only those erroneous values are blocked from NWISWeb, while allowing true extreme values to be displayed. The ***warning*** thresholds can be set to values which are possible but should be flagged for further checking. For example, a 7-foot stage may be possible at a site, but a rise from 3 feet to 7 feet in 15 minutes may not be; therefore the "Very Rapid Increase" threshold should be used to block this data point. Users should be very careful in setting threshold points, in order to avoid blocking a true extreme data point.

The "Value To Value Test Difference" threshold is in measurement units, and flags the data point if it varies from the previous point by the threshold value. It is similar to the rate-of-change thresholds in that the screening process will look at two adjacent values, but the test difference is only checked against the values of adjacent data points without regard to the time between them. In fact, there could be missing data between the recorded data points. The "Test Difference" flag will alert the user to larger-than-normal changes in the data stream.

The following table indicates which values are "masked" from view on NWISWeb and which are shown to external and internal users:

Display of ADAPS Threshold Exceedances
(Y = value is displayed, N = value is masked)

	Public		Internal	
Threshhold	Graph\ Summary Table	Data Table	Graph\ Summary Table	Data Table
V-High	N	N	N	Y
High	Y	Y	Y	Y
Low	Y	Y	Y	Y
V-Low	N	N	N	Y
V-rapid incr	N	N	N	Y
Rapid incr	Y	Y	Y	Y
Rapid decr	Y	Y	Y	Y
V-rapid decr	N	N	N	Y
Test Difference	Y	Y	Y	Y

4.5.2 Edit Time-Series Data Using Hydra
by Timothy C. Stamey

The **Hydra** program is designed to provide a graphical display of data and a method for graphically editing these data.

4.5.2.1 Overview

The data that can be edited by using Hydra, are Daily-Values and Edited Unit-Values. Computed Unit-Values cannot be edited with Hydra, but can be displayed as reference curves.

Program Structure

Hydra uses three windows for its operation. The Control window is placed in the lower left portion of the screen by default. This window displays the data in tabular form, and is also used for various control functions such as selecting the active curve and saving the changes back to the database.

The Graph window appears in the upper right by default. This window shows, in graphical form, the overview of all the data currently loaded into Hydra. Data cannot be edited in this window.

The Zoom window appears in the upper left by default. This window shows subsets of the data in graphical form. It is blank when the program starts up, and remains that way until the user specifies an area on the Graph window to be zoomed. Edited unit-values can be edited graphically in this window.

Program Environment

This documentation assumes the reader is familiar with the basic concepts of working in a Windows environment, such as moving the mouse cursor and clicking or double-clicking on-screen objects with the mouse. A familiarity with common Window-based application items such as menu bars and scrollable lists is also assumed.

Throughout this document, the mouse buttons are referred to as the first, second, and third buttons. Typically, the “first” button is the leftmost one, the “second” button the middle one, and the “third” button the rightmost one. This orientation may be reversed if the user’s mouse is in a left-handed mode, however.

Hydra is written using Motif widgets, and supports the common functions of most window managers. A quick rundown of the important features of this follows. For further information on this, the interested reader should consult a reference that covers Motif or the user’s specific window manager; a complete description is beyond the scope of this document.

- Any of the three Hydra windows can be resized, moved, or iconified the same way as any other windows on the user’s system.
- Some visual characteristics can be specified using a standard X resource file.

- Keyboard shortcuts can be used to navigate within windows.
    The arrow keys and the <tab> key allow the user to move between various fields within a window.
- The F10 key activates the menu bar.

One reference that describes these in more detail, as well as explaining various other functionality that Motif provides, is the “X Window System User's Guide: OSF/Motif Edition,” by Valerie Quercia and Tim O'Reilly, published by O'Reilly & Associates. This book covers far more than what is needed to work with Hydra, but to those unfamiliar with X and Motif, a good starting point will be chapters 1, 4, and the “Working with Motif Applications,” section of Chapter 8.

4.5.2.2 Starting Hydra

To start Hydra, first select the PR submenu from the ADAPS main menu and then select the option “Edit Time-Series Data using Hydra.” This brings up the program TS_EDIT, which allows the user to specify the data to view or edit in Hydra. The standard ADAPS startup menu is displayed and this menu allows the user to specify the database, agency, station ID, data descriptor, unit- or daily-values, statistic code (if daily values), and date range.

A <CR> at the ADAPS startup menu for TS_EDIT starts up Hydra and loads the data the user specified. After Hydra finishes, TS_EDIT loads the edited data back into the database, after which another time-series can be selected for editing.

4.5.2.3 Hydra Basics

The basics of the Hydra program are included in the sections that follow.

<u>Graph Structure and Axes</u>

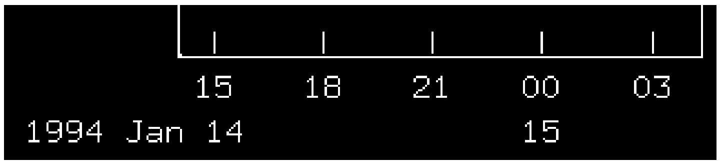
The Zoom and Graph window are structured in similar fashion. The horizontal axis is the time axis, and the vertical axis shows the values of the data.

Each axis is labeled, and contains a tic mark corresponding to each label. The interval between the tic marks on each axis is automatically chosen to give the best compromise between a workable number of tics and a logical interval between them. The tic interval may change with a window resize.

For the value (vertical) axis, the labels are real numbers.

For the time (horizontal) axis, what each label represents depends upon the time range chosen. For example, a plot that shows a range from noon to midnight in the same day, might have a tic mark placed every three hours, whereas one displaying an entire year might have a tic mark for every month.

To determine what a tic label represents, look at the label in the lower left corner of the window. This will contain part of a string of the form “1998 Mar 25 10:36:20.” Whatever unit is represented by the last element in this string is the base. The tic labels will represent the next smaller unit. If the base changes, the new base will be placed underneath the tic where the change takes place. An example is shown in figure 1:



Base units

Figure 1. Base units

In this example, the base unit is the day, because the day is the last element of "1994 Jan 14." Thus, the tics labels (15, 18, 21, 00, and 03) represent hours, because hours would be the next smaller time unit. Hours are displayed on a 24-hour scale. When midnight of the next day comes around, the new day label is placed beneath the “00” for midnight.

If no base unit is displayed, the tic labels are in years. The placement of the tic represents the beginning of the time unit in question. For example, a tic labeled “Apr” specifies the beginning of the month of April, or April 01 00:00:00.

Points and Lines

Curves displayed in the Graph and Zoom windows consist of two basic elements: points and lines. Points are represented in Hydra by small squares. Each point corresponds to a datum from the database, and will be plotted at the proper time/value intersection. For Daily Values, the time used for plotting purposes is noon. In reality, Daily Values data do not have times associated with them. Lines are used to connect the points into a continuous curve, as shown in figure 2.

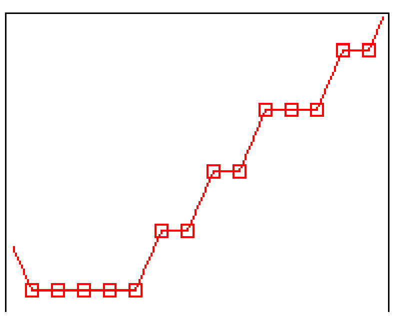


Figure 2. Points and lines - The small squares are points, and the lines connecting them are lines.

By default, the Graph window comes up showing only the lines and not the points. The Zoom window shows both points and lines by default. Either of these settings can be changed in the CurveInfo window. Either of the plot windows can show just the points, just the lines, both, or neither.

Study-Site Curve, Multiple Curves and Active Curve

Hydra allows the display of multiple curves simultaneously. Each curve will be assigned a color so that they can be distinguished from one another.

When Hydra is started from ADAPS, it will begin with one curve displayed. (It is possible this curve will contain no data; however, there is still a "curve" associated with the parameters and date range specified in TS_EDIT.) The start-up curve is considered the study-site curve. It is the only one that can be modified by the user, and the only one that can be saved back to the database upon exiting Hydra.

Other curves can be loaded into Hydra once it is running. These will be considered reference curves. Reference curves cannot be modified. Various types of data can be used as reference curves including raw measured, measured, edited, and computed unit-values; computed daily-values (even after being edited, which are called final daily-values); and measurements.

Only one curve at a time can be considered the active curve. The active curve is selected in the Control window. Making a curve active implies two different things:

1. The active curve's values will be displayed in the Tabular Curve list in the Control window.
2. Any changes made in the Zoom window will be applied to the active curve. Since only the study-site curve can be modified, this means that if a change is attempted in the Zoom window when the study-site curve is not active, it will have no effect.

The curve that is currently active is the one that is toggled in the Active display of the Control window. To provide additional feedback on which curve is currently active, various things are given the same color as that of the active curve, including:

- the mouse pointer in the Zoom window when it is in modify, add, or select mode
- the scrollbar trough color
- the background for the filename field in the SaveAs popup

Edited-Values

Any time a unit-value is changed in Hydra through any means, that value is automatically given a flag code of "*." This applies to both existing data whose values are changed, and new data that is added.

Note: The flag gets set to "*" only when the value is changed or a point is added. Changing the precision or the remark (obviously) does not set the flag code to "*." If a different flag already existed on the data point, it is changed to "*." This flag code is visible in the Tabular Curve list in the Control window. Remark codes may also be assigned to unit-values by the user as explained later.

The “*” code is applied to unit-values automatically whenever a data point is changed or inserted. For the daily-values, an “e” is automatically entered in the remarks column in Hydra and is stored with the “e” when stored back into the daily-values table. The “e” will be printed on the daily-values tables also so if the value is not considered estimated, the “e” will have to be edited out in order for it not to show up on the daily-values tables. For unit-values, “*” will cause the “Edited by USGS personnel” bit to be set in the unit-values flag variable.

Daily-Values versus Unit-Values

For the most part, Hydra handles both Daily and Unit-Values in the same manner. There are a few differences, however; these will be covered in more detail in later sections of the documentation. In summary, the differences are:

- Daily-Values curves have one and only one value per day. There are no restrictions on date/time population within a range for Unit-Values; any given range can have 0 or more values. The consequences of this for Hydra are:

  ✓ Daily-Values have an entry in the Tabular Curve list for every day in the specified range. If there is no datum for a particular day, the value is considered to be missing, and the value field for that day is blank. For Unit-Values, there are only rows in the Tabular Curve list for which there are values. The concept of a “missing value” is meaningless in the Unit-Values realm.

  ✓ When a value or set of values is deleted from a Daily-Values curve, the values are set to missing value. When a value or set of values is deleted from a Unit-Values curve, they are removed from the data set altogether.

  ✓ Points can only be added to a Daily-Values curve in places where there are missing values. Points can be added anywhere to a Unit-Values curve.

- Two adjacent Unit-Values points will not be connected via a line if the time interval between them exceeds the DV-abort limit. Daily-Values points are disconnected if there is a missing value between them.

- In the Control window, Daily-Values curves do not display a TIME column or a FLAGS column, either in the Tabular Curve list or the Tabular Editor.

- In the Graph and Zoom windows, Daily-Values points will plot at noon for the day they represent. Unit-Values plot at the time specified by the data.

4.5.2.4 Control Window

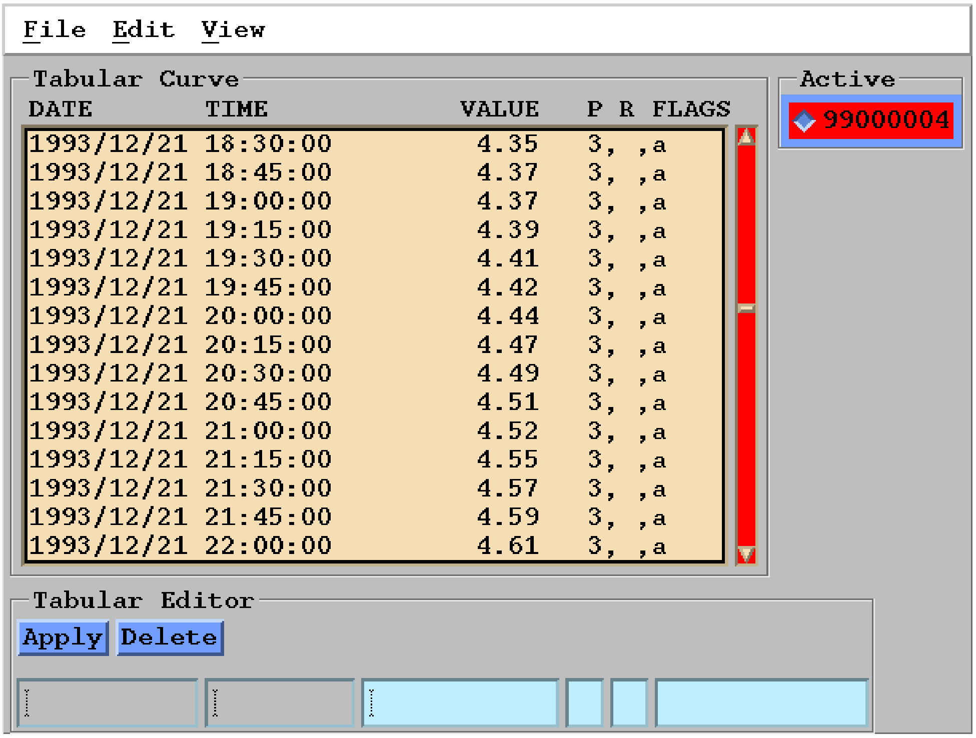


Figure 3. Control window, displaying unit-values data

Tabular Curve list

The Tabular Curve list displays the raw data in chronological order, from earliest to latest. The various columns show the date (and time, if it is a Unit-Value), the value, the precision for that value, and any associated remark and flags. The precision and remark columns are one character long, and have the headings of P and R, respectively.

For Daily-Values, the Time and Flags columns will be absent. Also, missing values are indicated in a Daily-Values curve by a blank value field. For Unit-Values curves, there is no such concept as a missing point.

The list shows 15 items at a time. If there are more than 15 items, there will be a scrollbar next to the list. This is a Motif scrollbar and can be used to scroll the list up and down to display a different block of items (see the “Working with Motif Applications” section of Chapter 8 of the O'Reilly book mentioned above for a full description of the Motif scrollbar). The trough of the scrollbar will have the same color as the currently active curve.

Use the list to select items. Hold the mouse pointer over an item and press the first mouse button. As the mouse is dragged up or down, the selections will appear in reverse video. Releasing the mouse button will make the selection take effect. This selection can be used for three different purposes:

1. To bring an item into the Tabular Editor. This only happens if exactly one row is selected.
2. To paste data into another curve
3. To delete rows

The range of values displayed by the Tabular Curve list at one time is indicated in the Graph and Zoom windows by means of two delimiters. These are vertical lines that intersect the points in these windows corresponding to the first and last items displayed in the Tabular Curve list. If the Tabular Curve list is displaying all of the data points in the curve, no delimiters will be drawn. Details of the columns in the Tabular Curve list follow.

Date, Time, and Value

These three items are the actual data. They show where the corresponding point will be plotted in the Graph and Zoom windows.

Precision

This column will contain a number from 1 to 9, specifying how many significant figures to display for the number in the Value column. The number that is stored in the database may contain more digits than the precision specified; the value displayed by Hydra is rounded according to the Precision. Please note that the value that is plotted is the actual stored value and not the rounded one.

Remark

The remark column contains human-specified or automatically applied information about the value. If it is not blank, it also protects the value from being overwritten by automated processes, such as the ADAPS primary processing program. Possible unit-values remark codes and their descriptions are:

Codes assignable by user

A – Value is affected by ice.
B – Value is affected by backwater.
R – Rating is undefined for this value.
& - Value is affected by unspecified causes.
K – Value is affected by instrument calibration drift.
X – Value is erroneous and will not be used.
< - Actual value is known to be less than the displayed.
> - Actual value is known to be greater than the displayed value.

Codes assignable by system

F – Value was modified by automated filtering.
~ - Value was automatically interpolated from two successive values.

Daily values remarks codes

Assigned by system

e – Value was edited or estimated by USGS personnel and is write-protected.
& - Value was computed from affected unit values.

Assigned by user

< - Actual value is known to be less than the displayed value and is write-protected.
> - Actual value is known to be greater than the displayed value and is write-protected.
1 – Value is write-protected.
  - No remark

Flags

Flags are associated with unit-values but not with daily-values. The Flags column is a multi-character field; each character is a distinct flag. The order is not significant. The flags are set by the data entry programs and by the data screening subroutines. They are displayed for information purposes only and are not editable.

Possible data source flags and their descriptions are:

o - Value was observed in the field.
a - Value is from paper tape (ADR).
s - Value is from a data-collection platform (DCP).
e – Value is from electronic data logger (EDL).
c - Value was recorded on strip chart.
t - Value was received by telephone transmission.
r - Value was received by radio transmission.
f - Value was received by machine readable file.
~ - Value is a system-interpolated value.
M - Value is a redundant satellite transmission (obsolete but may be seen in old data) value.

Possible data screening flags and their descriptions are:

I - Value exceeds the "very rapid increase" threshold.
i - Value exceeds the "rapid increase" threshold.
D - Value exceeds the "very rapid decrease" threshold.
d - Value exceeds the "rapid decrease" threshold.
L - Value exceeds the "very low" threshold.
l - Value exceeds the "low" threshold.

H - Value exceeds the “very high” threshold.
h - Value exceeds the “high” threshold.
T - Value exceeds the “standard difference” threshold.

Flags indicating processing status are:

***** - Value was edited by USGS personnel.
@ - Value was reviewed by USGS personnel.

Active Toggle

If more than one curve is loaded into Hydra, this is used to select which one is currently active. Click on the name of a curve with the first mouse button to select a new active curve. The color of each button in the list of active curves matches the color of the curve in the Graph and Zoom windows.

4.5.2.5 Menu Bar

File Menu

A. Reference curves

This menu item is used to manipulate reference curves. There are three items in the submenu:

(1) New

This brings in a new reference curve from the database. When this menu item is chosen, a new window is brought up which displays the ADAPS startup window in which the user can specify a database, station, data descriptor, and statistic code (if daily values), and the data-type to load from the database. The data-type choices listed in ADAPS are computed and final daily-values; raw measured, measured, edited, computed, correction, and shift unit-values; and measured values. The date range retrieved will be that of the study-site curve and cannot be changed.

(2) Open

This brings up a file selection popup. From here, the user can select a file that contains RDB data in a format Hydra will recognize. Such files will probably have been generated by the SaveAs option, described below. See Section (4) below for more information on the file selection popup.

(3) Save As

This item also brings up a file selection popup. The data for the current active curve will be saved to the filename specified. If an existing file is specified, its contents will be overwritten. If a new file is specified, it will be created. To provide a reminder about which curve is currently active, the background color of the text field for the filename will be the same color as that of the active curve.

If the user saves a curve to a filename which already exists, the contents of the file will be silently overwritten. Any curve can be saved to a file with this menu item, whether it is the study-site curve or a reference curve.

(4) File Selection Popup

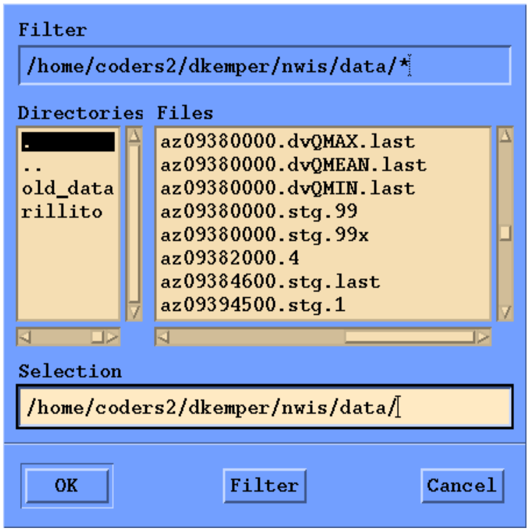


Figure 4. File selection popup

The popup shown in figure 4 is for saving a reference curve, as the background color of the Selection field matches that of a curve. For reading in an existing file, the background color of this field matches the background of the rest of the window.

This window is the standard Motif file selection popup window. Documentation on all the details of its operation can be found in a Motif reference. The following explanation will just cover the basics.

The main things the user needs to be concerned with are the two lists in the center -- one for directories and one for files -- and the Selection text field directly beneath them. The Selection starts out with the path to the user's current directory.

The user can change directories by double-clicking the desired directory name in the Directories list. This will repopulate both lists, and change the working path in the Selection field.

The user can select an existing file by double-clicking the file name in the Files list. This is most common for reference curve Open operations. Double-clicking a file name makes the File Selection popup disappear and the file choice take effect.

The user can specify a new or existing file by simply typing the name at the end of the pathname in the Selection field. Specifying a new name with this method is most common for reference curve SaveAs operations. Click the OK button after typing a name to make it take effect.

Clicking the Cancel button at any time takes a user out of the File Selection popup and cancels whatever operation had been requested.

B. Save

This item saves the current study-site curve to a temporary file. It does not make any changes to the database. However, any changes saved with this option will be automatically applied to the database when the user quits Hydra.

C. Revert

Revert undoes a set of changes by reading in the old data set for a curve. The user can go back to the data as it was when Hydra was first started, or back to it as it was when the Save option was last used.

It is probably a good idea to Save the study-site curve via the Save option before embarking on a large change that would be difficult to undo. That way, if something goes amiss, it will be fairly easy to recover via the Revert option.

Reference curves cannot be modified, and are therefore not affected by the Revert command.

D. Save & Quit

This option has the same effect as clicking Save followed by Quit. They are placed on the same button for convenience, as it is expected this will be a common command sequence. There is no difference in functionality from clicking both buttons separately in sequence.

E. Quit

This is the typical method of exiting Hydra. If changes have been made to the study-site curve and the Save option has been used to put them into a temporary file, that temporary file will be written to the database. Then the Hydra windows will shut down, and the user is put back into TS_EDIT.

If changes have not been saved yet, a warning popup will be displayed, saying:

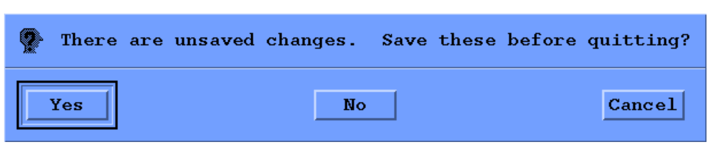


Figure 5. Quit warning

Clicking "Yes" will cause the data to be saved to the database and an exit from Hydra. Clicking "No" will cause changes to be ignored and an exit from Hydra. **Note:** If the data were previously saved, the last-saved changes will be written to the database, but any changes made since that time will be lost. Clicking "Cancel " will return the user to Hydra with no change, as if the Quit option had not been selected.

If the user wants to quit Hydra and have it ignore all the changes that have been made, including ones saved to a temporary file with the Save option, it will be necessary to first do a Revert back to the original data, or one of the Exit options below can be chosen.

F. Exit

Exit takes a user out of Hydra completely without saving any changes to the database at all, even those that may have been saved to a temporary file with the Save option. If there are any changes, a warning popup will appear to make sure the user understands what is happening.

There are two different Exit buttons, one to go back to the ADAPS menu from which Hydra was invoked, and one to take the user out of ADAPS entirely and back to the UNIX prompt.

Edit Menu

A. Paste

This option takes the data that was last selected, and places it into the active curve. This overwrites any existing data in the active curve that shares the same date range as that covered by the selected data.

Typically, the Paste option is used to take data from a reference curve and paste it into the study-site curve. A common sequence of events would be to make a reference curve the active curve, select a range, then make the study-site curve the active curve, and select the Paste operation from the menu. The selected data will be inserted into the study-site curve as soon as this menu item is selected.

It is possible to do a paste to the same curve from which the data was selected, but the only effect of this is to set the flag code to a "*" for all affected values.

Hydra will not allow a user to paste data from a Daily-Values curve into a Unit-Values curve, nor from a Unit-Values curve into a Daily-Values curve.

The data are selected by one of the two selection methods: selecting from the Tabular Curve list or from the Zoom window. When a selection is made, it stays in effect until the user does one of the following:

- makes another selection
- deletes the current selected items
- changes the active curve from a Daily to a Unit-Values curve, or from a Unit to a Daily-Values curve

Note: Certain actions cause a new selection to be made automatically. For example, when a point is modified, that point becomes the new selected point, erasing whatever the previous selection may have been.

The paste operation essentially looks at the date/time range of the selected items, and replaces all items in the curve that fall within that range with the selected items. This may mean that after the paste is complete, the active curve may contain more, less, or the same number of points that it had before.

B. Add/Modify modes

This toggle controls the action of the Tabular Editor. Only one of these can be set at a time. Clicking one on turns the other off automatically.

Modify mode is the default. In this mode, in the Tabular Editor the user can edit the value, precision, and remark code.

In add mode, the user can modify the date and time in the Tabular Editor, in addition to the fields mentioned above. This also allows the user to populate the Tabular Editor from scratch.

C. Delayed Update

This is an on/off toggle. By default Hydra is in delayed-update mode. Selecting this menu item turns off this mode. Selecting it again turns it back on.

Delayed-update mode means that any changes made to the curve via the editing options of the Zoom window are not reflected in the Tabular Curve list until the entire operation has been completed. If delayed-update is turned off, the Tabular Curve list is continuously updated.

This mode is on by default because it gives better performance. More information about delayed-update will be given in the section that deals with editing via the Zoom window.

View Menu

Selecting the Header menu item pops up a window that displays the RDB file header of the active curve. The color of the Dismiss button in this window is set to match that of the active curve to provide a visual reminder which curve's information is being displayed.

Some of the information included in the RDB file header (this is not a complete list):

- the name of the station
- the parameter name
- the DV-abort limit (expressed in minutes)
- the date range

This window is a view-only window. No changes can be made to the RDB header. Pressing Dismiss will get rid of the window.

The user can view more than one header at once by selecting this menu item again with a different active curve.

A. Delete Button

This button is used to delete the currently selected range. Although it appears in the Tabular Editor section, the Delete button has nothing to do with the Tabular Editor.

The delete button works on the currently selected region. The user can select a region either in the Tabular Curve list or in the Zoom window. The selected rows will show up as highlighted in the Tabular Curve list regardless of which method is used to select them.

Clicking delete simply removes these selected points from the curve. For a Unit-Values curve, points can only be edited in the control window and then would be removed entirely. For a Daily-Values curve, this means that they become missing. This distinction is reflected only in the Tabular Curve list; the Graph and Zoom windows behave the same either way.

B. Tabular Editor

This portion of the Control window is used to make text-based adjustments to data values, or to delete a value or range of values.

The Tabular Editor is used differently, depending on whether it is set to Add or Modify mode. Add mode is used to add points to the curve -- when in this mode, the user can start with a blank Tabular Editor and populate all the fields. Modify mode only allows changes to the value, precision, remark, and flags -- the user must load an existing point into the Tabular Editor to modify it.

The user can tell if he is in Add or Modify mode by examining the background color of the date and time fields in the Tabular Editor. They will be the same as the background of the rest of the window if in Modify mode, and they will be the same as the background of the value field in Add mode. In general, any fields that have the same background color as the rest of the window cannot be modified; those with a different colored background are user-modifiable.

A data point is loaded into the Tabular Editor by selecting it. This can be done either in the Tabular Curve list or in the Zoom window. In either case, a single point must be selected in order for anything to be loaded into the Tabular Editor.

When a point is selected, the fields from the Tabular Curve list for that point are copied into the text fields of the Tabular Editor. Each text field of the Tabular Editor corresponds to the column from the Tabular Curve list directly above. Thus, for a Unit-Values curve, the text fields represent, in order from left to right, date, time, value, precision, remark, and flags. For a Daily-Values curve, the time and flags will not be present.

Give the focus to any of the fields in the Tabular Editor by moving the mouse cursor into that field and clicking the first button. If the field chosen is editable, its background color will change when it takes the focus. The field with the focus is the one that will be affected by anything typed from the keyboard. In Add mode, the date, time, and value fields are all fully editable, so anything can be entered into these fields. In Modify mode, this is true only of the value field; the date and time cannot be modified at all. Any changes made to any of these three fields will cause the flag field to be set to a “*.” For Unit-Values, anything that may have previously been in the flag field is replaced. For Daily-Values, anything that may have been in the flag field is replaced.

The precision and remark fields are editable only to certain values. Place the mouse cursor into either of these fields, then press and hold the first button. A list of possible values will pop up. Slide the mouse over the desired value, release the button, and the field will take this value. If the menu is brought up and it is determined not to change the value of this field, simply release the mouse button from the popup list with the cursor.

Changing the precision field also affects the value field. When a new precision is selected, the precision of the value changes to reflect it. Similarly, a value of any precision can be typed into the value field. If <return> is pressed, the value will format itself to reflect the precision displayed in the Tabular Editor. If the user leaves the value field without pressing < return>, the value will not format itself until the user either changes the precision field or clicks the Apply button. The flags field is not editable.

When all the fields in the Tabular Editor are as wished, the user can click Apply to make the values in the Tabular Editor take effect in the Tabular Curve list. This also updates the displays in the Graph and Zoom windows. If the user decides not to change this point after all, or wants to start over, a new point (or the same one) can be selected and the changes will be ignored. Changes only take effect if the Apply button is clicked.

When Apply is clicked, the validity of the fields is checked. If an invalid value appears in any one of them, a popup message is displayed telling which field has the problem, and the Apply is not performed. The user will have to fix the problem field and click Apply again.

4.5.2.6 Graph Window

The graph window displays an overview of all the curves currently loaded into Hydra, as shown in figure 6.

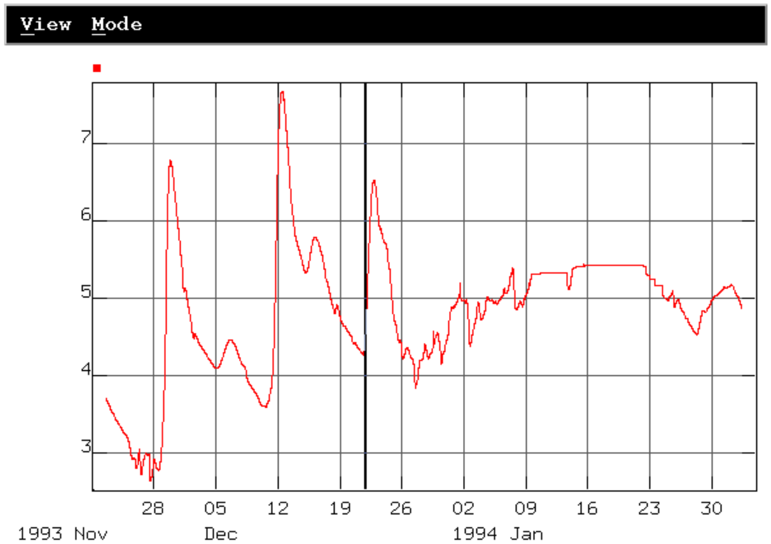


Figure 6. Graph window

The Graph window's display area also contains two vertical lines, showing the range of points that are currently visible in the Tabular List. These lines, called the delimiters, will move back and forth across the window as the Tabular Curve list is scrolled. If there appears to be only one line, they are probably sufficiently close together so that they are on top of each other.

Menu Bar

A. View

This menu contains two items: Curve and Axis. Selecting the Curve item pops up the CurveInfo window. Selecting the Axis item pops up the Axis Window. The operation of these windows will be covered later. These same options are available in the Zoom window menu bar as well, and they pop up the same windows there.

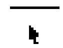
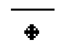
B. Mode

The Graph window can be placed into one of two modes, Zoom mode and Drag mode. The modes are mutually exclusive: turning one of them on automatically turns the other off.

By default, the Graph window is in Zoom mode. The user will not be able to change it to Drag mode until at least one reference curve has been loaded. Only reference curves can be dragged. Any curve can be zoomed.

C. Display Area

The mouse pointer's shape indicates the mode of the Graph window.

- for Zoom mode, it looks like: 
- for Drag mode, it looks like: 

D. Zoom Mode

This mode is used to populate the Zoom window. It is intended to enable the user to get a closer view of any part of any curve. Also, by zooming into a curve and placing it in the Zoom window, the user is allowed to edit daily-values graphically.

To place a part of the Graph window into the Zoom window, move the mouse pointer to any point within the graph in the Graph window and press the first mouse button. Holding this button down, move the mouse. A box will be drawn in the graph. To draw the box follow the following directions: while holding the mouse button down, draw either the vertical or horizontal line covering the range of values desired; keeping the button down, move the mouse to cover the range desired on the other axes to complete a box. This is called the zoom box, and it specifies the boundary of the data that will be displayed in the Zoom window. Once the button is released, the Zoom window will be populated with the part of the graph contained in the zoom box (figure 7).

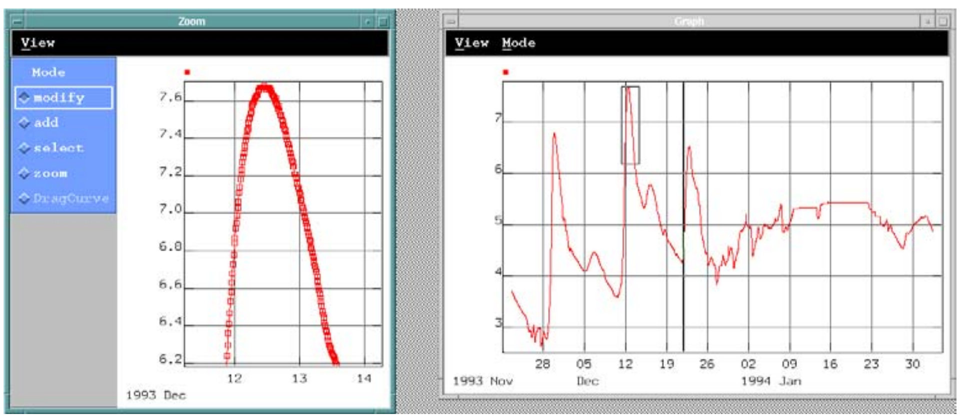


Figure 7. Zoom window showing part of the graph

This shows the Graph window with a zoom box drawn in it, and the resulting display in the Zoom window.

The user must begin a zoom box inside the boundaries created by the axes of the graph; this is called the display area. Once a zoom box has been started, it can be dragged outside of the display area. The user will not see the portion of the box that lies outside of the display area, but that space will be picked up by Hydra and reflected in the Zoom window.

Another zoom box can be created following the same steps. When the user creates a new zoom box, the old one will be destroyed, and the Zoom window will be updated to reflect the new zoom box.

Once a zoom box has been created in the Graph window, it can be moved around. Hold down the second mouse button and move the mouse. The box will move on the display. Releasing the mouse button causes the Zoom window to be updated with data from the box's new location.

The zoom box can also be moved using the third mouse button. The difference is that the Zoom window is updated continuously as the zoom box is moved, and not just when the button is released. This is generally slower, however, since the Zoom window must be continuously redrawn.

E. Drag Mode

Drag mode allows the user to move a reference curve around vertically and horizontally on the display. The user cannot drag the study-site curve or the active curve. There is also a Drag mode in the Zoom window, which operates essentially the same way as the one in the Graph window.

The first time a user selects Drag mode, the Drag window is displayed. This window stays on the screen until Hydra is exited and can be used any time the user is in Drag mode, in either the Graph or the Zoom window.

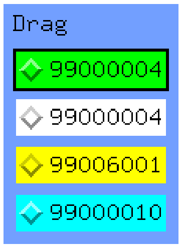


Figure 8. Drag window
All curves listed in the figure are reference curves.

The Drag window contains a list of all the curves currently loaded into Hydra, except for the study-site curve. Also, if one of the reference curves is currently active, that selection will be dimmed in the Drag window. In order to drag it, the user must first select a different curve to be the active curve.

The user can select a curve to be dragged by clicking on that curve's ID. When the mouse pointer is moved back into the Graph window, it will be the color of the curve that was selected for dragging.

Dragging a curve is accomplished simply by pressing the first mouse button and holding it down while the mouse is moved. The curve that was selected for dragging will move with the mouse pointer. Release the mouse button when the curve is placed where it is wanted.

After a curve has been dragged, a new button for it will appear in the Drag window, this one in a section called Un-drag, as shown in figure 9. Clicking this button will return a curve to its original position.

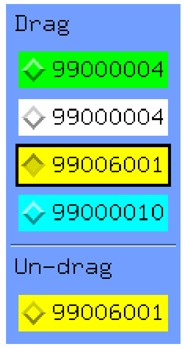


Figure 9. Drag window, after curve 99006001 has been dragged

A dragged curve can no longer become active. If the user Un-drags the curve, the curve can be made active again.

4.5.2.7 Zoom Window

The Zoom window displays a user-specified portion of the graph, and it is used to edit data within it. The Zoom window is shown in figure 10.

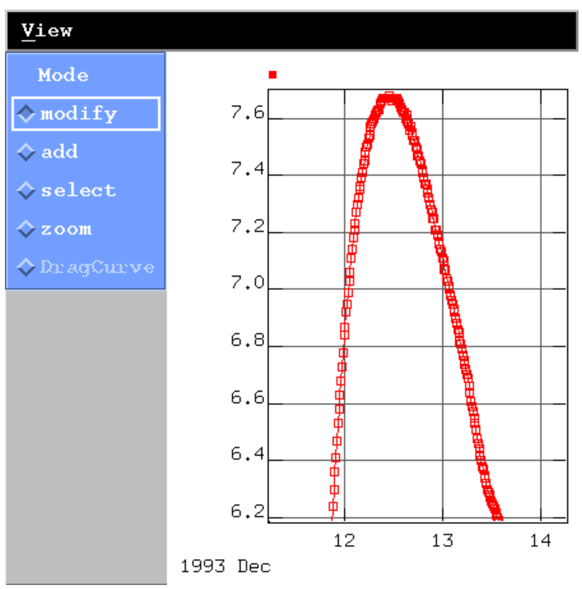


Figure 10. Zoom window

The Zoom window has three basic components. First is the display area, which is set up just like that of the Graph window. On the far left is the Mode selector, which specifies the current mode of the Zoom window and at the top is the menu bar.

The Zoom window's display area may also contain two vertical lines, showing the range of points that are currently visible in the Tabular List. These lines, called the delimiters, will move back and forth across the window as the Tabular Curve list is scrolled. Because the Zoom window need not show the entire curve however, the delimiters may not appear in the Zoom window, as the region displayed by the Tabular Curve list may be to the right or left of the region displayed in the Zoom window. It is also possible that one delimiter is on the screen, while the other is outside the bounds of the window. And as with the delimiters in the Graph window, they may be sufficiently close together that they are on top of each other.

A. Menu Bar

The View menu contains two items: Curve and Axis. Selecting the Curve item pops up the CurveInfo window. Selecting the Axis item pops up the Axis Window. The operation of these windows will be covered later. These same options are available in the Graph window menu bar as well, as explained earlier, and they pop up the same windows there.

B. Mode Selector

The following is a description on how to specify the current mode for the Zoom window. The choices are: Modify, Add, Select, Zoom, and DragCurve. Only one mode can be active at a time. Activate a mode by clicking on the checkbox next to the name; doing so will automatically turn off whatever mode was previously activated.

DragCurve mode cannot be selected until at least one reference curve has been loaded. Only reference curves can be dragged.

By default, the Zoom window is in Modify mode. Both daily and unit-values can be edited in the zoom window.

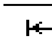
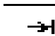
The behavior of these five modes will be described in the next section.

C. Display Area

The mouse pointer's shape indicates the mode of the Zoom window. These shapes are only used while the mouse is pointing into the display area:

for Modify mode, it looks like: 

for Add mode, it looks like: 

for Select mode, it looks like either:  or , depending on the selection state.

for Zoom mode, it looks like: 

for Drag mode, it looks like: 

D. Modify Mode

Modify mode lets the user modify the value of any points displayed in the Zoom window. It does not let the date/time be modified. Modify mode does not apply to unit-values.

To modify a curve, the curve must be active. The mouse pointer will be the same color as the active curve to give a visual clue as to which curve will be modified.

There are three methods to modify a curve, each one corresponding to one of the three mouse buttons. These are covered in the sections below.

1. Single-point edit

The first method to modify points operates on a single point at a time. Place the mouse pointer over the point to modify, then press and hold the first mouse button. Move the mouse up and down, and it will drag the point. Moving the mouse to the left or right while the button is depressed has no effect. Releasing the button makes the change take effect. The Tabular Curve list in the Control window currently may be displaying the point being modified, but when the list gets updated depends on whether the Control window is in delayed-update mode or not. If the Control window is in delayed-update mode, the corresponding value in the Tabular Curve list will not be updated until the button is released. If it is not in delayed-update mode, the value will change as the point is dragged, reflecting the point's current position. This mode may run slower.

Modifying a single point in this manner causes the point to become selected and loaded into the Tabular Editor.

2. Multi-point edit

The user can also change values of points using the second mouse button. This works essentially the same way, but with the difference that if the mouse is moved left or right while the button is depressed, other points will be modified. This is useful for changing the value of several points at once, while being able to finely adjust where each point ends up.

The Control window's delayed-update status is applied the same way for this modification method as it is for the single-point method. At the end of this modification sequence, the first point affected will be selected and placed into the Tabular Editor.

Note: If the mouse is moved too quickly from left to right while the second button is depressed, it may "skip" some points, leaving them in their original positions. It is also possible that the points in the Zoom window are packed closely enough together that it is impossible to pick them all up with this method regardless of how slowly the mouse is moved. In cases such as this, it will be necessary to zoom in closer, enlarge the window, or use the lightweight-curve method (described below) to modify the points.

An important thing to keep in mind with both single-point and multi-point editing is that in selecting which point will be modified, Hydra looks only at the horizontal position of the mouse. Think of every point having a vertical "field" that extends up and down the length of the Zoom window's display area; simply placing the mouse pointer within that field and pressing the button is sufficient to "grab" the point and move it, as shown in figure 11. Thus, the user can even "grab" points that may be above or below the current display area, and move them into the display area by moving the mouse with the button depressed.

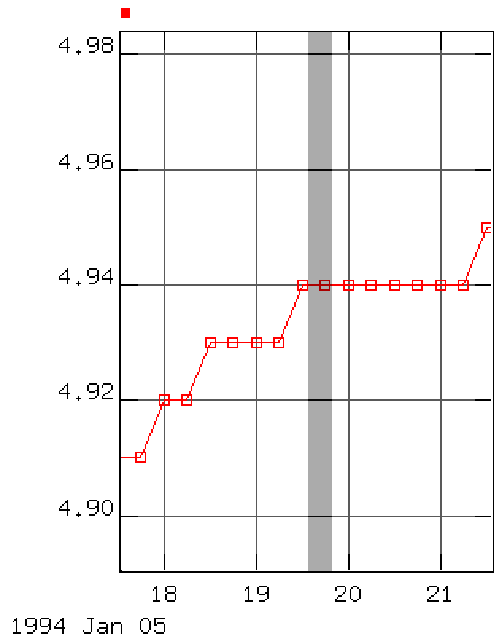


Figure 11. Selecting the point to be edited

In this example, placing the mouse cursor anywhere in the shaded region will cause Hydra to grab the point at 1994 Jan 05 19:45:00 for modification.

3. Snap to lightweight curve

The third mechanism for changing points' values involves drawing a lightweight-curve into the Zoom window's display area. Once this curve is drawn, all points above and below the lightweight curve will snap to the curve.

To draw this curve, position the mouse pointer within the Zoom window's display area, and press the third mouse button. Then move the mouse to the shape that is desired for the curve to take. A line will be drawn on the screen as the mouse is moved. The color of this line will match that of the active curve, showing which curve will be affected by the snap. When the button is released, the points above and below this line will snap to the line, changing their values accordingly. If no points in the active curve are above or below the line, no change is made.

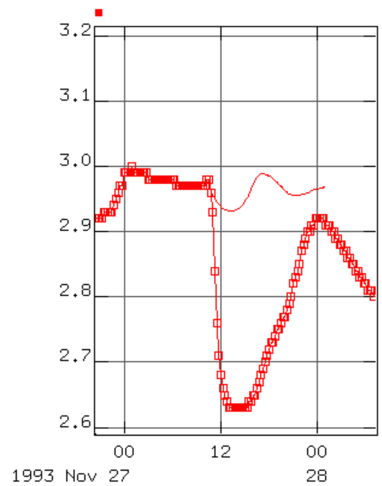


Figure 12. Lightweight curve, before the snap

Figure 12 shows a line that has been drawn into the Zoom window using the third mouse button. When the button is released, the data points below this line snap to the shape indicated by the line.

In this case, it does not matter how fast or slow the mouse pointer is moved; all the points will be picked up. Also, the state of the delayed-update toggle in the Control window is irrelevant here. The Tabular Curve list will not be updated until the points have all been snapped. After the operation is complete, any points affected by the modify operation will become selected.

The line, of course, should be drawn in a shape that the data can actually take. A line that doubles back on itself, for example, is not a valid curve shape. Drawing a line in such shapes has unpredictable results.

E. Add Mode

Add mode lets the user add points to a curve. To add points to a curve, the curve must be active. The mouse pointer will be the same color as the active curve to give a visual clue as to which curve will receive the new points.

Points can only be added that are within the bounds specified by the range given in TS_EDIT. If this range is not remembered, consult the RDB file header and look for the RANGE START and END fields.

Points can only be added to a curve where a value is missing. Adding a missing daily-values point is a simple matter of pointing the mouse pointer at the spot where the new point is desired, and then clicking the first mouse button. Unit-Values will be added at the actual position of the mouse cursor without regard for the time step. Hydra does not recognize a time step for Unit-Values.

The point does not actually get added until the button is released. As long as the button is held down, the new point can be moved around and positioned exactly where it is wanted. The coordinates of where the point is currently positioned are shown above the display area in the Zoom window. These are continuously updated as the mouse is moved around, and disappear when the button is released and the point is added to the curve.

Note: For a Daily-Values curve, the text at the top of the Zoom window indicates the day for which the point will be added. When the mouse button is released, the point may not appear exactly where specified, because all Daily-Values points plot at noon. Hydra will move the new point to noon of the corresponding day. The value itself will remain exactly what is specified.

F. Select Mode

Select mode allows the user to graphically select a range of points. These points will then be the ones applied to the next Paste or Delete operation.

When the select mode is first chosen, the cursor will be a ⇤ indicating that a selection has not begun yet. The color of the cursor indicates the current active curve, and thus the curve from which the selection will be made.

To begin a selection, place the mouse pointer to the left of the first point in the range to be selected for coverage, and click the first mouse button. **Note:** Where the mouse pointer is positioned vertically is irrelevant; a selection only applies to a time range.

When the first point has been selected, the cursor will change to ⇥ . To complete the selection, an endpoint must be selected. Choose a point to the right of the beginning point of the selection (a point with a greater time) and position the cursor just to the right of this endpoint. Click the first button again, and the selection is complete.

If the mode of the Zoom window is changed without an endpoint being selected, the start point is cancelled. The points selected via this method will also show up in the Tabular Curve list as highlighted rows.

Note: A range of points is being selected, not a time interval. The selection must start and end with a point; any space at the beginning or end of the selected region that contains no points is ignored. This is a significant distinction if the selected region is going to be used in a paste operation. See figure 13 below for an example.

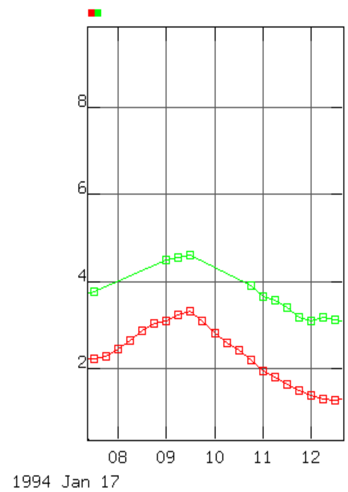


Figure 13. Select mode with gaps

Suppose the user is selecting points from the top curve to paste into the bottom curve. If the start point is clicked just to the left of 09:00:00, and the ending point just to the right of 11:00:00, five points are being selected. The bottom curve has nine points in this range; after the paste is made, these nine points will become the five points of the top curve, leaving the bottom curve with four fewer points (and a gap, like the top one has). Now, suppose that instead of clicking to the left of 09:00:00 to start the selection from the top curve, click to the right of 08:00:00. This results in exactly the same selection as the first case, because there are no points between 08:00:00 and 09:00:00. When the paste is done now, no more points will be lost in the lower curve than before; the selection begins with the first point to the right of the selected endpoint, which means it starts with the point at 09:00:00 no matter where the mouse pointer is placed within the large gap. All selected regions begin and end with a point, although ranges of missing points can be included within the starting and ending point.

G. Zoom Mode

When in Zoom mode, creating a zoom box in the Zoom window works basically the same as creating one in the Graph window. Like creating a Zoom box in the Graph window, anything previously visible in the Zoom window disappears and is overwritten with the new zoomed area.

There are two side effects of this: first, the zoom box indicating the data displayed is not visible once the data is displayed. Look at the values of the axes to determine what portion of the graph is being looked at. Second, because there is no zoom box anymore, it cannot be moved with the second or third mouse button. In the Zoom window in Zoom mode, only the first mouse button has any function, and that is to draw a new zoom box. Drawing a zoom box in the Zoom window also erases the one displayed in the Graph window, as the area covered by it is no longer what is displayed in the Zoom window.

H. DragCurve Mode

This mode works exactly the same as Drag mode in the Graph window.

4.5.2.8 CurveInfo Window

The CurveInfo window, shown in figure 14 is used to change the way curves are displayed in the Graph and Zoom windows. It is popped up by selecting the Curve option from the View menu in either the Graph or the Zoom window.

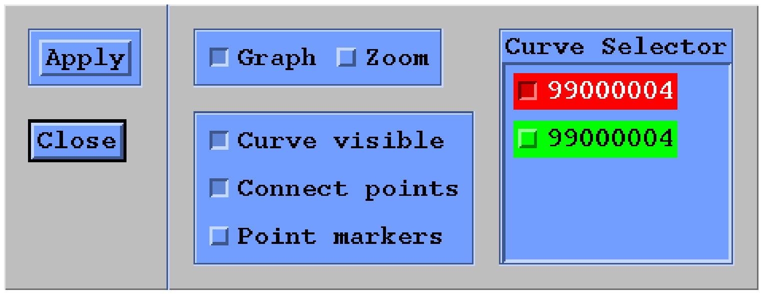


Figure 14. CurveInfo window

In this window, the user can select the window to which the changes will apply, the curve to which they will apply, and what portions of the curve will be visible. The CurveInfo window is divided into four sections: one for each of these three selections, and one for the buttons. No changes actually take effect until the user clicks the Apply button.

A. Selecting the Window

At the top are two toggle buttons, one for the Graph window and one for the Zoom window. This specifies which of these windows will receive the display options specified. One or the other or both windows can be selected. By default, when the CurveInfo window is popped up, the window from which it was launched will already be selected and the other deselected. It is possible, but pointless, to deselect both windows.

B. Selecting the Curve

On the right side of the CurveInfo window is a curve selector, similar to the selector for the active curve in the Control window. Here, however, as many curves as desired can be selected at once. By default, when the window pops up, the active curve will be the only one selected.

Only four curves are displayed in this list at once. The user can use the scrollbar to move up and down the list and access all the curves if there are more than four of them altogether.

C. Specifying the Display Options

In the lower center are three toggles that specify what parts of a curve, if any, should be displayed. They are:

1. Curve Visible: This setting overrides the two below. If this toggle is turned off, no part of the curve will be displayed regardless of the settings of the following two toggles.
2. Connect Points: This setting specifies whether the lines are visible.
3. Point Markers: This setting specifies whether the points are visible.

Turning off both Connect Points and Point Markers will have the same effect as making the curve invisible. For a complete discussion of what constitutes a point and a line, see the description of points and lines under Hydra Basics.

D. Control buttons

Clicking Apply causes Hydra to examine the settings in the CurveInfo window and to apply them to the proper curves in the proper windows. If the CurveInfo window is no longer needed, close it by clicking the Close button.

4.5.2.9   Axis Window

The Axis window, shown in figure 15 is used to manipulate existing axes and create new ones. Display this window by selecting the Axis option from the View menu in either the Graph or the Zoom window.

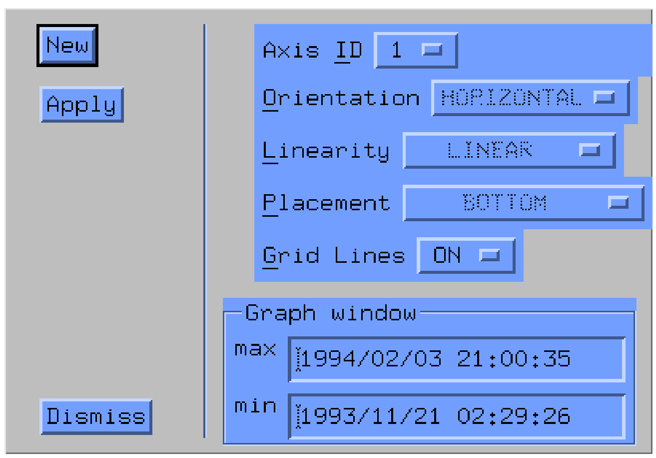


Figure 15. Axis window

The Axis window is divided into three sections: one for the buttons, one for the option fields, and one to specify the minimum and maximum bounds of the current axis (as that axis appears in the Graph window).

A. Buttons

1. New

The first button is the New button, used to create a new vertical axis. This may be desirable if two curves are displayed, and the values of one curve have a very small range compared to the values of the other. For example, if one curve has values that range from 2500 to 5000 and another has values that range from 3 to 5, the second curve will appear as a straight line along the bottom, because the range of 3 to 5 will cover only a very small space on the axis that goes from 3 to 2500. Creating a separate axis for the second curve solves this problem. See figure 16.

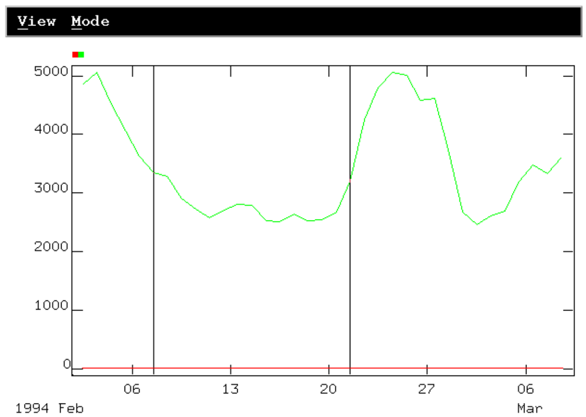


Figure 16. Curve with Different Value

In figure 16, note that there is simply a line along the bottom of the graph near 0, while the upper curve takes up the top half of the graph only.

To create a new axis, press and hold the New button with the first mouse button. This pops up a menu showing all the curves currently available in Hydra. Move the mouse pointer over the curve for which a new axis is required, and then release the button. The new axis will be created with upper and lower bounds that reflect the highest and lowest points in the curve that was selected. For example, if a new axis was created for the second curve in the case described in the paragraph above, the new axis would range from 3 to 5. The default vertical axis, on the left side of the screen, would also resize itself to reflect the remaining curve, and thus would go from 2500 to 5000.

Visually, the user can tell which axis is associated with which curve by examining the colored squares above the axis. Each axis will have one or more small squares above it, colored the same color as the curve that the axis represents. The curve associated with an axis, uses that axis to define its range; other axes are ignored by that curve.

The default vertical axis is always on the left. Any new axes created will appear on the right. The first new vertical axis will appear along the right side of the graph, and each subsequent one appears to the right of the previous one.

Each new axis created will have only one curve associated with it, the one specified upon axis creation. The default vertical axis is the only one that can have multiple curves associated with it. Its bounds are adjusted whenever a new curve is read in, or whenever a new axis is created, to show all of every curve associated with it without having any large blank areas at the top or bottom.

2. Apply

When a new axis is created, it takes effect as soon as a curve is specified in the popup menu. All other changes in the Axis Window require hitting the Apply button before they take effect. As many things as desired can be changed in the Axis Window and then applied all at once, or each change can be applied as it is made.

3. Dismiss

This button closes the Axis Window. Any changes not applied will be discarded.

B. Option fields

1. Axis ID

The first option field is the Axis ID. Every axis in Hydra is numbered. The horizontal, or time axis, is Axis 1. The original vertical axis, which displays the values, is Axis 2. Any new axes created will be numbered sequentially starting with 3. Hydra supports up to 10 axes, but the display will be very crowded if that many are brought up.

Changing the Axis ID option field resets the rest of the option fields and the max and min numbers to reflect the new axis chosen. The user can generally tell which axis in the display corresponds to which Axis ID simply by looking at the Placement field. The time axis will show a placement of Bottom and the default value axis will be on the left. A third axis, if created, will appear on the right, and from then on any new axes will be stacked to the right. See figure 17.

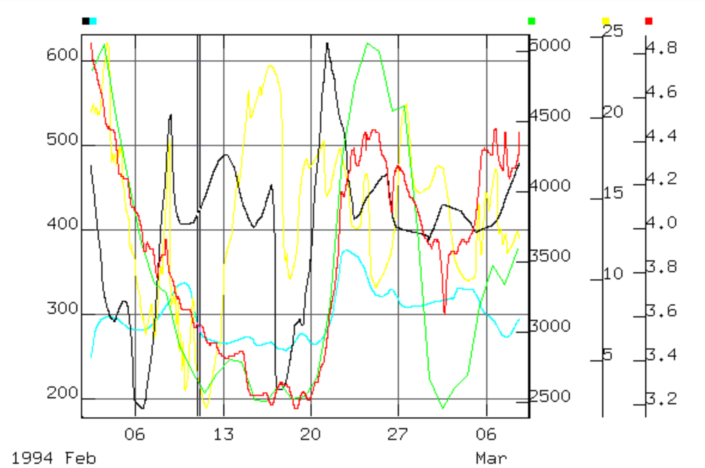


Figure 17. Axis ID window showing placement of the axes

Axis 1 (displaying range of February 6 to March 6): Orientation: horizontal Placement: bottom
Axis 2 (displaying range of 200 to 600): Orientation: vertical Placement: left
Axis 3 (displaying range of 2500 to 5000): Orientation: vertical Placement: right
Axis 4 (displaying range of 5 to 25): Orientation: vertical Placement: stacked right
Axis 5 (displaying range of 3.2 to 4.8): Orientation: vertical Placement: stacked right

The Axis ID field merely controls which axis' information is displayed, and to which axis changes will be made if Apply is clicked. Thus, there is no need to click Apply to select a new axis; the information comes up immediately when the Axis ID field is changed.

2. Orientation and Placement

The Orientation and Placement fields are for informational purposes only; they are not user-modifiable.

3. Linearity

The Linearity field controls whether an axis is displayed in Linear or Logarithmic form. The time axis Linearity cannot be changed. Other axes all start with Linear as default, but can be changed to Logarithmic by changing this setting. Apply must be clicked for the change to take effect.

4. Grid lines

This setting controls whether grid lines are drawn in the display area. All axes have tic marks and labels associated with them. If grid lines are turned on, thin lines running the width or height of the display area are drawn for each tic mark of that axis. By default, the two default axes, time and values, have grid lines turned on, and all new axes that are created have them turned off. That setting can be changed for any of them with this option field. Apply must be clicked for the change to take effect.

C. Max and Min

These fields display the current maximum and minimum of the axis currently selected, as it appears in the Graph window. **Note:** This is not the same as the domain or range of the data the axis contains: a small amount of padding is added to the extremes of each axis so that the curves displayed do not get lost in the boundaries of the display area.

The max and min values can be changed if desired, to display a larger area than the Graph window currently shows. The max and min cannot be changed to numbers that would show only a subset of a curve; this is done to preserve the integrity of the Graph window as a complete overview of all the curves. To take a closer look at something, use the Zoom window. Click Apply for the change to take effect. To change the axis bounds of the Zoom window, simply draw a new zoom box.

4.5.3 MISTE (MIssing STreamflow Estimation)

by Joseph P. Nielsen and William H. Kirby

Introduction

MISTE (MIssing STreamflow Estimation) is a tool for estimating missing daily discharge values for a (study) site using daily values that have been determined for other (index) sites. It is a program in the ADAPS suite of programs that processes primary hydrologic data. It is started from within the program HYDRA at the time daily values are edited. The estimated values that are computed by MISTE are returned to HYDRA as a reference curve by which the study-site daily values may be edited. Although MISTE is designed for streamflow data, any **mean** daily-value data may be used in a session as either a study site or an index site.

Background

The program uses stepwise regression analysis to correlate daily discharge data at the study site with daily discharge data from one or more index sites. The analysis produces a missing-values estimation equation for the study site.

Input to the program consists of concomitant vectors (arrays) of known daily-values for the study site (dependent variable) and for the index sites (independent variables). A single independent variable is a vector of index-site daily-values that is lagged a specific number of time steps with respect to the study-site values. Up to 100 variables can be considered at one time.

The estimation equation is of the form:

$$y = a_0 + a_1 x_1 + a_2 x_2 + \ldots + a_n x_n$$

where the x_n are independent variables and the a_n are coefficients determined by the regression. Up to 10 variables may be included in the final equation ($1 \le n \le 10$).

The user has available the following regression parameters by which the analysis can be reviewed: the equation variables, the coefficients, the standard error of estimate, the coefficient of determination, R^2, diagnostic statistics standard error of the coefficients (not yet available), and variance inflation factor, (VIF) for assessing the reliability of the estimated coefficient values. Also provided for each equation is a plot of the residuals versus time, a plot of the residuals versus day-of-the-year, a plot of the residuals versus study-site daily values, and a hydrograph of the study-site daily-values and estimated daily-values.

The user should keep in mind that the intended use of MISTE is to provide a means of hydrograph comparison and missing-record estimation that is similar in principle to overlaying plotted hydrographs on a light table, but with the advantages of "objective" (i.e., reproducible) computation rather than freehand sketching and of digital output to HYDRA and the daily-values file. Although MISTE is able to process large amounts of data using powerful statistical techniques, there are statistical and hydrological pitfalls in application of these techniques to estimation of missing hydrologic record. The pitfalls include sensitivity to outliers, non-constant variance (heteroscedasticity), serial correlation, cross-correlation among index sites, and possible conflicts between the linear-regression equations and the governing hydrologic laws. Therefore, MISTE cannot be relied on to identify a reliable equation from a large selection of index sites and lags. MISTE does not contain any built-in hydrologic knowledge. The user must supply it. The user bears the primary responsibility for identifying good index sites and supplying reasonable lag values. This identification must be done outside of MISTE, using hydrograph comparisons on a light table, in PLOTWAT, or in HYDRA. Similarly, the regression results and diagnostics do not reflect any hydrologic knowledge. The user is responsible for assessing whether the results make any hydrologic sense. The primary tool for this must be graphical comparison of the regression results with study-site and index-site hydrographs and with the user's knowledge of local hydrology.

Creating an Equation

MISTE is invoked from within program HYDRA, which itself is invoked within ADAPS:

> ADAPS →
> PR -- Process Primary Data →
> 2 -- Edit Time-Series Data using Hydra.

Select the study site, data descriptor (DD), and date range in the site selection screen.

```
               TS_EDIT - Edit Time-Series Data with Hydra
                      NWIZQVARSA TEST SITE FOR MT DATA
DATE: 09-09-2002     USER jnielsen                             TIME: 06:08:30
******************************************************************************
CURRENT USER INFORMATION
PA - FILE PATH     - /home/test/jnielsen
------------------------------------------------------------------------------
DB - DATA BASE     - NWIS Training Database
AG - AGENCY        - USGS   GEOLOGICAL SURVEY
ST - STATION(S)    - 01014000 St. John River below Fish R, at Fort Kent, ME
DA - DATA TYPE     - DAILY VALUES
DD - DATA DESCR.   - DISCHARGE, IN CFS
SC - STATISTIC     - 00003 MEAN
DT - DATES         - 10-01-2000 TO 09-30-2001
******************************************************************************
Enter: PA,DB,AG,ST,DA,DD,SC,DT  to edit field or
    [CR] to continue:
```

Use the following steps to create a missing values estimation equation. **NOTE**: To stop processing during these steps, enter "qu" (quit) at any prompt requesting typed input.

1. In HYDRA window "Control," click "Edit → Estimate." A new window named "miste" appears.

2. In window "miste," select "0 - Create a new equation for this DD." This option appears only if an equation has been previously saved. Otherwise the program jumps directly to the next step.

3. Select an index site by choosing the station and DD from the menus.

```
                       NWTS2RDB - MISTE Index Station #1
                       NWIZQVARSA TEST SITE FOR MT DATA
DATE: 09-09-2002      USER jnielsen                           TIME: 07:20:56
******************************************************************************
CURRENT USER INFORMATION
PA - FILE PATH     - /home/test/jnielsen
------------------------------------------------------------------------------
DB - DATA BASE     - NWIS Training Database
AG - AGENCY        - USGS   GEOLOGICAL SURVEY
ST - STATION(S)    - 01010500 St. John River at Dickey, Maine
DD - DATA DESCR.   - DISCHARGE, IN CFS
SC - STATISTIC     - 00003 MEAN
******************************************************************************
Enter: PA,DB,AG,ST,DD,SC  to edit field or
    [CR] to continue:
```

4. Enter the bounding lag times. Lag time is the number of days by which the index record has to be lagged or delayed (shifted to later times) in order to correlate with the study record. The concept is the same as if the records were being estimated by graphical plotting on paper on a light table -- in that case, the lag would be the distance by which the INDEX record must be shifted to the RIGHT on the time axis (to later times) in order to line up with the peaks and troughs of the study record. For sites on the same stream, a rule of thumb would be to select a lag equal to the approximate travel time between the sites. If the index site is upstream of the study site, the index record has to be shifted to later times (lagged or delayed) to line up with the study site. The lag is PLUS in this case. If the index site is downstream, its record has to be shifted to earlier times (advanced rather than delayed) in order to line up with the study record. The LAG is MINUS in this case (a LEAD rather than a lag). The bounding lag times should be as close together as possible and still bracket the approximate travel time; the bounding lags may be entered in either order and they may be equal.

```
   MISTE - Regression Analysis - Selected Index Sites
-------------------------------------------------------------------------------
                   |      |                 Daily Values:
                   | parm | ----------------------------------------------------
   agency/site     | code |  total    | estimated|    first     |    last
-------------------|------|-----------|----------|--------------|-------------
USGS 01010500       |00060 |    20338 |     2174 | 05-jul-1910 | 21-jun-2001

  Enter one bound of lag time (in days)
  --> -1

  Enter other bound of lag time (in days)
  --> +1
```

5. Repeat steps 3 and 4 for each index site. The user should exercise restraint in specifying additional index stations. The additional index sites should have a strong hydrologic relation to the study site; for example, a tributary entering between the first index site and the study site. After the last index site has been specified, answer “No” to the prompt for additional index sites.

6. The screen that follows (below) will list the study site first, and then all the index sites that have been selected. For each site, the dates of the first and last daily-value in the database, as well as the total number of daily-values and the number of estimated daily-values, are given. These should be screened to see if there is sufficient overlapping record between the sites to continue the regression.

```
-----------------------------------------------------------------------------
       MISTE - Regression Analysis - Selected Index Sites
-----------------------------------------------------------------------------
                    |      |                Daily Values:
                    | parm | ------------------------------------------------
    agency/site     | code |  total    | estimated|    first     |    last
--------------------|------|-----------|----------|--------------|-------------
USGS 01014000       |00060 |     25446 |     1947 | 01-oct-1926 | 17-jun-2001
USGS 01010500       |00060 |     20338 |     2174 | 05-jul-1910 | 21-jun-2001
USGS 01013500       |00060 |     26790 |     1426 | 29-jul-1903 | 21-jun-2001


-----------------------------------------------------------------------------


   Do you want to specify another index station? (Y or N)
   --> n

   Do you want to use seasonality? (Y or N)
   --> n
```

7. If "Yes" is selected to use seasonality, the user will be prompted to define the day and month to start and end the season. Only those daily-values within the defined season will be used in the regression analysis. See the section "Creating an Equation Using Seasonality" below.

8. Enter the begin and end dates of the data to be used in the regression, as well as whether linear or logarithmic regression should be performed. The summary at the top of the window shows the study- and index-site records available for regression analysis. (If seasonality has been chosen, the summary reflects only the selected season.) In selecting the begin and end dates (and seasonality), keep in mind the objective of the exercise -- to estimate a period of missing record in a particular year for which primary record computations are being performed. Using a long multi-year period of record for regression may not improve the prediction if the relation between the study and index sites varies from year to year or season to season. This has to be judged by trial and visual assessment of the results. MISTE will not exercise hydrologic judgment; the user has to do that.

```
-----------------------------------------------------------------------------
       MISTE - Regression Analysis - Selected Index Sites
-----------------------------------------------------------------------------
                    |      |                Daily Values:
                    | parm | ------------------------------------------------
    agency/site     | code |  total    | estimated|    first     |    last
--------------------|------|----------|----------|-------------|-------------
USGS 01014000       |00060 |    25446 |     1947 | 01-oct-1926 | 17-jun-2001
USGS 01010500       |00060 |    20338 |     2174 | 05-jul-1910 | 21-jun-2001
USGS 01013500       |00060 |    26790 |     1426 | 29-jul-1903 | 21-jun-2001


-----------------------------------------------------------------------------



Enter complete dates  -- yyyymmdd -- to use data for complete range of
dates in regression


   Begin-date (yyyymmdd)
   --> 19951001

   End-date (yyyymmdd)
   --> 20000930

   Enter 1 for linear or 2 for logarithmic
   --> 2
```

9. The following screen shows the index and study sites and the total number of daily-values, and estimated daily-values, in the period selected for the regression (including the season if defined).

```
-----------------------------------------------------------------------------
       MISTE - Regression Analysis - Selected Index Sites
-----------------------------------------------------------------------------
                    |      |                Daily Values:
                    | parm | ------------------------------------------------
    agency/site     | code |  total    | estimated|    first     |    last
--------------------|------|----------|----------|-------------|-------------
USGS 01014000       |00060 |     1827 |      679 | 01-oct-1995 | 30-sep-2000
USGS 01010500       |00060 |     1827 |      666 | 01-oct-1995 | 30-sep-2000
USGS 01013500       |00060 |     1827 |      428 | 01-oct-1995 | 30-sep-2000


-----------------------------------------------------------------------------



   Do you want to continue with the regression? (Y or N)
   -->
```

9. Before doing the regression, MISTE shows the total number of points that will be used in the analysis and provides one last opportunity to discontinue the regression.

```
  There are 1827 points available for regression analysis.

Do you want to continue with the regression? (Y or N)
--> y
```

10. Continue with the regression. The terms kept in the equation, the coefficients, and the statistical summaries are displayed when the regression is complete. The regression analysis may take a minute or more to complete, depending on the size of the data set.

```
-------- Regression Output ----------------------
Standard Error =        0.04628789
R squared =        0.98861456
Adjusted R Squared =        0.98859583
Term Name =  INTERCE  Term Coefficient =       0.61880419
Term Name = S1L(1)    Term Coefficient =       0.25539166
Term Name = S2L(0)    Term Coefficient =       0.31401538
Term Name = S1L(0)    Term Coefficient =       0.39587802
-------------------------------------------------

      1) Call graphs of:
                 Residual hydrograph plot
                 Residual day-of-year plot
                 Residual scatter plot
                 hydrograph plot
      2) Save Regression Equation.
      3) Calculate output for regression.
      4) Abort regression.

 Please choose a number for the selection:
 -->
```

11. Select "1) Call graphs of:" to review the regression results graphically using tkg2. Select the respective plots in the new window named "MISTE." Four diagnostic graphs are available to assist in determining the success of the regression. Click on “EXIT” in the “MISTE” window to return to the regression output screen. Once a MISTE session is completed, the diagnostic graphs cannot be recalled. Any needed printouts should be made at this time.

- ➔ **Hydrograph plot:** This graph shows a hydrograph of the study site daily discharge superimposed on the predicted daily discharge (from the regression) for the entire period of the regression analysis. This plot is useful for showing if the relation between the index and study sites has changed over the period of the regression analysis. If so, a refined regression period or a reevaluation of the index sites should be considered.

- ➔ **Residual day-of-year plots:** This graph shows two stacked plots. The top plot shows the average study and predicted discharge for every day of the water year. The bottom plot shows the average residual (study discharge minus predicted discharge) for every day of the water year. If seasonal regression is used, only the season used in the regression will be shown on each plot. These plots are useful for showing if the relation between the index and study sites changes over the water year. If so, a seasonal regression should be considered.

- ➔ **Residual hydrograph plot:** This graph shows the residual (study discharge minus predicted discharge) for the entire period of the regression analysis. This plot is useful for showing if the relation between the index and study sites has changed over the period of the regression analysis. If so, a refined regression period or a reevaluation of the index sites should be considered.

- ➔ **Residual scatter plots:** This graph shows two stacked plots. The top plot is a scatter plot of the predicted vs. the study discharge. If a log regression was used, the axes will be in log units. The bottom plot will vary depending on the type of regression used. For linear regression, this will be a scatter plot of the residual vs. the study discharge. For log regression, this will be a scatter plot of the ratio of study to predicted discharge vs. the study discharge. These plots are useful in showing if the relation between the study and index sites is dependent on streamflow. If so, a seasonal regression or a reevaluation of the index sites should be considered.

12. Select "2) Save Regression Equation" to store the equation terms and coefficients in ADAPS. Provide a meaningful name for the equation and enter descriptive text.

```
      1) Call graphs of:
                Residual hydrograph plot
                Residual day-of-year plot
                Residual scatter plot
                hydrograph plot
      2) Save Regression Equation.
      3) Calculate output for regression.
      4) Abort regression.


 Please choose a number for the selection:
 --> 2

 New Equation Name:
 --> test
 New Equation Description:
        ➔  test equation for ADAPS 4.2 documentation
```

13. Select "3) Calculate output for regression" to compute the reference curve of estimated daily values and return to HYDRA. In the HYDRA session, the MISTE output will be identified in the Control Window as “MISTE-DATA.”

```
There are 353 points available to calculate output.

Do you want to continue with the calculation of output?  (Y or N)
 -->
```

14. Select "4) Abort regression" if the equation is not satisfactory. The user will be returned to the Hydra session.

Using a Previously-Created Equation

A previously-created equation can be used to estimate missing daily-values if it has been saved in ADAPS. Follow these steps to use a previously-created equation.

1. In the HYDRA window "Control," click "Edit→ Estimate" to open window "MISTE."

2. In window "MISTE," select the appropriate equation from the list that is displayed. The reference curve of estimated values is computed and returned to HYDRA. When using an existing equation, the reference curve in HYDRA is identified in the Control Window as "MISTE-EQ#" where # is the equation number used.

```
     0   Create a new equation for this DD

     1   test


   -Enter a number to select one of the above
   -Enter a 'd' followed by a number (i.e. d2) to delete an equation listed
     above.
   -Enter '?' followed by a number (i.e. ?2) for a more detailed description
     of one of the above.

   --> 1

--------------------------------------------------
Please wait while information for
equation # 1 is being retrieved.
--------------------------------------------------
```

Creating an Equation Using Seasonality

A regression equation can be developed that is based on seasonal data only. For example missing winter values may be estimated using only winter periods of record at the index and study sites.

Follow steps 1-5 in "Creating an equation" and continue with these steps:

1. Answer "yes" to the seasonality prompt.

```
Do you want to use seasonality? (Y or N)
 --> y
```

2. Enter the begin and end month/day of the period (season) to be used in the analysis.

```
Enter only month and day - mmdd - to use data for a season (you will
be prompted for a year range after this)

   Begin-date  (mmdd)
   -->  0101

   End-date    (mmdd)
   -->  0331
```

3. Continue at step 7 in “Creating an equation.”

Getting a Description of an Existing Equation

A detailed description of a previously-created equation can be retrieved from MISTE by entering "?" followed by an equation number that is listed in window "MISTE" (see "Creating an Equation,” step 2). The description will include the study site and data descriptor used, the final equation including the index sites, data descriptors, coefficients, and details of the regression analysis including the study period and season used, the regression type (log/linear), the r-squared and standard error of the equation, and the diagnostic statistics of the coefficients (standard error (not yet available), t-ratio, and VIF). The diagnostic graphs described in “Creating and Equation” step 11 cannot be recalled.

```
-----------------------------------------------------------------
EQUATION NAME:        test
EQUATION DESCRIPTION: test equation for ADAPS 4.2 documentation
REGRESSION PERIOD:    01-oct-1995          to  30-sep-2000
SEASON:        NA
LOG TRANSFORM:        yes


DEPENDENT VARIABLE:
      SITE:          01014000        DD: 3
      R-SQUARE:        0.988615
      ADJ R-SQUARE:    0.988596
```

```
      STD ERR OF EST:  0.046288

 FINAL EQUATION:
  INTERCEPT    0.618804
  TERMS:
  SITE         DD       LAG  COEFFICIENT T-Ratio  VIF
 01010500       5         1       0.255392         23     24.615940
 01010500       5         0       0.395878         36     23.160540
 01013500       1         0       0.314015         71     2.947940

---------------------------------------------------------------
```

Detailed information on an equation can be retrieved after use from within HYDRA by using the "View – Header" option:

```
# //FILE TYPE="NWIS-I DAILY-VALUES" EDITABLE=YES
# //STATION AGENCY="USGS " NUMBER="MISTE-EQ2      "
# //DATABASE NUMBER=1 DESCRIPTION="NWIS Training Database"
# //STATION NAME="St. John River below Fish R, at Fort Kent, ME"
# //DD DDID="   3" RNDARY="0222233332" DVABORT=120
# //DD LABEL="DISCHARGE, IN CFS"
# //PARAMETER CODE="00060" SNAME="DISCHARGE"
# //PARAMETER LNAME="DISCHARGE, CUBIC FEET PER SECOND"
# //STATISTIC CODE="00003" SNAME="MEAN"
# //STATISTIC LNAME="MEAN VALUES"
# //RANGE START="20001001" END="20010930"
# //REGRESSION NUMBER=2 NAME="test"
# //REGRESSION DESC=" test equation for ADAPS 4.2 documentation "
# //REGRESSION TYPE="LOGARITHMIC"  TERM_COUNT=2 SEASON=NO
# //REGRESSION RANGE_START="19951001" RANGE_END="20000930"
# //INTERCEPT COEFFICIENT=0.618804
# //TERM_1 AGENCY="USGS " NUMBER="01010500       " DD_NO="5"
# //TERM_1 STAT=00003 LAG=-1 COEFFICIENT=0.255392
# //TERM_2 AGENCY="USGS " NUMBER="01010500       " DD_NO="5"
# //TERM_2 STAT=00003 LAG=0 COEFFICIENT=0.395878
# //TERM_3 AGENCY="USGS " NUMBER="01013500       " DD_NO="1"
# //TERM_3 STAT=00003 LAG=0 COEFFICIENT=0.314015  TERMS:
```

The diagnostic statistics of the regression are intended to indicate whether the regression equation represents "real" hydrologic effects or whether it is merely an artifact of random sampling fluctuations. (Consider tossing a fair coin four times. Suppose that there are three heads. Does that prove that the coin is not fair? The diagnostic statistics are intended to answer this kind of question.) The diagnostic statistics can be explained in general terms as follows:

- R-square and adjusted r-square -- the fraction of the variance of the study site data that is "explained" by the index site data and the regression equation.
- Standard error of estimate -- the magnitude of scatter of the study site data around the regression line or equation; the standard deviation of the residuals from the regression equation.
- T-ratio -- the ratio of the coefficient value to its standard error of estimate. The magnitude of this ratio indicates whether the coefficient value is significantly different from zero in a statistical sense. If the t-ratio is less than one, the value of the coefficient is less than the uncertainty in its determination; such a value might occur by random sampling error even if the index site had no real relation to the study site. T-ratios greater than about two or three are commonly taken as indicative of real effects.
- Variance Inflation Factor (VIF) -- a measure of the degree of correlation between an independent variable and the other independent variables ("multicollinearity"). A value of one indicates no multicollinearity; values greater than 10 indicate potential for serious problems with the validity of the coefficients. Problems include unrealistic magnitudes and signs, unrealistic numbers of variables included in the equation, and terms that seem nearly to cancel each other. These problems do not necessarily affect the standard error of estimate or r-square, but they can cause inaccurate predictions if the values of the predictor variables (index sites) are outside of the range used to establish the regression equation. Since streamflows at neighboring sites or different lags are highly intercorrelated, multicollinearity is expected if multiple index sites or lags are specified. MISTE has no algorithm for detecting or correcting for multicollinearity. It is the user's responsibility to exercise restraint and specify only those index sites and lags that have clear physical relations to the study site.

The regression diagnostic statistics require some judgment in their interpretation in the context of estimating missing record. These statistics are based on assumptions of uniform variability of the observations ("homoscedasticity") and serial independence of successive observations. These assumptions may not be satisfied by stream-flow data. This does not invalidate the use of the regression equation for estimation of missing record, but it does mean that no hard and fast rules for interpreting and using the diagnostic statistics can be provided. In particular, the value of r-square or the standard error of estimate should not be taken as the sole measure of goodness of the regression equation -- hydrologic reasonability, visual assessment of the graphical diagnostic products, and visual assessment of the estimated record in HYDRA should be the main criteria for judging the regression results.

Deleting an Equation

A previously-created equation can be deleted from ADAPS by entering "d" followed by an equation number that is listed in window "MISTE" (see "Creating an Equation," step 2).

4.5.4 Update/Display Data Corrections

by Sarah E. Giffen

Data corrections are applied to recorded water data parameter readings to compensate for erroneous recordings. These corrections can vary by both time and data value. They are usually applied for short durations of time. There are three separate sets of data corrections available, which can be applied independently of one another. For stage data these sets are referred to as the “Gage Height Correction,” “Datum Correction from Levels,” and “Other” and are displayed as such in ADAPS. Gage Height Corrections are defined as corrections applied to the gage height due to instrument errors. Datum Corrections from Levels are defined as corrections applied to that gage height to correct for vertical movement of the gage documented by levels run at the station. Other corrections refer to any other corrections that need to be applied to the gage height that don’t fall within the other two categories. For QW data, the three sets of corrections have been named “Sensor Fouling,” “Calibration Drift,” and “Other” corrections. Other non-stage data corrections may be named by the user based on what is relevant for that type of data. The three correction sets are displayed separately. All three sets of data corrections can vary both by time and parameter, and can consist of up to three points, each point being an input data point and the corresponding data correction at that point. The interpolation between these points is linear. The first correction value will be used for data below the first input point and the last correction value will be used for data above the last input point.

The proration of data corrections between values is done as an unweighted linear calculation between the individual user-supplied input and correction value pairs. This proration process also occurs automatically across water year boundaries. The last value in the previous water year and the first values of the current water year are used for the proration. If there are no entries in the previous water year’s file, the data correction values from the previous water year are not applied and the data correction begins at the time and with the values available in the current water year. Up to 100 datum corrections can be stored for each water year, and are displayed as 28 entries per page.

To Update/Display data corrections select “Update/Display Data Corrections” from the “PR-Primary Data Processing” menu (DC_EDIT). In the “current user information” menu verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. For multi-parameter processing, the data descriptor must be an input parameter, since data corrections are not applied to computed parameters (for example, discharge in stage-discharge processing). The output (OT – output to) should also be specified. Options are to file, to terminal, or to a printer.

After these items have been specified, a carriage return will display a list of the number of corrections that have already been entered for each of the three types of corrections for three consecutive water years: the water year previous to the specified year, the specified water year, and the year following the specified water year. This menu for stage data is shown below. If a data set other than stage is selected, the name column heading with the data correction, gage height correction, and other correction entries will not be shown. In the “id menu” for the data set displayed below, no corrections have been entered in the selected water year (the 2001 water year).

```
USGS 01010000                St. John River at Ninemile Bridge, Maine

                                   ID MENU
                              =================

                NUMBER OF   CORRECTIONS
  NUM            2000      2001      2002        NAME
  ====          =====     =====     =====        ========================

    1             6         0         0          Gage Height Corrections
    2             0         0         0          Datum Corrections from Levels
    3             0         0         0          Other

Enter the set number of the correction desired:
```

Select the number, 1-3, for the desired correction set (Gage Height Corrections, Datum Corrections from Levels, or Other) to update. Selecting, for example, number 1 in order to add a Gage height Correction for the 2001 water year, will display "Record not found - would you like to add it [Y/N DEFAULT=Y]." Answering "yes" displays the screen where the data corrections are entered, which is displayed below. If there had already been a Gage Height Correction for the selected water year, this question would not be displayed and the "data correction" menu would be displayed (this menu is discussed later in this section).

```
                              EDIT CORRECTION SET
   USGS 01010000     St. John River at Ninemile Bridge,  Maine
   Gage height (transducer-DCP), in feet                    WATER YEAR:  2001
           DATES VALID FROM:   10/01/2000 00:00 TO 09/30/2001 23:59
 IN ADD MODE – TYPE IN YOUR ENTRY – TO EXIT ADD MODE TYPE IN AN "X"
************************************************************************************************************
  START     DATE    TIME    ZONE    INPUT     CORR    INPUT    CORR   INPUT   CORR
  END       DATE    TIME    ZONE    COMMENT
PRV:2000/08/14     1415 EDT                 0.00     -0.04
     2000/08/14    1430 EDT

  1:    /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
        /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
  2:    /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
        /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
  3:    /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
        /____/___ _____ ____ ____ _____ _______  ______ ______ ______ _______ _____
NXT:  None

 "Q" = enter menu          "E" = exit program     "A"  = add to end of list
 "F" = forward 1 page      "M" = down 1 line      "D" = delete line   "C" = change line
 "B" = backward 1 page     "U" = up 1 line        "I"  = insert line  "S" = save and quit
```

The correction set to update (set 1 in this case), station number, station name, and water year are listed at the top of the table. Below that is a message telling the user that they are automatically in “add” mode since there are no preexisting data corrections. The user can start to add data corrections or can exit “add” mode by typing an “X.” The line with the “PRV” heading displays the last data correction (for the specified correction set) from a previous water year. The start date, time and input, and correction value pair is listed on the first line. The end date and time, as well as a comment field, are listed on the second line. The start date and time specifies the time that a correction is started and the end date and time specifies the time when the correction ends.

The first correction, gage height correction for the 2001 water year in this case, is entered under the “1:” line heading. To enter a correction, enter the month, day, time, time datum (PST, etc.), input value, and corresponding correction in the spaces provided. The time datum can be skipped by hitting enter after the time. The default time datum for that station at that date and time will be automatically entered and the entry will skip to the first correction input point. Up to three pairs of input points and corrections may be entered on a line after the time data. These three points are entered with the first point being the lowest data input point and corresponding correction. After entry of the first line of correction information, hit enter to get to the second line. On the second line the date and time can be left blank, with or without a comment, and the correction will prorate linearly through time to the next available correction. If a date and time is entered on the second line, the correction will be held constant through time and ended at the date and time specified. The values will not be lined up perfectly under the headers as they are entered. After entering all data on the first line, a carriage return will center the data in their respective columns.

The correction can have one, two, or three input and corresponding correction value pairs. If it is a one-point correction, the data correction will be applied as a constant across the entire range of input, regardless of the input point entered. If it is a two or three-point correction, the correction values will be prorated between the input points and will be carried as a flat correction for values less than or greater than the least and greatest specified input points respectively.

An example of a correction is displayed and explained below:

```
                         EDIT CORRECTION SET
  USGS 01010000    St. John River at Ninemile Bridge, Maine
  Gage height (well-DCP), in feet                WATER YEAR: 2001
        DATES VALID FROM:   10/01/2000 00:00 TO 09/30/2001 23:59
 IN ADD MODE – TYPE IN YOUR ENTRY – TO EXIT ADD MODE TYPE IN AN "X"
******************************************************************************
  START    DATE    TIME    ZONE    INPUT     CORR    INPUT   CORR  INPUT  CORR
  END      DATE    TIME    ZONE    COMMENT
PRV:1999/05/04     1357 EDT                 0.00    -0.02
    1999/05/04     1358 EDT
------------------------------------------------------------------------------
  1: 2000/10/01    1400 EDT                 0.00     0.02   1.00   0.32   5.00   0.40
     2000/10/15    1000 EDT         this is the first correction for the water year
       /____/___ _____ ____ ____ _____ _______ ______ ______ ______ _______ _____
  2:   /____/___ _____ ____ ____ _____ _______ ______ ______ ______ _______ _____
       /____/___ _____ ____ ____ _____ _______ ______ ______ ______ _______ _____
  3:   /____/___ _____ ____ ____ _____ _______ ______ ______ ______ _______ _____
      /____/___ _____ ____ ____ _____ _______ ______ ______ ______ _______ _____
------------------------------------------------------------------------------
NXT: None

 "Q" = enter menu         "E" = exit program    "A"  = add to end of list
 "F" = forward 1 page    "M" = down 1 line      "D" = delete line  "C" = change line
 "B" = backward 1 page   "U" = up 1 line        "I"  = insert line  "S" = save and quit
```

In this example, the first correction is a three-point correction with a starting time of 10/01/2000 at 1400 EDT and an ending time of 10/15/2000 at 1000 EDT. The three input points are 0.00, 1.00, and 5.00 and the corrections, 0.02, 0.32, and 0.40, will be prorated between these values respectively. The last correction value of 0.40 will be applied to any values greater then 5.00. If no end date had been specified the correction would be prorated forward to the next correction. The comment shown after the ending time is for descriptive purposes only and is not used by the system.

After entering all data corrections, "X" will exit "add" mode. Choose from the list of options (Q, F, B, E, M, U, A, D, I, C, and S) at the bottom of the screen to continue. Selecting "Q - enter menu" will exit the current screen without saving any changes and return to the "enter" menu. Selecting "E-exit program" will exit the program. If "S-Save and Quit" is selected, the "Recompute the record? [Y/N DEFAULT=Y]" prompt will be displayed. Selecting "yes" will recompute the entire record, including application of all data corrections, shifts if applicable, and primary processing. No output will be generated, but the recomputation will ensure that the integrity of the database is maintained. Selecting "no" will save the changes/ additions but will not recompute the record. If "S-Save and Quit" is selected, the "data correction" menu will be displayed next. This menu is also displayed earlier if a correction set was chosen from the id menu that already contained corrections. The menu is shown below:

```
                 DATA CORRECTION MENU
                 ==============================

        "AD"  -  ADD correction values
        "ED"  -  EDIT/update correction values
        "DL"  -  DELETE entire selected record
        "VI"  -  VIEW correction values
        "LI"  -  LIST selection on screen/printer

        "ID"  -  Return to set ID screen
        "US"  -  Return to USer information screen

      "QUIT"  - QUIT and return to previous menu
      "EXIT"  - EXIT and return to UNIX
     ENTER THE CODE OF THE FUNCTION DESIRED:
```

Selecting "AD—ADD correction values" will display the data corrections screen in add mode again. Selecting "ED-EDIT/update correction values" will display the data corrections screen also but not in add mode. Selecting "DL-DELETE entire selected record" will show the first page of corrections, 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. Selecting "VI-VIEW correction values" will display the data corrections screen. Selecting "LI-LIST selection on screen/printer" will print/display (depending on the OT specifications) the data corrections for the selected data correction set and year in the format shown below:

```
                        U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

          STATION NUMBER 01010000  St. John River at Ninemile Bridge, Maine    SOURCE AGENCY USGS   STATE 23  COUNTY 003
   LATITUDE  464200  LONGITUDE  0694259  NAD27  DRAINAGE AREA 1341.00   CONTRIBUTING DRAINAGE AREA 1341.0   DATUM 931.26  NGVD29
                                            Date Processed: 2002-05-03 13:51 By sgiffen

                                                         CORRECTION CURVES
 Correction set #1                                        2001 Water Year
                                                  Gage height (well-DCP), in feet
               STARTS                        ENDS            INPUT    CORR.      INPUT    CORR.      INPUT    CORR.
      ___________________________    ___________________________  _______  _______    _______  _______    _______  _______

 PRV: 1999/05/04 13:57:00 EDT      1999/05/04 13:58:00 EDT        0.00    -0.02


    1 2000/10/01 14:00:00 EDT      2000/10/15 10:00:00 EDT        0.00     0.02       1.00     0.32       5.00     0.40
      this is the first correction for the water year


 NXT: None

More? [Y/N DEFAULT=Y]:
```

The correction set (1-3 selected in the "ID menu"), station number, station name, and water year are listed at the top. Listed next, with the line heading "PRV," is the last data correction (for the specified correction set) for the site from a previous water year. All of the corrections for the specified correction set and water year are listed next. The start date and time, end date and time, input point and correction value pairs are listed in columns from left to right. Any comment fields will be shown on the line following the correction for which it applies.

Selecting “ID-Return to set ID screen” will display the “ID screen” menu. Selecting “US-Return to user information screen” will return the user to the information screen display menu.

4.5.5 Update/Display Rating Tables

by James M. Caldwell

The RT_EDIT program allows the user to update and display rating tables.

Valid rating types are:

- Conversion of input
- Standard rating
- Stage-fall (slope) rating
- Fall/discharge ratio rating
- Stage-area rating
- Stage-velocity correction factor rating
- Deflection-velocity rating
- Conversion of auxiliary input

Ratings are stored under the data descriptor (DD) associated with the computed side of the rating. Where there are auxiliary DDs 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 or a Conversion Of Input rating, COI) must be stored with the corresponding base gage-height DD, not the auxiliary gage-height DD.

Note: in ADAPS 4.2, multi-parameter ratings have been moved from the input parameter to the computed parameter. For example, with stage-discharge ratings, the data descriptor used is discharge.

To display or update ratings, select “Update/Display Rating Tables” from the PR – primary data processing menu. From the initial menu, the database, agency, station, and data descriptor are specified. The program checks to see if the site and data descriptor chosen have any existing ratings. If a rating does not exist, the program queries whether one is to be added: “There are no ratings for this DD, do you wish to add a new rating.” For creating a new rating, see the section on “AD - Rating” below. If a rating exists, the rating selection list menu displays the ratings available for the chosen site and data descriptor with the prompt: “Enter the number of the rating desired, or key return to add a new rating.”

Update/ Display Existing Rating

To update or display an existing rating choose the appropriate rating from the rating selection list menu. The currently active rating is displayed with an (*) appended. After choosing the desired rating, one of three possible rating menu displays appear, depending upon the Aging Status of the rating and upon the access level of the user (see ***section 4.5.15 Manage Record Data Aging Status*** and ***section 3.8.2 Status level and aging of ratings***).

The Aging Status of the rating can be:

- Working - The rating has been entered into the system and is either new or being revised.
- In-Review - The rating has been completed and is currently awaiting review.
- Approved - The rating is completed and has been approved.

Ratings that are "In-Review" or "Approved" are locked and cannot be changed unless they are reset to "Working" status. The ability of a user to change the Aging Status of a rating depends on the access level and is summarized as follows:

User:

Move rating from "Working" to "In-Review"

ADBA:

Move rating from "Working" to "In-Review"
Move rating from "In-Review" to "Working"
Move rating from "In-Review" to "Approved"

SYST:

Move rating from "Working" to "In-Review"
Move rating from "In-Review" to "Working"
Move rating from "In-Review" to "Approved"
Move rating from "Approved" to "Working"

Below is an example of the rating screen displayed with a rating in working status:

X Terminal on hqsun3.er.usgs.gov

```
                 05014500 Swiftcurrent Creek at Many Glacier MT
                              DISCHARGE, IN CFS
                         Rating Type: stage-discharge
                              Rating ID: '   69'
                        Rating Status: working record
                 Created by jcorn     on 15-nov-2002 09:39:04 MST
                 Modified by jcorn     on 06-jan-2003 12:50:44 MST
             AD - Add Rating
             MD - Modify Rating Dates
             CP - Copy Rating
             IR - Set rating to In-Review
             ED - Edit the rating descriptor points
             ID - Modify Rating ID
             RM - Modify Rating Remarks
             DE - Delete Rating
             DI - Output Rating:

             SL - Select Rating              US - Re-start Program
             QU - Quit this Program          EX - Exit ADAPS Programs

           Enter option desired:
```

When a rating is "In-Review," there are fewer options displayed. Below is an example of the menu display with the status as "In-Review":

X Terminal on hqsun3.er.usgs.gov

```
                 05014500 Swiftcurrent Creek at Many Glacier MT
                              DISCHARGE, IN CFS
                         Rating Type: stage-discharge
                              Rating ID: '   69'
                        Rating Status: in review record
                 Created by jcorn     on 15-nov-2002 09:39:04 MST
                 Modified by jcorn     on 06-jan-2003 12:52:22 MST
             AD - Add Rating
             MD - Modify Rating Dates
             CP - Copy Rating
             AP - Approve rating      WK - Set Rating to Working
             ET - Extend Rating
             DI - Output Rating:

             SL - Select Rating              US - Re-start Program
             QU - Quit this Program          EX - Exit ADAPS Programs

           Enter option desired:
```

The menu display for an approved rating provides the same options as "In-review" except the "AP – approve rating" option will not be present (for User access) or will be replaced with "WK – Set rating to working" (for ADBA or SYST access).

The options on these screens are discussed in detail below:

AD – Add Rating

If creating a new rating, the user is initially queried for the four-digit rating ID. Next, the options for expansion types are selected: linear, log or an equation. An option to enter remarks is the next option provided. The remarks will be saved with the rating and will be printed along with the rating.

For linear or log ratings, the rating value in/out points are displayed in four columns on a page. The first column contains the first ten rating value in/out points; the second column contains the next ten rating points; and so on up through the fourth column. If there are more than 40 points in the rating, they are stored on the succeeding pages. Up to 999 rating point pairs can be entered for one rating. Options on these pages are:

- S - Save and return
- Q - Quit (no save)
- F - Forward one page
- B - Backward one page
- U - Up one line
- M - Down one line
- I - Insert line
- D - Delete line
- C - Change line
- A - Add points. An "X" is used to exit add or insert mode (usually entered in Column one or first field on the form).

To begin adding entries in the record choose the "A" key.

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 "A." 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 carriage return is necessary after a pair of values has been entered. 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 "X."

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 "I." To exit from Insert mode without making an insertion, enter "X."

Change a Rating Point

A rating point is changed by placing the cursor on the line that is to be changed and entering “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.

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.

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.

Quit (no save)

The user can quit the rating edit program without saving any edited points, if so desired. This option removes the user completely from the RT_EDIT program and back to the PR sub-menu level.

For a logarithmic expansion-type rating, the rating offset screen (next screen after entering all definition points) allows the entry of two breakpoints and three offset values. 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 first breakpoint is reached. The second offset value is then applied from the first breakpoint until a second breakpoint, if any, is reached and a third offset value is picked up. 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. If this occurs, 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.

For an equation-type rating, follow the steps above to the option for an equation rating. The Equation is: output = $A * (B + \text{input})^{C} + D$. Enter values for the coefficients A, B, C and D. Values for C (the power for the equation) are limited to –25 to +25 excluding zero. The maximum of any other coefficient is 10E30. The 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 following validation rules apply to ratings:

Stage-discharge	**independent values -**	**no minimum limit**
	dependent values -	**minimum value is zero and values must be ascending**
Stage-area	**independent values -**	**no minimum or maximum**
	dependent values -	**minimum value is zero and values must be ascending**
Velocity & General	**independent values -**	**no minimum limit**
	dependent values -	**no minimum limit**
Stage-coeff.	**independent values -**	**no minimum limit**
	dependent values -	**minimum value > zero**
Fall	**independent values -**	**no minimum limit**
	dependent values -	**minimum value is zero**
Fall-Factor	**independent values -**	**minimum value is zero**
	dependent values -	**minimum value is zero**

For a new rating, after entry of the rating, the user will be automatically moved to the Rating Effective Dates screen (see "**MD - Modify Rating Dates"** below).

MD - Modify Rating Dates

Each rating has a start and end date associated with it. The user is asked for the rating effective dates after creating a new rating. For an existing rating in "working" status, these dates can be modified using the "MD – modify rating dates" option from the rating menu. The Rating Effective Dates screen has the options:

- AP- Append a new rating date
- RE – Return to rating menu (one of the screens as shown above)

When entering rating dates, the user will first be prompted for the rating desired from the rating selection list. Prompts then follow in sequence:

1. Enter the rating start date as (MM DD YYYY).
2. Enter the rating starting time as (HHMMSS).
3. Enter the rating starting time datum (PST, etc.) The default time datum will be the station time zone from the site file.
4. Enter the new rating date remarks text.

After completing entry of the starting date, a screen showing all ratings and dates for that data descriptor is displayed with the options:

- AP - Append a new rating date
- ED - Edit a rating date
- RM - Remove a rating date
- RE - Return to rating menu

The rating has no direct links to dates and times. The function of the rating effective dates is to apply those links. The data aging status for Rating Dates (setting them to in-review or approved) is not done as part of approving the ratings themselves, but instead takes place in the SETSTATUS program used to set the aging status of the daily and unit-values, shifts, and data corrections. This is because the Rating Dates are tied to the processing of the raw data and thus are tied to the final values computed from the raw data, and need to be aged along with these data categories.

ET - Extend Rating

This option is only available for ratings set to “In-Review” or “Approved.” It will create a copy of the rating in the “Working” status. The user will be asked to enter a new rating ID that reflects the original base rating being extended. (For example, if the original rating ID was 5 then enter 5.1 as the ID for the extended rating). It is recommended that this option be used to extend a rating that has been set to “Approved.”

CP - Copy Rating

This option will create a new rating from the current one selected and place it in “Working” status. Options to apply this copied rating to a new data descriptor, a new station ID, or new rating ID number are available on the first screen. One of these options must be selected and changed, as duplicates are not allowed. To activate the copied rating, switch to the site and DD where the rating was copied, and add one or more rating dates to the copied rating.

IR – Set Rating to In-Review

This option is shown for ratings set to “Working” and is available for all access levels. It is used to set the aging code of the active rating to “In-Review.”

AP – Approve Rating

This option is shown for ratings set to “In-Review” and is only available for the “ADBA” and “SYST” access levels. It is used to set the aging code of the active rating to “Approved.”

WK – Set Rating to Working

This option is shown for ratings set to “In-Review” or “Approved” and is only available for the “ADBA” or “SYST” access level. It is used to set the aging code of an “In Review” rating back to “Working” by the ADBA or to set the aging code of an “In Review” or “Approved” rating back to

"Working" by the SYST. While the system allows an "Approved" rating that was used to compute "Approved" data to be set back to "Working" without also resetting the data, this is strongly discouraged. Instead, it is recommended that a new rating be created using the extend (ET) or copy (CP) options described above.

ED - Edit the Rating Descriptor Points (or the equation)

This option, which is only available for ratings set to "Working"' returns the user to the screen showing all rating input/output points (for linear or log ratings) or the screen showing the rating equation (for equation ratings). See the section above, "AD – Add Rating," for an explanation of working with these screens.

OF – Modify Rating Offsets

This option is only available for log ratings set to "Working." The user is returned to the Rating Offset Screen. See the section above, "AD – Add Rating," for an explanation of working with this screen.

ID – Modify Rating ID

This option is only available for ratings set to "Working." The user is returned to the Rating ID Screen and given the opportunity to change the rating ID number.

RM – Modify Rating Remarks

This option is only available for ratings set to "Working." The user is returned to the Rating Remarks Screen. See the section above, "AD – Add Rating," for an explanation of working with this screen.

DE – Delete Rating

This option is only available for ratings set to "Working" that do not have any "Approved" rating dates. To delete a rating with "Approved" rating dates, all of the data in the water years contained in the rating dates for that rating must be first set to "Working." Please note that deleting a rating from the database may take a couple of minutes to complete.

DI - Output Rating

In this option the current rating is sent to the output as specified in the "current user information" menu at the initial startup (OT – output to). Options are: to file, to terminal, or to a printer. If outputting to a file the file path can be specified with the PA option.

Upon entry into the DI option, the following menu options are available:

SL – Select Rating

This option is used to change the active rating of the Update/Display session. The user is given a list of the available ratings for the chosen data descriptor and allowed to reselect.

EP-Rating Expansion

This option defaults to no. If selected, a separate menu will be provided giving options to set the increment of rating expansion, the minimum and maximum values for the expansion, and the precision of the rating output numbers (standard or expanded, with standard as defined in the setup of the output data descriptor and expanded being one more than standard). For log or linear ratings, the minimum and maximum values will default to the minimum and maximum rating definition points. For equation ratings the default minimum and maximum values will be blank and must be filled in prior to continuing.

The rating expansion program automatically expands a rating from its descriptors (input points that define the rating). Actual rating definition points are indicated by asterisks (*) after their table values. The program also computes (expands) values for an equation-type rating.

CU- Units Conversion

This option allows for conversion of the rating input and/or output values to other units. The unit conversion options available are specific to the input and output parameter codes. For example, the following screen shows the conversion options available for discharge:

```
 1  ACRE-FT/DAY
 2  ACRE-FT/HOUR
 3  ACRE-FT/MIN
 4  ACRE-FT/S
 5  CUBIC METERS/S
 6  CUBIC METERS/M
 7  CUBIC METERS/H
 8  CUBIC METERS/D
 9  MGD
10  GALLONS/DAY
11  GALLONS/HOUR
12  GALLONS/MIN
13  GALLONS/S
14  LITERS/DAY
15  LITERS/HOUR
16  LITERS/MINUTE
17  LITERS/S
18  USER SUPPLIED CONVERSION
```

A user-supplied conversion is also available based on a user-specified equation. If chosen, the user will be prompted for the coefficients in the generic equation $Y = (C * (X + A)^B) + D$. In addition, the user will be prompted for printing labels and rounding codes for the equation output.

SH - Shift Adjusted Rating

This option produces a rating for a specific date with shifts applied that can be output in either tabular or RDB format.

DI – Display Rating Table

This option sends the rating to the chosen output device using the settings as specified in the EP and CU options (see above).

RD – Output Rating in RDB Format

This option is used to output the rating in RDB (relational-database) format. These are tab-delimited ASCII files, which can be used in other applications (see section 6.4). Upon selection of this option, the user will always be prompted for a file name for the RDB output. (The output option as specified in the initial entry to the Upate/Display Ratings program is not used.) An RDB file of the requested name will be created using the settings as specified in the EP and CU options (see above).

4.5.6 SHIFT_ANLY, Shift Analysis and Error Bars

by Glenn B. Engel

The SHIFT_ANLY program performs a shift analysis for a specified period using data from the measurement and rating files. The program also computes the range of discharge and shifts represented by the error range as indicated by the discharge-measurement rating.

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.

Program Operation

The shift-analysis program operates as follows: (1) the program takes the measured (recorded) stage (gage height) from the measurement file and applies the relation from the Rating File for the station to obtain an “original” rating discharge corresponding to that measured gage height, (2) the measured discharge from the measurement file and the relation from the Rating File are used to obtain a corresponding “rating” stage (backward look-up), and (3) the shift is computed by subtracting the measured stage from the "rating” stage. The percent difference (either with or without the shift) in discharges is computed by subtracting the rating discharge from the measured discharge, dividing by the rating discharge, and multiplying by 100.

After choosing the shift-analysis program (SHIFT_ANLY) from the ADAPS menu or from the command line, any or all of the specified user information that is displayed on the user-information screen 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.

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 are based on those stage/discharge ratings found in the ADAPS rating file whose starting date occurs prior or during the user time period. Also remember in ADAPS 4.2 and later releases, ratings are tied to the output DD, so pick the discharge DD for shift analysis.

When the user information is correct, a carriage return then invokes a screen where the user can choose a particular rating or allow the program to use the ratings in place at the time of each measurement. The next screen allows the user to choose either the first or second discharge that may be listed with the discharge measurement. A carriage return here will produce an output table which consists of three parts: (1) measurement data, (2) rating shift analysis, and (3) uncertainty bars. The parts of the table are explained below:

(1) The measurement portion of the table contains the measurement number, date, time, stage, discharge, measurement rating, and the percent error plus or minus the rating the unchanged measurement represents. For example, a rating of Good would be +/- 5% and a rating of Fair would be +/- 8%.

```
                    MEASUREMENT
     ------------------------------------------------------------

                                                       R   PCT
                                                       T   UNC
NUMBER    DATE     TIME   STAGE   DISCHARGE            D   (+/-)
--------  -------  -------  -------  -----------  ---  ------
```

(2) The rating shift analysis portion of the table contains the “optimum shift” computed for the measurement, by the rating being worked backwards from the measured discharge to get the rating stage and then subtracting the measurement stage from the rating stage. The optimum shift is rounded, and the rating is worked forward to get the "with optimum shift" discharge, (the percent difference from the rating that the measurement with the shift indicates.) This percent difference should naturally be quite small as it only reflects the sensitivity of the rating between hundredths of feet.

The rating shift analysis also includes the discharge from the rating that the measurement stage would indicate, without the shift and what percent difference the measured discharge would be from that rating discharge. To obtain that, the rating is worked forward from the measured stage to get the "without shift" discharge, then the percent difference from the measured discharge is computed.

```
                RATING SHIFT ANALYSIS
                ------------------------------------
    OPTIMUM SHIFT              WITHOUT SHIFT
  ----------------------------------   --------------------------
    SHIFT   DISCHARGE   % DIF    DISCHARGE   % DIF
    --------  ----------------   --------   ----------------   --------
```

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 figures 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.

(3) The "uncertainty bars" portion of the (SHIFT_ANLY) table indicates the optimum shift again that was shown in the rating shift analysis portion of the table. The program also computes the low and high ends of uncertainty, based on the measurement rating.

For each measurement a percentage error is applied based on the rating of the measurement in the measurement file:

- E - +/- 2%
- G - +/- 5%
- F - +/- 8%
- Other - +/- 10%

The rating is worked backwards from the measured q – % indicated to get the "low" Q and stage; measurement stage is subtracted from "low" stage to obtain shift.

The rating is worked backwards from the measured q + % indicated to get the "high" Q and stage; measurement stage is subtracted from "high" stage to obtain shift.

```
                        UNCERTAINTY  BARS
                        ------------------------------
              LOW              OPTI-              HIGH
     -------------------------   MUM      ----------------------------
     SHIFT  DISCHARGE   SHIFT      SHIFT  DISCHARGE
 --------  ------------------   -----------   ------------------------------
```

At this point the user can request that the error bars be plotted on a shift (X-axis) vs. stage (Y-axis) plot, which is used to help develop shift diagrams.

4.5.7 Update/Display Shifts

by James M. Caldwell

Shifts in the stage-discharge rating reflect the fact that stage-discharge relations are not constant but vary from time to time because of changes to the physical features that form the control. A shift is a table of rating points and corresponding adjustment shifts that indicate how much the base rating is adjusted at that point. A shift is used to avoid multiple changes to an unstable rating, to allow for gradual movement of a rating through time, or to more easily apply a preliminary rating until enough information is gathered to create a new base rating. Although it is important to understand that a shift represents a change in the stage-discharge relation, ADAPS applies the shift by adjusting the recorded gage-heights and using the base rating. Shifts can vary by both stage and time and can consist of up to three points. The interpolation between these points is linear. A shift is held constant above the highest stage and below the lowest stage entered.

In ADAPS 4.2 and later releases, variable shifts are used exclusively with stage-discharge ratings. These shifts are fixed (hard-wired) to a particular rating. The data descriptor used is discharge. The input points refer to gage height.

To update or display shifts, select “Update / Display Shifts (SV_EDIT)” from the PR-Primary Data Processing submenu. In the “current user information” menu verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. The DD-Data descriptor must be set to discharge. The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer. If outputting to a file, the file path can be specified with PA.

After these items have been specified, a carriage return will display the ratings available for the selected station. Select the sequence number for the desired rating.

If no shift exists for the selected rating for the given water year the following prompt will appear: “RECORD NOT FOUND - WOULD YOU LIKE TO ADD IT [Y/N DEFAULT=Y].” A carriage return or yes answer at this prompt will bring up the edit screen to add shifts.

If a shift exists for the given rating in the given water year, a “shift correction” menu will appear with the following options: “AD- ADD correction values,” “ED- EDIT/update correction values,” “DL- DELETE entire selected record,” “VI- VIEW correction values,” “LI- LIST selection on screen/printer,” “ID- Return to ID screen,” “US_ Return to user information screen,” “QUIT,” and “EXIT.”

Selecting AD will bring up the edit screen with the cursor at a new line below the existing shifts. Selecting ED will bring up the edit screen with the cursor on an existing shift line. Selecting DL will bring up the edit screen displaying the existing shifts with the prompt: “ARE YOU SURE THIS IS THE RECORD YOU WANT TO DELETE? [Y/N DEFAULT=Y].” Selecting VI will display the variable shifts for this rating. The shifts for the specified water year will be numbered sequentially with the first shift of that water year being number one. Selecting LI will list on the screen/printer the variable shifts for this rating for the specified water year, but the numbering will reflect all of the shifts which have been applied to that rating regardless of water year.

Below is an example of a variable shift edit screen:

```
                 EDIT SHIFTS FOR RATING # 5.0     TYPE: stage-discharge
    USGS 01010000         St. John River at Ninemile Bridge, Maine
    Discharge (well-DCP), in cfs                             WATER YEAR: 2001
             DATES VALID FROM: 10/01/2000 00:00 TO 09/30/2001 23:59
  Enter one of the commands from the menu
********************************************************************************
    START DATE TIME  ZONE   INPUT    SHIFT    INPUT    SHIFT    INPUT    SHIFT
    END   DATE TIME  ZONE  COMMENT
PRV:1997/04/19 1200 EDT        0.00  | -0.04     1.75    -0.04     2.50     0.00
    1997/04/19 1215 EDT
--------------------------------------------------------------------------------
  1:2000/10/01 0001 EDT        0.00     0.00     1.75     0.00     3.00     0.00
          /__/__ ____ _____  ________________________________________________
  2:2000/10/12 0400 EDT        1.00    -0.02     1.80    -0.06     3.00    -0.04
    2000/10/20 1230 EDT     meas, removed log from storm on 10/12
  3:2001/04/01 1000 EDT        1.20    -0.04     1.80    -0.02 ________ ________
          /__/__ ____ _____  ________________________________________________
--------------------------------------------------------------------------------
NXT: None

 "Q"= enter menu       "E"= exit program    "A"= add to end of list
 "F"= forward 1 page   "M"= down 1 line     "D"= delete line  "C"= change line
 "B"= backward 1 page  "U"= up 1 line       "I"= insert line  "S"= save and quit
```

The station number, station name, and water year are listed at the top of the table. Listed next, with the line heading PRV, is the last shift for that rating from a previous water year.

The first shift for the selected water year (the 2001 water year in this example) is displayed with the line heading “1:”. The start date and time (24-hour time) and time zone are listed on the first line, followed by the input points and corresponding shift values (the + or – correction to gage height). For the first shift there are three input points and corresponding shift values. If it is a one-point shift, the shift will be applied as a constant across the entire range of stage regardless of the stage entered. If it is a two or three point shift, the shift will be prorated between the input stages and will be carried as a flat shift for values less than or greater than the least and greatest specified input stages respectively. On the next line, the end date and time are followed by any comments pertaining to this shift. This shift is applied to the period between the start time and the end time. If there is no end time entered, the shift is prorated to the next shift, or held constant if there is no next shift.

The variable shift input form displays up to three shift values per page. To move the cursor from one shift value to another shift value, enter “M” to move to the next one or “U” to move to the previous one. To see the next page of shift values, enter “F.” Up to 333 pages of shift information can be entered for a water year. To move back to a previous page, enter “B,” which returns the page immediately preceding the current one.

Add a new variable shift value to the end of the list by entering “A.” 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, “A” (Add mode) must be entered to begin adding entries. To discontinue entries and exit from the Add mode, enter “X.”

To insert a variable shift value, place the cursor on the line where the entry is to be made and then enter “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 “X.”

Change a variable shift value by placing the cursor on the line to be changed and then entering “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.

To enter or change a shift, enter the month, day, time, time zone, input value, and corresponding shift values in the spaces provided. The time zone can be skipped by hitting enter after the time. The default time zone for that station at that date and time will be automatically entered and the entry will skip to the first shift stage input point. Up to three pairs of stages and shifts may be entered on a line after the time data. These three points are entered with the first point being the lowest stage and corresponding shift. After entry of the first line of shift information, hit enter to get to the second line. On the second line the date and time can be left blank, with or without a comment, and the shift will prorate linearly through time to the next available shift. If a date and time is entered on the second line, the shift will be held constant through time and ended at the date and time specified.

Note: When inputting shifts (whether inserting, adding or changing), the input points and the corresponding shift are separated by spaces. The values will not be lined up perfectly under the headers as they are entered. After entering all data on a line, a carriage return will center the data in their respective columns. Any comments on the end date line should be lined up under the comment header.

4.5.8 Primary Computations

by Joseph P. Nielsen

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 when running the PRIMARY computations program:

1. Primary computations actually run a number of individual computation programs in series:
    - Computation of data correction and computed unit values for the input parameter(s)
    - Computation of shift-correction unit values (if discharge processing)

- Computation of computed unit-values for the output parameter, daily-values, and production of the primary report

As the steps in the primary computation progress, the status is displayed to the screen.

2. The date range given for primary computations can cross a water-year boundary (October 1 and September 30) but can only consist of up to 366 days. It will prorate shifts, data corrections, and ratings automatically across water years as well.

3. The primary computations are performed from either the input or output DD record. If an input DD is specified, the primary computation will proceed on all the processors that use that input DD.

4. For primary computations to proceed, a processor record must be established for either the chosen DD or for a DD that uses the chosen DD as input. If no processor record is available, the user is returned to the main PR menu.

5. Primary computations, other than a "Report Only" primary, cannot be performed during a water year where "Approved" or "In-Review" daily-values records already exist for the DDs concerned in the computation. For example, a slope station cannot be recomputed anytime in a particular water year if any one of the DDs 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 "Approved" or "In-Review."

6. The screening of unit-values for a computed DD, such as discharge, is done during the PRIMARY program. The Threshold limits used for this screening are the computed DD thresholds that were entered in the DD_EDIT or THRESHOLD_EDIT programs.

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

8. The maximum number of unit-values processed by the Primary program is 2880 UVs per day. This allows processing of data collected at fixed intervals down to 30 seconds. The actual data-collection intervals may be less than that, for example measurements from an event-driven recorder, but the Primary can only process 2880 such measurements.

Program Operation:

Interactive primary computations are controlled through two menu screens. After selecting "Primary Computations" from the PR menu, the first screen displayed is the standard ADAPS startup menu. This menu displays the user's current settings. Any of the options can be changed by entering the two-character identifier for the option to be changed. The options available are:

- PA - File Path
- OT - Output To
- DB - Data Base

- AG - Agency
- ST - Station(s)
- DD - Data Descriptor
- DT - Dates
- BA - Job mode

The second menu screen is the primary computations menu. This menu displays the primary report options. Any of the options can be changed by entering the two-character identifier for the option to be changed. The options available in this table are.

- RP- Primary Report
- RO- Report Only
- DG- Diagnostic Report
- QU- Quit Primary
- EX- Exit ADAPS

RP-Primary Report: Two primary report options are available, “historical” and “standard.” The historical primary report includes hourly unit-values, whereas the standard primary report does not. The report will automatically be set to the default, which is established in the setup of the data descriptor. The type of report selected can be changed from the default to the other option by typing “RP.”

RO- Report Only will be set to “NO” when the screen first appears. Changing Report Only to “YES” will generate a primary report but will not save the computed values back to the database. The report will state “Report Only Primary” in the upper right hand corner along with the data aging status.

DG- Diagnostic Report will be set to “NO” when the screen first appears. Changing Diagnostic Report to “YES” provides a report of unit-value computational information including date/time, corrected input unit-value, shift used, and shifted unit-value for each unit-value for the time period requested (times shown on the report are the original recorded UTC times). The specific information may vary from above depending on the type of computation.

After the interactive computations are completed, the user is returned to the PR menu.

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.

4.5.9 DVTABLE_EDIT, Edit Daily-Values Statistical Summary

by Glenn B. Engel

The DVTABLE_EDIT program is used to edit the current year and period-of-record statistics portion of the daily-values table statistical summary. The instantaneous peak-flow, peak stage, and low flow values and dates must be added to the table using the DVTABLE_EDIT program. The statistical summary is available only on a type 1 daily-values table.

Select the Edit DV Statistical Summary option from the ADAPS menu or by using DVTABLE_EDIT from the command line. The first screen indicates pathname and database. The DVTABLE_EDIT program operation is controlled through a series of menu screens.

The first menu screen is the standard ADAPS user information menu. Use the menu to select the station, data descriptor, statistic, and water year of the table to be edited.

The second menu screen indicates the station and DD selected and the period of record for the statistics and when statistics were last run. The menu is used to select the desired operation to perform.

```
OPTION: 1 = NEW STATION OR WATER-YEAR
        2 = CHANGE STATISTICAL PERIOD
        3 = CHANGE SUPPRESSION FLAGS
        4 = COMPUTE STATISTICS
        5 = EDIT STATISTICS
        6 = SAVE STATISTICS
        7 = DELETE SUMMARY
```

Option 1 allows the user to change the station or water year at this point.
Option 2 allows a change in the period of record to compute the statistics.
Option 3 allows changes in use of contributing drainage area for statistics, suppressing rounding, and use of records with missing data.
Option 4 computes the statistics for the year chosen and for the period of record chosen.
Option 5 is used to edit the peak-flow and peak stage (instantaneous as opposed to daily) with dates of occurrence for the current year and for the period of record, if necessary. Low flow for the current year and for the period of record can be edited also.

```
IN - INSTANTANEOUS VALUES INITIALIZED
CV - COMPUTED STATISTICS PRELIMINARY

PW - PEAK FLOW (WATER YEAR)         -          DATE -
PR - PEAK FLOW (PERIOD OF RECORD)   -          DATE -
SW - PEAK STAGE (WATER YEAR)        -          DATE -
SR - PEAK STAGE (PERIOD OF RECORD)  -          DATE -
LW - LOW FLOW (WATER YEAR)          -          DATE -
LR - LOW FLOW (PERIOD OF RECORD)    -          DATE -

MO - EDIT PERIOD OF RECORD MONTHLY STATISTICS
SU - EDIT PERIOD OF RECORD SUMMARY STATISTICS
```

This menu screen also allows access to edit the period of record monthly (MO) and summary (SU) statistics manually if desired, although these are updated automatically when the statistics are run.

Options 6 and 7 are self explanatory.
When the new statistics for the period of record are run and statistics are edited, a completed daily-values table can be printed (DV_TABLE) using the "statistical summary" option which will include monthly, annual, and instantaneous values for the period of record ready for publishing.

4.5.10 DV_MANIP, Daily-Values Manipulation

The DV_MANIP program allows the user to manipulate daily-values data. Examples are copying daily-values from one data set to another, adding values for two stations together, subtracting one station from another, and lagging a station by a specified amount of time.

Options available from DV_MANIP menu

(0) Restore original ADAPS data -- The user has the opportunity to restore the original ADAPS data if an ADAPS data set has been modified during the current session by being the output of some manipulation.

(1) Review (display) existing data -- 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.

(2) Copy DV data from one data set to another -- Y(i) = X(j). The subscripts (i) and (j) represent time periods of the output and input data sets as explained later. The existing data, including rounding and write-protect flags are copied without change.

(3) Compute by evaluating the equation: Y = a + b(X+c)^d -- Create an 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, no input data set, X is used and all values of the output data are set to the constant, a.

(4) Combine two data sets: Y = X1 (operator) X2 -- Create an output data set by combining two data sets, Y(i) = X(j) @ X2(k), where @ is one of the arithmetic operators: + - * / ^ and the subscripts (i), (j), and (k) represent time periods.

(5) Transform a data set: Y = (transformation) X -- Create an 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).

(6) Enter daily-values, day-by-day -- Daily-values are entered on a day-by-day basis as each date for the period specified shows on the screen.

(7) Convert English (CFS) to metric (CMS) -- 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.

(8) Compute load from discharge and concentration -- 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.

(9) Round to nearest .5 units -- Round data to nearest .5 units: Y(i) = [rounding-function][X(j)] and is usually used for temperature data.

Warning: Mean temperatures may have been rounded to the nearest 0.5 degree in the DV table. However, when a DV table of mean temperatures that includes monthly statistics is retrieved, the monthly mean on the output from running DVTABLE is not necessarily rounded to the nearest 0.5 degree. This is because a computation during the execution of DVTABLE computes the mean of the daily means for the month.

Note: The rounding of temperature data from a field recorder to the nearest 0.5 degrees is no longer necessary, as reporting temperature to the nearest 0.1 degree Celsius is acceptable.

(10) Set write-protect, rounding flags – The user has the option of setting write-protect and/or rounding flags on a data set.

Note: In the equations above, Y(i) represents one daily value in the output data set while X(j) and X2(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.

Program Operation

The following is the sequence of operations necessary to perform a daily-values manipulation:

- Begin
- Specify output destination
- Specify output data set
- Specify data set output option
- Specify daily-value manipulation option
- Specify input data source

- Specify input data set
- Acknowledge update of write/protection, rounding flags
- Display input data set
- Display, store or cancel program

After the DV_MANIP program is chosen from the ADAPS menu, 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/F/Tn,<CR>=A):

Here the user is prompted to specify where the output data (the results of the manipulations) are to be stored.   That is, the destination must be indicated for the daily-values data that will be computed under the manipulation selected. There are four options for storing the results:

A The results are to be stored in an ADAPS daily-values record. The user is given an opportunity to specify the database, 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.
F The results are to be written to a file in a daily-values table format suitable for printing.
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.

If the user, for example, enters "T1" at the prompt, as shown below, a temporary data set will be used.

Specify output destination (A/C/F/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 database, agency, site, data descriptor and statistic code as well as the date-span. Since no data yet exists 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 in the ADAPS menu were described previously and are:

0. Restore original ADAPS data
1. Review (display) existing data
2. Copy DV data from one data set to another
3. Compute by evaluating the equation: Y = a + b(X+c)^d
4. Combine two data sets: Y = X1 (operator) X2
5. Transform a data set: Y = (transformation) X
6. Enter daily-values, day-by-day
7. Convert English (CFS) to metric (CMS)
8. Compute load from discharge and concentration
9. Round to nearest .5 units
10. Set write-protect, rounding flags

If Option 2 is selected, the following prompt is displayed:

COPY DATA SET

After specifying the output data set and selecting the manipulation option desired, the user is 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 the user enters 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 appear 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):
ENTER ENDING DATE AS (MM DD YYYY):

Note: The date-span selected for the input data set does not have to be 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):

The results of the manipulation may be reviewed before actually storing the data. The following options are allowed:

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.

The result of the manipulation could have been displayed before storing.
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). This also often occurs if an ADAPS data set is chosen for output.

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 – Re-specify output data set.
Cancel the current output selection and reenter.

Q Quit program.
Return to ADAPS menu.

Note: This program will not modify data where the water year has been marked as "in review or approved."

If D is chosen, 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: In this example, the output data set was for the entire water year while the input data set was for 10-5 through 9-30. Therefore the input value for 10-5 was copied to 10-1 for the output and so forth, and there were no data available for the last five 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.

4.5.11 Print/Display Unit-Values Tables

For more information on Print/Display Unit-Values Tables see ***Section 4.7.2*****.**

4.5.12 Daily-values Tables

For more information on Daily-Values Tables see ***Section 4.6.4.***

4.5.13 EOYSUMM, End-of-Year Summary

The EOYSUMM, End-of-Year Summary program is used to obtain extremes of gage height and discharge generally during a particular water year and also to obtain a listing of peaks above a base discharge, if one has been defined, for entry into the peak-flow file.

The EOYSUMM program allows the user to select the station number, data descriptors containing computed unit-values, the time period to be processed, and the destination of printed output at the user information screen. A <CR> at the user information screen starts the processing. Computed unit-values must be previously stored for the data descriptors selected.

EOYSUMM currently is set up specifically to produce table summaries for discharge and gage height. 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, and based on the criteria given in the WRD Data Reports Preparation Guide (Novak, 1985, p. 93).

The program also lists the maximum and minimum discharges and corresponding gage heights, as well as the maximum and minimum gage heights and corresponding discharges. Finally, a list of maximum and minimum daily-values for mean discharge is printed. Discharges are listed in both CFS and CMS and gage heights are listed in both feet and meters.

It is the responsibility of the user to check the values obtained from the EOYSUMM program against the final record to verify that the computed unit-values of gage height and discharge are correct.

The user has the option of sending the peak-flow data obtained through the EOYSUMM program directly to a peak-flow submission file that will be used to update the peak-flow database.

4.5.14 Peak-Flow Entry and Retrieval (PEAKFLOW)

by David L. Kresch

To access the Peak-flow Entry and Retrieval program (PEAKFLOW), select the PR sub-menu from the main ADAPS menu, and then select the "Peak-Flow Entry and Retrieval" option. The resulting menu gives the user the option of either editing (option 1) or retrieving (option 3) data from the Peak-flow file. The Peak-flow file is edited (updated) by means of a card-image file that must already exist before entering PEAKFLOW. When option 1 is selected, the program prompts the user for the name of the file that contains the card images. These cards are similar to, and in most cases have the same format as the old WATSTORE cards. Descriptions of these cards are in the sections that follow.

An operating system command -- pkrtfq (PeaK ReTrieval and FreQuency) -- has been provided to automate the process of retrieving peak-flow data from the NWIS ADAPS subsystem and performing flood-frequency analysis with the HASS PEAKFQ program. This command is discussed in the ***Flood Frequency Analysis*** section near the end of this chapter.

Introduction

The Peak-flow file contains a collection of instantaneous maximum (peak) stream discharges and associated gage heights (stages) at streams throughout the nation. The file is organized by agency, water-measurement site, and water year. The file contains, for each water year during the period of record at each site, one record for the annual peak discharge and one record for each partial duration peak discharge. A water year, the 12-month period from October through September, is named by the calendar year in which it ends. For example, the 1995 water year begins on October 1, 1994 and ends on September 30, 1995.

The Peak-Flow Entry and Retrieval Program is used to:

- enter new records into the Peak-flow file
- change or correct information in a currently existing record
- delete one or more records
- move a peak to a partial peak or a partial peak to a peak
- list the contents of one or more records
- correct the data identifiers

The Peak-flow file is always used in conjunction with the Site File, which contains fixed identification items for all sites represented in the NWIS data files. Data will not be stored in or retrieved from the Peak-flow file unless the Site File contains header entries for the stations to be processed. This restriction ensures that all data are associated with a properly identified site. In addition to the mandatory items, a base discharge value (necessary to enter partial duration peak discharge data) and gage datum should also be stored in the Site File.

For each type of data to be stored in the Peak-flow file, the agency code, station ID number, and date of peak-flow must be provided. The time of peak may also be provided. These four record identifiers are listed below:

- Agency Code

- Station ID Number
- Date of Peak-Flow or Partial Duration Peak-Flow
- Time of Peak-Flow or Partial Duration Peak-Flow

The types of peak data and corresponding qualification codes stored in the Peak-flow file are listed and described in table 1.

Table 1: Peak-flow data elements

Data Element	Description
Peak-flow	The maximum instantaneous discharge for the water year.
Gage height (stage)	Gage height at the time of the maximum instantaneous discharge.
Gage height qualification codes	1 - gage height affected by backwater 2 - gage height not the maximum for the year* 3 - gage height at different site and(or) datum 4 - gage height below minimum recordable elevation 5 - gage height is an estimate 6 - gage datum changed during this year *If code 2 is given here, there should be date and data entries for the maximum annual gage height.
Peak-flow qualification codes	1 - discharge is a maximum daily average 2 - discharge is an estimate 3 - discharge affected by dam failure 4 - discharge less than indicated value, which is minimum recordable discharge at this site* 5 - discharge affected to unknown degree by regulation or diversion** 6 - discharge affected by regulation or diversion** 7 - discharge is a historic peak*** 8 - discharge actually greater than indicated value 9 - discharge due to snowmelt, hurricane, ice-jam or debris dam breakup A - year of occurrence is unknown or not exact B - month or day of occurrence is unknown or not exact C - all or part of the record affected by urbanization, mining, agricultural changes, channelization, or others D - base discharge changed during this year

Table 1: Peak-flow data elements (continued)

Data Element	Description
Peak-flow qualification codes	E - only annual maximum peak available for this year *Code 4 cannot occur simultaneously with codes 1, 2, 3, 7, or 8. **Codes 5 and 6 cannot occur simultaneously. ***Code 7 should indicate that the value for the particular year is a historic peak and the particular year occurred before or after the systematic record, or during a break in the systematic record.
Highest since year	Peak discharge reported is the highest since this year.
Annual peak stage	Maximum stage for the water year
Peak stage month	Month of peak stage
Peak stage day	Day of peak stage
Peak stage qualification code	1 - gage height affected by backwater 3- gage height at different site and(or) datum 5- gage height is an estimate. 6 - gage datum changed during this year
Partial duration peak discharge(s)	Each peak discharge less than annual maximum peak discharge but higher than base discharge in Site File
Partial duration peak time(s) discharge	Time of each partial duration peak
Partial duration peak stage(s) stage	Each peak stage less than annual maximum
Partial duration peak stage qualification codes	1 - gage height due to backwater 3 - gage height at different site and(or) datum 4 - gage height below minimum recordable elevation 5 - gage height is an estimate 6 - gage datum changed during this year
Partial duration peak discharge qualification codes	1 - discharge is a maximum daily average 2 - discharge is an estimate 3 - discharge affected by dam failure 4 - discharge less than indicated value, which is minimum recordable discharge at this site* 5 - discharge affected to unknown degree by regulation or diversion** 6 - discharge affected by regulation or 7 – discharge is a historic peak***

Table 1: Peak-flow data elements (continued)

Data Element	Description
Partial duration peak discharge qualification codes (continued)	8 - discharge actually greater than indicated value 9 - discharge due to snowmelt, hurricane, ice-jam, or debris dam breakup A - year of occurrence is unknown or not exact B - month or day of occurrence is unknown or not exact C - all or part of the record affected by urbanization, mining, agricultural changes,channelization, or others D - base discharge changed during this year E - only annual maximum peak available for this year *Code 4 cannot occur simultaneously with codes 1, 2, 3, 7, or 8. **Codes 5 and 6 cannot occur simultaneously. ***Code 7 should indicate that the value for the particular year is a historic peak and the particular year occurred before or after the systematic record, or during a break in the systematic record.

Peak-flow Entry Program Operation

Six peak-flow entry program operations are available. Table 2 summarizes the operations and the corresponding codes used to request the operations. The card types available for each operation are also shown in the table. The operation code is specified by means of the peak-flow code card (card 2).

Table 2: Summary of operations and corresponding codes

Code	Operation	Card Types
ENT	Initially enter peak-flow information or update peak-flow information	Z,2,3,4,X
CID	Change or correct the record access key identifiers (agency or site identification) with which the peak-flow data are stored.	Z, 2, X, 6
DEL	Delete one or more peak-flow records for a site.	Z, 2, X
MOV	Move a peak to a partial peak or a partial peak to a peak.	Z, 2, X
PRT	Print out one or more records for a site in table format.	Z, 2, X
YER	Change or correct the water year.	Z, 2, X

Data Identification

Peak-flow records are uniquely identified by three required items: agency code, site identification number, and date of peak-flow. Optionally, the time of a peak-flow may also be provided, but if provided, it becomes part of the identifier and must be used to reference the record. The default agency code is USGS, but it can be overridden through the use of a Z-card. The site identification number and dates of peak-flow for the CID, DEL, PRT, and YER operations are specified on the 2-Card. For the ENT operations, site identification is specified on the 2-card, but the date of peak-flow is specified on the 3- or 4-card. Time of peak-flow for ENT operations is specified by using an X-Card following the 3- or 4-card. Time of peak-flow for all other operations is specified by using an X-Card following the 2-card.

Agency Identification

The agency responsible for the data stored in the Peak-flow file is identified by a code consisting of three to five alphanumeric characters. Each record in the Peak-flow file must be identified by an agency code. The use of an agency code in processing peak-flow data is mandatory. A data record not identified by agency will result in an error message, and the data will be ignored. The agency code, if other than “USGS” must be specified on the agency identification card (Z-card).

Site and Water Year Identification

The other two required identifiers of a peak-flow record, the site identification number and the date (water year identification) of the peak, are specified on the peak-flow code card (2-card). The peak-flow code card (2-card) is required to identify the data to be entered or updated in the Peak-flow file, and to specify the operation. A description of the format of a generalized peak-flow code card follows.

Table 3: Generalized peak-flow code card (2-card)

Columns	Description
1	Enter a 2.
2-16	Site identification number
17-38	Blank
39-42	Beginning calendar year of the period of record to be processed (operation codes CID, DEL, MOV, and PRT), or incorrect calendar year of the record to be Changed (operation code YER). If the month (col. 43-44) is blank, this field is assumed to be a water year. If operation code is ENT, leave this field blank.
43-44	Beginning (or incorrect) month -- a 2-digit number that represents the beginning month of the period of record to be processed (for example, 01 for January, 12 for December). If the operation code is ENT, leave this field blank.
45-46	Beginning (or incorrect) day -- a 2-digit number that represents the beginning day of the period of record to be processed. If the operation code is ENT, leave this field blank.
47-50	Ending calendar year of the period of record to be processed (operation Codes CID, DEL, and PRT), or correct calendar year of the record (operation code YER). If the month (col. 51-52) is blank, this field is assumed to be a water year. If operation code is ENT or MOV leave this field blank.
51-52	Ending month -- a 2-digit number that represents the ending month of the period of record to be processed. If the operation code is ENT, MOV, or YER leave this field blank.
53-54	Ending day -- a 2-digit number that represents the ending day of the period of record to be processed. If the operation code is ENT, MOV, or YER leave this field blank.
55-57	Operation Code (*see Table 2*).
59-80	Blank

Time Identification

If the time is included in the identifier, it is specified using the X-card. Once a record has been tagged with a time, the time must be used in future operations to identify the record. Time of peak-flow for ENT operations is specified by using an X-card following the 3- or 4-card. Times for the other operations are specified by using an X-card following the 2-card.

The following sections contain detailed descriptions of the six program operations and the formats of the cards that are available for use with them.

Data Entry (ENT)

The operation code ENT is used for entering or updating peak-flow data from card-image files, to be stored in the Peak-flow file. The agency code is supplied on the agency identification card (Z-card), and the other three record identifiers (site ID, date, and time) are supplied on the peak-flow code card (2-card), data cards (type 3- or 4-card), and extended data cards (X-card), respectively.

The water year, during which each peak discharge occurred, is determined from the calendar year and month specified on the type 3 or 4 data cards. The peak-flow data are also entered on card types 3 and 4. A type 3-card is used for annual peak discharge and annual maximum gage-height data, whereas a type 4-card is used for partial duration peak discharge data (peaks above a base). Fields are provided on the X-card to enter peak values of eight places, rather than seven, and/or the time at which the peak occurred.

With this operation, initial entry of data causes creation of a new record; data already existing in a record can be modified or deleted. If a new peak-flow record is to be created, a type 3-card must be supplied; in other cases, it is optional. Type 4-cards are always optional. Type 2-cards are always mandatory.

The five card types available for use with operation code ENT are:

- agency identification card (Z-card), optional
- peak-flow code card (2-card), mandatory
- peak-flow data card (3-card), optional when a 4-card is present
- partial duration peak-flow data card (4-card), optional when a 3-card is present
- extended data card (X-card), optional except when updating an existing record containing a time

A type 2-card, which contains the operation code ENT, is always required. If the optional Z-card is to be included, it must precede the 2-card.

At least one 3-card or one 4-card must be included. If both types 3- and 4-cards are given, the 3-card must follow the 2-card and precede the 4-card(s). The type 4-cards may appear in any order.

If the time of occurrence of a peak or extended length (8 digit) peak-flow value is to be entered, an X-card must immediately follow the 3 or 4-card that corresponds to the same peak.

Agency Identification Card (Z-card)

The Z-card is used when it is necessary to override the default agency code (USGS). The format of the Z-card used in an ENT operation is described below:

Table 4: Agency identification card (Z-card) for the ENT operation

```
------------------------------------
Columns  Description
------------------------------------
1        Enter a Z.
2-16     Site identification number
17-32    Blank
33-37    Agency code
38-80    Blank
```

Peak-Flow Code Card (2-card)

The type 2-card is required to identify the data to be entered or updated in the Peak-flow file. The format of the 2-card as it applies to the ENT operation is described below:

Table 5: Peak-flow code card (2-card) for the ENT operation

```
-------------------------------------
Columns  Description
-------------------------------------
1        Enter a 2.
2-16     Site identification number
17-54    Blank
55-57    Operation code -- enter ENT.
58-80    Blank
```

Peak-Flow Data Card (3-card)

The type 3 peak-flow data card is required for entering, updating, or deleting annual peak discharge or annual peak gage-height data. The type 3-card can be used only when the operation code ENT is specified on the type 2-card.

If the record identified by the site ID on the preceding type 2-card and the date on the type 3-card does not currently exist, a record will be created with the data entered on the type 3-card. For initial entry, the minimum requirement for a record to be created includes entry of an annual peak discharge, an annual peak stage, or a maximum annual stage. The remaining fields are optional. If a new record (water year entry) is being created, and type 4-cards are being processed, the type 3-card should precede all type 4-cards.

If the record specified currently exists, coded values on the 3-card will replace the values in the record. A value in the record may be deleted (that is, given a null value, rather than being replaced with a new value) by placing a string of 9s in the field; details are given below. No more than one annual peak can be entered for any given water year.

Table 6: Peak-flow data card (3-card) for the ENT operation

Columns	Description
1	Enter a 3.
2-16	Station ID number; same as on type 2-card.
17-20	Calendar year -- a 4-digit number representing the calendar year of the annual peak discharge; if columns 21-22 are blank, this field is assumed to be a water year.
21-22	Month -- a 2-digit number representing the month of the annual peak discharge. For example, March is coded as 03.
23-24	Day -- a 2-digit number in the range 01-31 representing the day of the month of the annual peak discharge.

Table 6: Peak-flow data card (3-card) for the ENT operation (continued)

Columns	Description
25-31	Annual peak discharge in cfs -- the value has a decimal point, and significant digits to the right of the decimal point where needed. Whole numbers need no decimal point. Blank fields are interpreted as no data available (initial entry) or no modifications necessary (updates). The data value may be put anywhere in the 7-column field (for example, bb19.2b, where b=blank). There must be no alphabetic characters or embedded blanks within the data values. The decimal point is inserted only when a fractional portion is to be reported. On an update, a field of 999999 is interpreted as a deletion code and the associated qualification codes are automatically deleted.
32-43	Annual peak discharge qualification codes -- this field contains 12 1-column fields in which up to 12 qualification codes can be entered. There are a total of 14 single-character codes presently available. Certain combinations of codes are invalid (See *Table 1* for codes).
44-51	Gage height associated with annual peak discharge -- the value is punched with a decimal point, and significant digits to the right of the decimal point where needed. Whole numbers need no decimal point. Blank fields are interpreted as no data available (initial entry) or no modifications necessary (updates).
52-55	Gage height qualification codes – this field contains four 1-column fields in which up to 4 qualification codes can be entered. There are a total of 6 single-character codes presently available (See *Table 1* for codes).
56-59	"Highest since" year -- a 4-digit number representing the calendar year after which the given peak discharge (cols. 25-31) is known to be the highest. This year is determined from historic newspaper accounts, local information, or other sources. Code 9999 to delete value. A blank indicates no year to be entered or no change.
60-75	Annual peak gage height information. These columns contain four fields for the annual peak gage height, to be coded ONLY if the maximum gage height for the water year is not the gage height associated with the maximum discharge.
60-61	Month, represented by a 2-digit number, in which the annual peak gage height occurred. While this month may not be in the same calendar year as the annual peak discharge, it is in the same water year.
62-63	Day of the month in which the annual peak gage height occurred
64-71	Annual peak gage height
72-75	Annual peak gage height qualification codes – this field contains four 1-column fields in which up to four qualification codes can be entered. There are a total of four single-character codes presently available (See *Table 1* for codes).
76-80	Blank

Partial Duration Peak-Flow Data Card (4-card)

The type 4 peak-flow data card is required for entering, updating, or deleting partial duration peak discharge data (data above a base and less than an annual maximum). The type 4-card can be used only when the operation code ENT is specified on the peak-flow code.

To add partial duration peak data to a record, a base discharge should be in the Site File and the annual peak record should either already exist or be in the process of being created; the latter requiring that a type 3-card also be supplied preceding the type 4-cards. If the record is being created, then each type 4-card causes a partial duration peak entry to be added to the record. If the record already exists, each type 4-card either causes a partial duration peak entry to be added or causes one to be updated. If the month, day, and time match those of a partial duration peak entry already in the record, then an update is made to that entry. If the month, day, and time do not match, a new entry is added to the record. No more than one partial duration peak per date and time can be stored; however, there can be one partial duration peak and one annual peak stored for the same date and time.

For a partial duration peak to be added to a record, a value for the partial duration peak discharge or the partial duration peak gage height should be coded. To delete a partial peak entry from a record, a year/month/day and both the partial peak discharge and the gage height values must be deleted (coded). Qualification codes are automatically deleted when either a discharge or gage height value is deleted.

Table 7: Partial duration peak-flow data card (4-card) for the ENT operation

Columns	Description
1	Enter a 4.
2-16	Site ID number -- same as on type 2-card
17-20	Calendar year -- a 4-digit number representing the calendar year of the data on the card. This entry may or may not be the same as on the preceding type 3-card, if one is present, but the month and year must have occurred in the same water year as the peak discharge; if columns 21-22 are blank, this field is assumed to be a water year.
21-22	Month -- a 2-digit number representing the month of the partial duration peak.
23-24	Day -- a 2-digit number representing the day of the month of the partial duration peak.
25-31	Partial duration peak discharge -- the value is stored with a decimal point, and significant digits to the right of the decimal point where needed. Whole numbers need no decimal point. Blank fields will be interpreted as no data available (initial entry) or no modifications necessary (updates). The data value may be stored anywhere in the 7-column field (for example, bb19.2b, where b=blank). There must be no alphabetic characters or embedded blanks within the data values. The decimal point is stored only when a fractional portion is to be reported. On an update, a field of 999999 is interpreted as a deletion code and the associated qualification codes are automatically deleted. If cols.44-51 are also coded as a field of 999999, the partial peak data for the coded date are deleted from the record.

Table 7: Partial duration peak-flow data card (4-card) for the ENT operation (cont.)

Columns	Description
32-43	Partial duration peak discharge qualification code – This field contains 12 1-column fields in which up to 12 qualification codes can be entered. There are a total of 14 single-character codes presently available. The codes may be stored in any of the columns, in any order (for example, bb2A5bbbbbbb, where b=blank). If a code is to be deleted from a record in an update, it must be preceded by an asterisk (*) (for example, b2*A5bbbbbbb, in which codes 2 and 5 will be added, and code A deleted). Certain combinations of codes are invalid.(See *Table 1* for codes.)
44-51	Partial duration peak gage height -- the value is stored with a decimal point, and significant digits where needed to the right of the decimal point. Whole numbers need no decimal point. Blank fields are interpreted as no data available (initial entry) or no modifications necessary (updates). The data value may be punched anywhere in the 8-column field (for example, bb19.20b, where b=blank). There must be no alphabetic characters or embedded blanks within the data values. The decimal point is stored only when a fractional portion is to be reported. On an update, a field of 999999 is interpreted as a deletion code and the associated qualification codes are automatically deleted.
52-55	Partial duration peak gage height qualification codes – This field contains four 1-column fields in which up to four qualification codes can be entered. The codes may be stored in any of the columns (for example, b31b, where b=blank). If a code is to be deleted from the record in an update, it must be preceded by an asterisk (*) (for example, b*1b, in which code 1 will be deleted). (See *Table 1* for codes.)
56-80	Blank

Extended Data Option Card (X-card)

The type X extended data option card, which is optional, is used for entering the time of a peak and/or an 8-digit peak-flow value. It can be used with both the 3- and the 4-cards, and must immediately follow the 3- or 4-card to which it applies.

Table 8: Extended data card (X-card) for the ENT operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 3 or 4-card.)
17-20	Calendar year -- a 4-digit number representing the calendar year of the peak or partial duration peak-flow; if columns 21-22 are blank, this field is assumed to be a water year. (This field must match the corresponding field on the 3 or 4-card.)

Table 8: Extended data card (X-card) for the ENT operation (continued)

Columns	Description
21-22	Month -- a 2-digit number representing the month of the peak or partial duration peak-flow. (This field must match the corresponding field on the 3 or 4-card.)
23-24	Day -- a 2-digit number representing the day of the month of the peak or partial duration peak-flow. (This field must match the corresponding field on the 3 or 4-card.)
25-30	Time -- a 6-digit number representing the time of the peak or partial duration peak-flow.
31-38	Peak or Partial Duration Peak-flow, extended to 8 digits. Use this field only if the value will not fit in the 7-digit field provided on the 3 or 4-card.
39-43	Time -- a 6-digit number representing the time of the Annual Peak Gage Height (for use with 3-cards only).
45-80	Blank

Change Record Identifiers (CID)

The operation code CID indicates that records in the file are to have one or more of their record identifiers changed. The four record identifiers are the agency code, the site ID, date, and time. Only the agency code and the site ID may be changed using the CID operation. Water year is changed by the YER operation. To change the month or day of an annual peak, or to change the month, day, or time of a partial peak, it is necessary to manually delete the entry and add it back with the correct date and/or time.

The new or corrected site ID must be specified on the peak-flow code card (type 2), along with the operation code CID and the water year or range of years of the record to be corrected. If all records for that site are to be corrected, no water year is specified. The current existing site ID must appear on the special program option card (type 6). If the agency code is to be corrected, the new agency code must be specified on a Z-card preceding the peak-flow code card, and the current agency code must be specified on a Z-card preceding the special program option card (6-card).

The three card types available for use with operation code CID are:

(a) agency identification card (Z-card), optional
(b) peak-flow code card (2-card), mandatory
(c) extended data card (X-card), optional
(d) special program option card (6-card), mandatory

Agency Identification Card (Z-card)

The agency identification card (Z-card) is optional. It may be required to:

- supersede the agency code submitted by the symbolic parameter
- correct the agency code in the Peak-flow file

If the agency code is to be corrected, the correct agency code is specified in columns 33-37 of the Z-card preceding the peak-flow code card, and the current agency code is specified in columns 33-37 of the Z-card preceding the special program option card. A brief description of the Z-card follows:

Table 9: Agency identification card (Z-card) for the CID operation

Columns	Description
1	Enter a Z.
2-16	Site ID number
17-32	Blank
33-37	Agency code
38-80	Blank

Peak-Flow Code Card (2-card)

The correct record identifiers (except the agency code) are coded on the peak-flow code card. A site ID number must always be given. The 2-card is the first card except when preceded by a Z-card. A description of the 2-card as it applies to the CID operation follows:

Table 10: Peak-flow code card (2-card) for the CID operation

Columns	Description
1	Enter a 2.
2-16	Correct site ID number. This site must exist in the Site File.
17-38	Blank
39-42	Beginning calendar year of the period of record to be processed. If The month (col. 43-44) is blank, this field is assumed to be a water year.
43-44	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be processed (for example, 01 for January, 12 for December).
45-46	Beginning day -- a 2-digit number that represents the beginning day of The period of record to be processed.
45-47	Ending calendar year of the period of record to be processed. If the month (col. 51-52) is blank, this field is assumed to be a water year.
51-52	Ending month -- a 2-digit number that represents the ending month of the period of record to be processed.
53-54	Ending day -- a 2-digit number that represents the ending day of the period of record to be processed.
55-57	Operation code -- enter CID.
58-80	Blank

Extended Data Option Card (X-card)

The type X extended data option card, which is optional, is used for entering the beginning and ending times for the period.

Table 11: Extended data card (X-card) for the CID operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 2-card.)
17-20	Beginning calendar year of the period of record to be processed. If the month (col. 43-44) is blank, this field is assumed to be a water year. (This field must match the corresponding field on the 2-card.)
21-22	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be processed. (This field must match the corresponding field on the 2-card.)
23-24	Beginning day -- a 2-digit number that represents the beginning day of the period of record to be processed. (This field must match the corresponding field on the 2-card.)
25-30	Beginning time -- a 6-digit number that represents the beginning time of the period of record to be processed.
31-38	Blank
39-43	Ending time -- a 6-digit number that represents the ending time of the period of record to be processed.
45-80	Blank

Special Program Option Card (6 Card)

The incorrect record identifiers (except the agency code) are coded on the special program option card. The 6-card follows the 2-card (or X-card if present). If required, a Z-card may precede the 6-card. A description of the 6-card as it applies to the CID operation follows:

Table 12: Special program option card (6 Card) for the CID operation

Columns	Description
1	Enter a 6.
2-16	Incorrect site ID number (the number to be changed).
17-80	Blank

Options

The change to be executed by the CID operation is controlled by the content of the input cards. The two possible options are to change agency code or site ID number. Generally, the five control cards are submitted in the following order:

- Z-card (mandatory only for agency code change)
- 2-card (mandatory for all options)
- X-card (used only when including times with the dates)
- Z-card (mandatory only for agency code change)
- 6-card (mandatory for all options)

The Z-card (agency identification card) is required for the agency change option and in all other cases where the agency is not the default of USGS. The site ID contained on the 2-card and preceding Z-card must correspond to an entry in the Site File. The site ID contained on the 6-card and preceding Z-card need not correspond to an existing entry in the Site File. The two change options are described below.

Change of Agency Code

There must be an entry in the Site File that corresponds to the new agency code and current site ID number. Four cards are needed to change the agency code:

- a Z-card, containing the new or corrected agency code
- a peak-flow code card (2-card) containing the operation code CID and the site ID number
- a second Z-card, containing the agency code currently used to identify the record
- a special-program option card (6-card) containing the current site ID number

The second card, the peak-flow code card (2-card), may optionally contain one or two water year entries. If only one water year is given, the agency code will be changed only in the record for that water year. If two water year entries are given, the agency code will be changed in the records for all years within the range defined by the two water years, inclusive. If no water year entries are made on the peak-flow code card, then the agency code will be changed in all records for the site. There need not be an entry in the Site File for the site identified by the second Z-card.

Change of Site ID Number

There must be an entry in the Site File that corresponds to the current agency code and the new site ID number. If the agency code is the default of USGS, only two cards are needed to change a site ID number:

- a peak-flow code card (2-card) containing the operation code CID and the new or corrected site ID number
- a special program option card (6-card) containing the site ID number currently in the record

The first card, the peak-flow code card, may optionally contain one or two water year entries. If only one water year is given, the site ID number will be changed only in the record for that water year. If two water year entries are given, the site ID number will be changed in the records for all years within the range defined by the two water years, inclusive. If no water year entries are made on the peak-flow code card, then the site ID number will be changed in the records for all water years.

There need not be an entry in the Site File for the site identified by the special program option card (6-card). If the site ID number is changed using the CID operation and that number (new number) is not present in the Site File, an entry must be made in the Site File before the station data can be changed.

Record Deletion (DEL)

The operation code DEL indicates that one or more records (water year) for a site are to be deleted from the peak-flow file. The peak-flow code card (2-card) is required for this operation, and the extended data card (X-card) is also required if the record to be deleted includes a time identifier. The agency identification card is optional.

The site ID number and the operation code DEL are specified on the peak-flow code card. Optionally, one or a range of years may be specified on the peak-flow code card. If only a begin date or end date is specified, only the record for that date is deleted. If two dates are specified, all records within the range defined by the two dates will be deleted. If a single record is being deleted (blank begin or end date) the time of the peak, if any, must also be indicated. Times can also be included when deleting a range of peak records. The time(s) of the peaks to be deleted are specified on extended data cards (X-cards).

The three card types available for use with operation code DEL are:

- agency identification card (Z-card), optional
- peak-flow code card (2-card), mandatory
- extended data card (X-card), optional except when deleting a single value that includes a time identifier

Agency Identification Card (Z-card)

The agency identification card must precede the peak-flow code card, if needed, to supersede the default agency. A brief description of the Z-card follows:

Table 13: Agency identification card (Z-card) for the DEL operation

Columns	Description
1	Enter a Z.
2-16	Site ID number
17-32	Blank
33-37	Agency code
38-80	Blank

Peak-Flow Code Card (2-card)

The site ID number must always be given on the peak-flow code card. The 2-card is the only card required, except when the Z-card is needed to identify the agency, or the X-card is needed to specify a time. A description of the 2-card as it applies to the DEL operation follows:

Table 14: Peak-flow code card (2-card) for the DEL operation

Columns	Description
1	Enter a 2.
2-16	Site ID number
17-38	Blank
39-42	Beginning calendar year of the period of record to be deleted. If the month (col. 43-44) is blank, this field is assumed to be a water year. If one year is to be deleted, this field must be coded.
43-44	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be deleted (for example, 01 for January, 12 for December).(If left blank, assumes year in columns 39-42 is a water year.)
45-46	Beginning day -- a 2-digit number that represents the beginning day of The period of record to be deleted.
47-50	Ending calendar year of the period of record to be deleted. If the month(col. 51-52) is blank, this field is assumed to be a water year. If one year is to be deleted, this field must be coded.
51-52	Ending month -- a 2-digit number that represents the ending month of the period of record to be deleted. (If left blank, assumes year in columns 47-50 is a water year.)
53-54	Ending day -- a 2-digit number that represents the ending day of the period of record to be deleted.
55-57	Operation code -- enter DEL.
58-80	Blank

Extended Data Option Card (X-card)

The type X extended data option card, which is optional, is used for entering the beginning and ending times for the period.

Table 15: Extended data card (X-card) for the DEL operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 2-card.)
17-20	Beginning calendar year of the period of record to be deleted. If the month (col. 43-44) is blank, this field is assumed to be a water year. (This field must match the corresponding field on the 2-card.)
21-22	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be deleted. (This field must match the corresponding field on the 2-card.)
23-24	Beginning day -- a 2-digit number that represents the beginning day of The period of record to be deleted. (This field must match the corresponding field on the 2-card.)
25-30	Beginning time -- a 6-digit number that represents the beginning time of the period of record to be deleted.
31-38	Blank
39-44	Ending time -- a 6-digit number that represents the ending time of the period of record to be deleted.
45-80	Blank

Record Move (MOV)

The operation code MOV indicates that a record for a site is to be moved from a peak to a partial peak, or from a partial peak to a peak. The peak-flow code card (2-card) is required for this operation, and the extended data card (X-card) is also required if the record to be moved include a time identifier. The agency identification card is optional.

The site ID number, the date of the peak, and the operation code MOV are specified on the peak-flow code card. If the record being moved includes the time of the peak, the time must also be specified. The time of the peak to be moved is specified on an extended data card (X-card).

The three card types available for use with operation code MOV are:

- agency identification card (Z-card), optional
- peak-flow code card (2-card), mandatory
- extended data card (X-card), optional except when moving a record that includes a time identifier

Agency Identification Card (Z-card)

The agency identification card must precede the peak-flow code card, if needed, to supersede the default agency. A brief description of the Z-card follows:

Table 16: Agency identification card (Z-card) for the MOV operation

Columns	Description
1	Enter a Z.
2-16	Site ID number
17-32	Blank
33-37	Agency code
38-80	Blank

Peak-Flow Code Card (2-card)

The site ID number and date of the record to be moved must always be given on the peak-flow code card. The 2-card is the only card required, except when the Z-card is needed to identify the agency, or the X-card is needed to specify a time. A description of the 2-card as it applies to the MOV operation follows:

Table 17: Peak-flow code card (2-card) for the MOV operation

Columns	Description
1	Enter a 2.
2-16	Site ID number
17-38	Blank
39-42	Calendar year of the record to be moved. This field must be coded.
43-44	Month -- a 2-digit number that represents the month of the record to be
43-45	Moved (for example, 01 for January, 12 for December).
45-46	Day -- a 2-digit number that represents of the record to be moved.
47-55	Blank.
55-57	Operation code -- enter MOV.
58-80	Blank.

Extended Data Card (X-card)

The type X extended data option card, which is optional, is used for entering the time of the record to be moved.

Table 18: Extended data card (X-card) for the MOV operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 2-card.)
17-20	Calendar year of the period of record to be moved. (This field must match the corresponding field on the 2-card.)
21-22	Month -- a 2-digit number that represents the month of the record to be moved.(This field must match the corresponding field on the 2-card.)
23-24	Day -- a 2-digit number that represents the day of record to be moved. (This field must match the corresponding field on the 2-card.)
25-30	Time -- a 6-digit number that represents the time of the record to be moved.
31-80	Blank

Record Print (PRT)

The operation code PRT indicates that one or more records for a site are to be printed in a peak-flow record list format. Only the peak-flow code card type 2 is required for the PRT operation. The agency identification card is optional.

The site ID number and the operation code PRT are specified on the peak-flow code card. Optionally, one or two dates may be specified on the peak-flow code card. If a single date is specified, only the record for that year is printed. If two dates are specified, all records for the site between these dates will be printed. If no dates are given, all records for the site will be printed.

The two card types available for use with operation code PRT are:

- agency identification card (Z-card), optional
- peak-flow code card (2-card), mandatory
- extended data card (X-card), optional

Agency Identification Card (Z-card)

The agency identification card must precede the peak-flow code card if needed to supersede the default agency of USGS. A brief description of the Z-card follows:

Table 19: Agency identification card (Z-card) for the PRT operation

Columns	Description
1	Enter a Z.
2-16	Site ID number
17-32	Blank
33-37	Agency code
38-80	Blank

Peak-Flow Code Card (2-card)

The site ID number must always be given on the peak-flow code card. The 2-card is the only card used, except when a Z-card is needed to identify the agency. A description of the 2-card as it applies to the PRT operation follows:

Table 20: Peak-flow code card (2-card) for the PRT operation

Columns	Description
1	Enter a 2.
2-16	Site ID number
17-38	Blank
39-42	Beginning calendar year of the period of record to be printed. If the month (col. 43-44) is blank, this field is assumed to be a water year. If this entry is left blank, the printing will begin with the earliest record(chronologically) available for the site.
43-44	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be printed (for example, 01 for January, 12 for December).(If left blank, assumes year in columns 39-42 is a water year.)
45-46	Beginning day -- a 2-digit number that represents the beginning day of the period of record to be printed.
47-50	Ending calendar year of the period of record to be printed. If the month (col. 51-52) is blank, this field is assumed to be a water year. Code this entry if a range of water years is to be listed.
51-52	Ending month -- a 2-digit number that represents the ending month of the period of record to be printed. (If left blank, assumes year in columns 47-50 is a water year.)
53-54	Ending day -- a 2-digit number that represents the ending day of the period of record to be printed.
55-57	Operation code -- enter PRT.
58-80	Blank

Extended Data Option Card (X-card)

The type X extended data option card, which is optional, is used for entering the beginning and ending times for the period.

Table 21: Extended data card (X-card) for the PRT operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 2-card.)
17-20	Beginning calendar year of the period of record to be printed. If the month (col. 43-44) is blank, this field is assumed to be a water year. (This field must match the corresponding field on the 2-card.)
21-22	Beginning month -- a 2-digit number that represents the beginning month of the period of record to be, printed. (This field must match the corresponding field on the 2-card.)
23-24	Beginning day -- a 2-digit number that represents the beginning day of the period of record to be printed. (This field must match the corresponding field on the 2-card.)
25-30	Beginning time -- a 6-digit number that represents the beginning time of the period of record to be printed.
31-38	Blank.
39-44	Ending time -- a 6-digit number that represents the ending time of the period of record to be printed.
45-80	Blank

Update Water Year (YER)

The operation code YER indicates that a record in the file has been stored with an incorrect water year that is to be corrected. If the date (other than just the water year) is to be corrected, the record must be deleted, and added again using the ENT operation.

If the default agency code is desired, only one card is needed to perform this function: the peak-flow code card (type 2) containing the operation code YER, the site ID number, the current water year, and the new or corrected water year.

Only a single water year can be placed on the peak-flow code card; that is, the water year can be changed for only a single record at a time, rather than for a range of records or all records for a station.

If required, a Z-card may be added preceding the 2-card, to supersede the default agency (USGS).

The three card types available for use with operation code YER are:

- agency identification card (Z-card) optional
- peak-flow code card (2-card) mandatory
- extended data card (X-card), optional

Agency Identification Card (Z-card)

If needed, the agency identification card must precede the peak-flow code card. A brief description of the Z-card follows:

Table 22: Agency identification card (Z-card) for the YER operation

Columns	Description
1	Enter a Z.
2-16	Site ID number
17-32	Blank
33-37	Agency code
38-80	Blank

Peak-Flow Code Card (2-card)

The primary identifiers, the current water year, and the operation code YER are coded on this card. A description of the 2-card as it applies to the YER operation follows:

Table 23: Peak-flow code card (2-card) for the YER operation

Columns	Description
1	Enter a 2.
2-16	Site ID number
17-38	Blank
39-42	Incorrect calendar year of the record(s) to be changed (as stored in the file). If the month (col. 43-44) is blank, this field is assumed to be a water year.
43-44	Incorrect month -- a 2-digit number that represents the month of the record to be changed (for example, 01 for January, 12 for December).
45-46	Incorrect day -- a 2-digit number that represents the day of the record to be changed.
47-50	Correct calendar year of the record(s) as they are to be stored in file.
51-52	Correct month -- a 2-digit number that represents the month that the record is to be changed to.
53-54	Correct day -- a 2-digit number that represents the day that the record is to be changed to.
55-57	Operation Code -- enter YER.
58-80	Blank

Extended Data Option Card (X-card)

The type X extended data option card, which is optional, is used for entering the beginning and ending times for the period.

Table 24: Extended data card (X-card) for the YER operation

Columns	Description
1	Enter an X.
2-16	Site identification number. (This field must match the corresponding field on the 2-card.)
17-20	Incorrect calendar year of the record(s) to be changed. If the month (col. 43-44)is blank, this field is assumed to be a water year. (This field must match the corresponding field on the 2-card.)
21-22	Incorrect month -- a 2-digit number that represents the month of the record to be changed. (This field must match the corresponding field on the 2-card.)
23-24	Incorrect day -- a 2-digit number that represents the day of the record to be changed. (This field must match the corresponding field on the 2 card.)
25-30	Incorrect time -- a 6-digit number that represents the time of the record to be changed.
31-38	Blank
39-45	Correct time -- a 6-digit number that represents the time that the record is to be changed to.
45-80	Blank

Multiple Operations

Any number of operations may be submitted for a given execution of the peak-flow entry procedure. Each 2-card indicates the beginning of an operation.

The input data cards must be organized in accordance with the following rules:

- When an agency card (Z-card) is required, it must precede the peak-flow code card (2-card) to which it applies.
- The first card for each operation must be a 2-card, except when a Z-card precedes the 2-card.
- Peak-flow data cards (3- and 4-cards) are used only when the operation code on the preceding 2-card is ENT.
- Special program option cards (6-card) are used only when the operation code on the preceding 2-card is CID.
- Extended data cards (X-card) may immediately follow 3- and 4-cards to include a time, or extend the length of the peak-flow field when the operation code on the preceding 2-card is ENT, may immediately precede 6-cards to include time for the CID operation, or may immediately follow 2-cards to include time for all other operations.

Standard Input Format for the Peak-Flow Record

If a record in the input file has the same record identifiers as a record that already exists in the Peak-Flow file, the input record replaces the existing record. A message is printed for every record inserted or replaced in the Peak-Flow file.

Output

The primary output consists of peak-flow records stored in the Peak-Flow file that are the result of entering or updating data. An entry is automatically made into a peak-flow output file for every entry to, and update of, the Peak-Flow file. This record shows the changes made to the Peak-Flow file. A peak-flow record table displaying the contents of the new or updated record(s) may also be produced.

A peak-flow record table may be generated using the PRT option on the Z-card. These records are placed in a separate print file specifically for this purpose.

Peak-Flow Retrieval Program Operation

The Peak-Flow Retrieval program is run interactively using an input file of site identifiers to specify the sites to be retrieved. Date and other retrieval specifications are given within the interactive responses during program operation. Two types of files can be used to specify the stations to be retrieved. One type, the agency/site-ID file, contains a list of agency and station numbers similar to those used by other programs within the NWIS system. The other type, the I-card file, contains a list of I-cards and optionally, Z-cards. Output from both files are identical except that if the old “WATSTORE style” Input/Update card format is selected, and if the option to include H, N, and Y-cards is selected, the I-cards are included in the output file. Each retrieval requires either an agency/site-ID file or an I-card file as input to the program.

Agency/Site-ID File

The agency/site-ID file contains a list of the agency codes and site-IDs (station numbers) of the sites to be included in the retrieval. Each station number is specified on a separate line (record) within the file. Optionally, the beginning and ending dates for the retrieval period for each site may also be specified. The format for each record in an agency/site-ID file is described below.

Table 25: Agency/station identification file for retrieval

```
------------------------
Columns  Description
------------------------
1-5      Agency code
6-20     Station identification number
21-28    Beginning date (YYYYMMDD) to be retrieved. (Optional)
29-36    Ending date (YYYYMMDD to be retrieved. (Optional)
```

During execution of the Peak-flow Retrieval program, the user may interactively enter a single retrieval period to be applied to all of the stations in the agency/site-ID file. However, this retrieval period will be overridden by retrieval dates entered into the agency/site-ID file for individual stations.

An agency/site-ID file can either be created manually, before entering the Peak-flow Retrieval program, or interactively within the program. To create an agency/site-ID file interactively, enter the desired name for the file in response to the program prompt:

Name of the peak-flow agency/site-ID file:

The program will not be able to find the file, and will ask the user if he or she wants to create one. After responding with yes, the user is given several different options for creating the file.

I-Card File

An I-card file contains a list of I-cards, which contain the site-IDs (station numbers) and other optional retrieval criteria for the sites to be included in the retrieval. Optionally, Z-cards can be included to specify agencies other than USGS. I-card files must be created before entering the Peak-Flow Retrieval program because they cannot be created interactively within the program.

Agency Identification Card (Z-card)

If needed, the agency identification card (Z-card) must precede the I-card to specify stations identified by agency codes other than USGS. A brief description of the Z-card follows:

Table 26: Agency identification card (Z-card)

```
Columns  Description
-------------------------------------
1        Enter a Z.
2-16     Site identification number
17-32    Blank
33-37    Agency code (left justified)
38-80    Blank
```

Station Identification Card (I-Card)

Each station to be included in a retrieval must be identified by an I-card. A brief description of the I-card follows:

Table 27: Station identification card (I-Card)

Columns	Description
1	Always I
2-16	Station identification number, right justified. This field may be left blank on the first I-Card of a retrieval, in which case the auxiliary data specified will be applied to all stations without matching I-Cards.
17-24	Generalized skew. If not specified, the generalized skew will be determined by the computer based on gage latitude and longitude using the generalized skew map accompanying the WRC guidelines.
25-32	Length of historic period, in years. A positive value must be supplied for the historic adjustment to be applied. The historic period contains the systematic record period as a subset. If this field is left blank, any input historic peaks will be ignored and any high outliers will be treated as normal systematic peaks.
33-40	User-specified historic-high-outlier discharge threshold. Used only in conjunction with the historic period, this threshold is used to override the WRC-computed high-outlier threshold. If this field is left blank, the WRC threshold will be lowered automatically to equal the smallest historic peak(s) if one is known. If a positive value is specified in this field, all peaks that exceed this value will be used in the historic adjustment. Any historic peaks lying below this value will be ignored.
41-48	User-specified low-outlier discharge criterion. This criterion, if a positive number, will override the WRC-computed low-outlier criterion. A blank, negative value, or zero will be ignored.
49-56	Gage base discharge, representing a lower limit of measurable flood peak discharge at the site. This discharge, if a positive number, will supersede the gage base inferred from any "less than" qualification codes of the input peak-flow records. A blank, negative value, or zero will be ignored. (The gage base discharge is not the same as the partial-duration base discharge that may be recorded in the Station Header File.
57-64	Standard error of the generalized skew. If not specified, a value of 0.55, corresponding to the standard error of the generalized skew map accompanying the WRC guidelines, will be used.
65-69	Station-option codes selected from the following list. The codes may be in any order or combination and may be punched in any available column. In case of conflict, the rightmost code is used. The available options are: (S) Station-skew option. Causes the station skew, adjusted for outliers and historic data, rather than the WRC weighted skew, to be used for the final frequency curve.

Table 27: Station identification card (I-Card) (continued)

Columns	Description
	(G) Generalized-skew option. Causes the generalized skew, rather than the WRC weighted skew, to be used for the final frequency curve.
	(K) Known regulation/urbanization input option. Allows peaks with the known regulation or urbanization codes (code 6 or C printed as K by program J407) to be included in the statistical analysis.
	(H) Historic peak input option. Allows all historic peaks to be used, whether or not they exceed the user-specified historic-high-outlier discharge threshold. The program will print a warning message if it finds any below-threshold historic peaks and will lower the threshold to include them. Use of this option may cause the historic adjustment to include some historic and systematic peaks that are not representative of the historic period.
70	Blank
71-74	Begin Year: first water year of retrieved records to be included in the statistical analysis; earlier years will be ignored. This value must be either blank or a four-digit number. If blank or less than the first year of the input record, no years will be dropped from the beginning of the record.
75-78	End Year: last water year of retrieved records to be included in the statistical analysis; later years will be ignored. This value must be either blank or a four-digit number. If blank or greater than the last year of the input record, no years will be dropped from the end of the record.
79-80	Blank

The information beyond column 16 is not used by the retrieval program, but is included in an output file of WATSTORE Input/Update cards if the option to include H, N, and Y-cards has also been specified.

Flood Frequency Analysis

An operating system command -- **pkrtfq** (**P**ea**K** **R**e**T**rieval and **F**re**Q**uency) -- has been provided to automate the process of retrieving peak-flow data from the NWIS ADAPS subsystem and performing flood-frequency analysis with the HASS PEAKFQ program. The command is executed from the operating system command prompt by entering **pkrtfq** followed by either the name of an I-card file (see previous section) or a gaging-station number.

Usage: **pkrtfq I_card_file [-o output_file_prefix]**

If a gaging-station number is entered instead of an I-card file, the program creates a temporary I-card file for that gaging station.

Two output files are created by the program. A text file, ending with the suffix ".prt", contains the flood frequency-analyses report(s) and a postscript file, ending with the suffix ".ps", contains the flood frequency plot(s).

The [–o output_file_prefix] option, which is optional, can be used to name the prefix of the output files. If the –o option is not included, the name of the I-card file or gaging-station number that was entered is used as the prefix for the output file names.

Note that pkrtfq, as stated above, is an operating system command - not an ADAPS menu option.

4.5.15 Manage Record Data Aging Status (SETSTATUS)

by James F. Cornwall

The SETSTATUS program is designed to allow records workers at various levels of responsibility to set the data aging codes for Unit-Values, Daily-Values, and related data such as Rating Dates, Shift and Correction Curves, and Statistical Summary records. The functional capability of this program varies with the user's level of access within the NWIS Database.

Introduction

Beginning with the NWIS 4.2 release, the PROVISIONAL/FINAL flags in the NWIS database for Unit- and Daily-values records have been replaced by fields known as "Data Aging Codes," which are used to indicate the status of records in their transition from raw measurements to published data. The value of the data aging code for each record may be one of the following:

Code	Field Name	Field Description
W	Working record	The record has been entered into the system and it has been checked by USGS personnel.
R	In-Review record	The processing of the record has been completed and it is currently awaiting review by the lead technician or reviewer.
A	Approved record	The processing of the record has been completed and it has been approved for publication.

The function of the SETSTATUS program is to set the data aging codes in order to protect the unit/daily-values and related records from modification once the records have been inspected by technicians and edited where necessary. The operation of the program and the scale of the data upon which it is allowed to operate, depend upon the level of access the user is allowed in the NWIS database. The user's access level, controlled by the UNIX groups that contain his or her UserID, may be "USER," "ADBA," or "SYST."

Technicians working on individual records will generally have "USER" access. Those whose tasks include reviewing records for approval will generally have access at the "ADBA" (ADAPS Database Administrator) level, while the overall technical supervisors and Database Administrators will have access at the "SYST" (System DBA) level. Program operation for the "USER" level is restricted to acting upon a single DD for a single water year. For each DD provided to the program, all related DDs are also automatically selected, and then all records for those DDs in the selected water year are flagged with the data aging code R to indicate the records are being moved from "Working" to "Review" status. Additional program capabilities, such as operation on multiple DDs using ADAPS Groups and specifying time spans other than a single water year, are allowed at the “SYST” access level, as described in following sections.

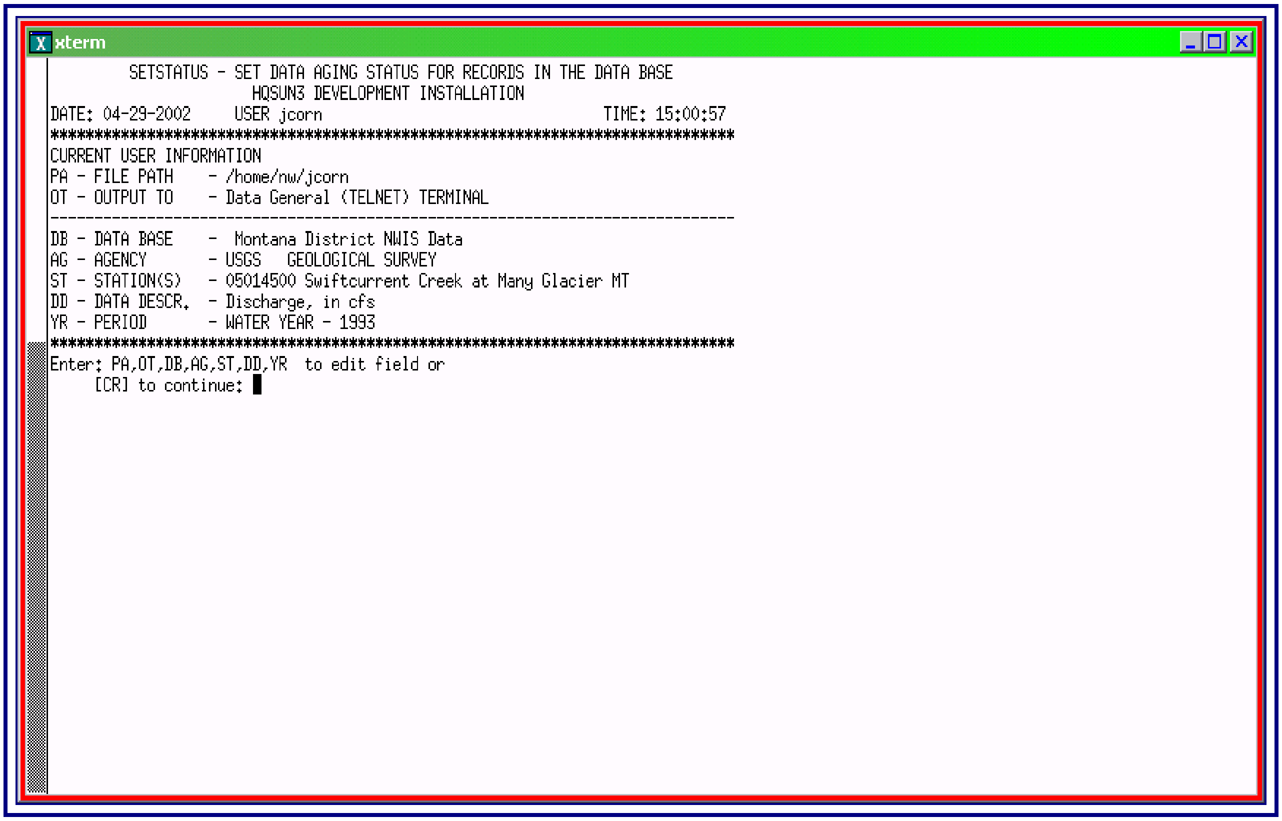
An example of “related DDs” is the Stage DD from which a Discharge DD is computed, or the Velocity DD used in velocity-type computations. In a velocity-computation setup, when any one of the DDs is specified for stage, velocity, or discharge, the other two DDs will be automatically selected as well. Data aging codes will be set for all related records in the affected database tables.

The SETSTATUS program is also designed to perform database consistency checks before updating the records for the selected DDs. There are two checks performed, which are designed to prevent the movement of data into “Approved” status without making certain everything has been computed and stored in the correct sequence and using approved rating curves. The first check is performed on all data, regardless of the update operation. This check is a verification that any Rating Curves for the affected stations have an “Approved” status. The code will check each DD for Ratings, and if any are found which do not have a data aging code of A, the program will inform the user and stop execution so the problem can be corrected. The second consistency check is performed only when moving data from “Working” status into “Review” status. All the data for the selected DDs are scanned for modification date/times. The date/times for derived data (that which has been computed from other data -- for example, Daily-Values which are computed from the “computed” Unit-Values) are compared against the date/times for the appropriate source data. If any source data are found which are newer than the derived data, an error message is generated and the program will not perform any updates to the aging codes. This check ensures that if source data (Unit-Values, Shift Curves, etc.) are edited or altered in some way, the end products (Daily-Values) will not be set to “Approved” without having been updated to reflect the revised source data.

NOTE: This second consistency check has been temporarily disabled in the SETSTATUS code in order to prevent problems encountered during cleanup of data transferred from NWIS 4_1. The checking will be reinstated once these cleanup issues have been resolved, and will be performed upon future aging-status updates.

Program Operation

To display properly, the user should have the terminal window set wide enough to show at least 132 columns. Use of a narrow window setting will produce badly formatted displays.



The SETSTATUS program first uses the standard ADAPS user startup menu for selection of user parameters such as output destination, file paths, and selection of the station, DD, and water year. The choices allowed for the Station and Water Year submenus depend upon the user's database access level. “USER” and “ADBA” personnel may only choose a single DD for a single station, and may only select a single water year. “SYST” personnel are also allowed to select an ADAPS Group file rather than single station/DDs, and may select multiple water years to process.

```
HQNWIS7 Xterm
 ***** SETSTATUS - Manage Data Aging Status *****

                    ---- Record Counts (for Selected DDs and all related DDs) ----
    Data Aging        DVs     Total UVs    Rating    Corr.     Shift      Stat.
    Code status      (WYs)     (Days)      Dates    Curves    Curves    Summary
==================================================================================
     Working            1         0          0         0         0         0
     in-Review          0         0          0         0         0         0
     Approved           0         0          1         0         0         0

You will be processing records for     2 DDs for Water Year 2002.

Please Select from the Following Command Options:

             **** - Cannot allow "AP" option while you have data in "Working" status!
             "RV" - Change "Working" records to "In-Review" status
             "WK" - Change "In-Review"/"Approved" records back to "Working" status
             "US" - Return to USer information screen
           "QUIT" - QUIT  and return to previous menu
           "EXIT" - EXIT  and return to UNIX

                            Enter option desired:
```

After selecting a station, DD, and water year, the SETSTATUS program performs the database check to ensure all ratings for the selected DDs are “Approved.” If successful, it then scans the database and displays the number of records in each of the data aging code categories (“W,” “R,” “A”) for the selected DDs.

Along with the count of existing records in each aging status, the screen presents the user’s command options. The “US” menu option returns to the ADAPS startup screen and allows the user to select another station, DD, or water year, or to redirect the output destination. The “QUIT” and “EXIT” menu options are standard ADAPS actions. The remaining command options vary according to the user’s access level and the count of records in each category.

The “AP” option is used to update the aging codes for any displayed records from “in-Review” to “Approved” status. This command is available only for “ADBA” and “SYST” users. If there are no records found in the “in-Review” category or if there are problems, the “AP” command will not be shown, and an appropriate warning message will be given instead.

- If there are records found in “Working” status, the user will be warned that all data must be in “in-Review” status before approval. The command option will be replaced by “****”.
- If there are no records in “in-Review,” the user will be notified and the command option will be replaced by “----.”
- The “RV” option is used to update the aging codes for any displayed records from “Working” to “in-Review” status. This command is available for all user levels. For access level “USER,” this is the only command option available. If there are no records in “Working” status that can be updated, the “RV” command will not be shown, and an appropriate warning message will be given instead.
    - For access level “USER,” the command will be shown only when there are records in “Working” status and there are NO records in either “in-Review” or “Approved” status.

    - For access level "ADBA", the command will be shown when there are records found in "Working" status, even if there are records found in "in-Review" or "Approved" status. "ADBA" users are not allowed to change records in "Approved" status; these records will be unaffected.
    - For access level "SYST," the command will be shown when there are records found in either "Working" or "Approved" status. All records found, including "Approved," will be updated to "in-Review" status.
- The "WK" option is used to update data aging codes for the selected records back to "Working" for further editing or corrections. This command is available only for "ADBA" and "SYST" users. If there are no records found in either the "in-Review" or "Approved" categories, an appropriate warning message will be given instead.
    For access level "ADBA," the command will be shown when there are records found in "in-Review" status, even if there are also records found in "Approved" status. "ADBA" users are not allowed to change records in "Approved" status; these records will be unaffected.
    - For access level "SYST," the command will be shown when there are records found in either "in-Review" or "Approved" status. All records found, including "Approved," will be updated to "Working" status.

In order to ensure that data aging codes are updated in the correct sequence and all data in the database is checked for consistency prior to setting it into "Approved" status, the program will validate and enforce operation of the menu options. For example, if the program scans the database and finds that some records are in "Working" status and some are in "in-Review," there is a problem. Since the database consistency check **(temporarily disabled)** is performed when moving from "Working" to "in-Review," the program must not allow data to be moved directly from "Working" to "Approved." To accomplish this, the menu option is not provided to the user, instead a warning message is shown telling him the problem. To enforce this, the program will not allow the option to be executed unless it has been shown to the user and is an allowable choice. In other words, the user cannot enter the command "AP" unless it is shown on the screen as a choice.

```
HQNWIS7 Xterm
                              U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY
                                         WATER RESOURCES DISCIPLINE
                                    Date Processed: 2002-11-20 14:11 By jcorn

                              SETSTATUS Report: Data Aging Codes Updates for Water year 2002

   Setting Data Aging Codes to <IN-REVIEW>

... DD Information ...........     .......... Counts of database records updated ............................................

                                  Rating     -- Unit Values (1 record/day) ---     DVs      Corr.     Shift     Statistic
Station ID        Agency   DD #    Dates       meas    edit     da     corr  shift   (by WY)   Curves    Curves    Summary
===============================================================================================================================

01010000          USGS      1        1           0       0       0      0      0        1         0         0         0
01010000          USGS      2        0           0       0       0      0      0        0         0         0         0

***  Updates for Water Year 2002 Completed.  ***


     2   Data aging code records for     2 DD_IDs have been set to <REVIEW> status.


     2   Data aging code records for     2 DD_IDs have been set to <REVIEW> status.

*** Enter <CR> to continue:
```

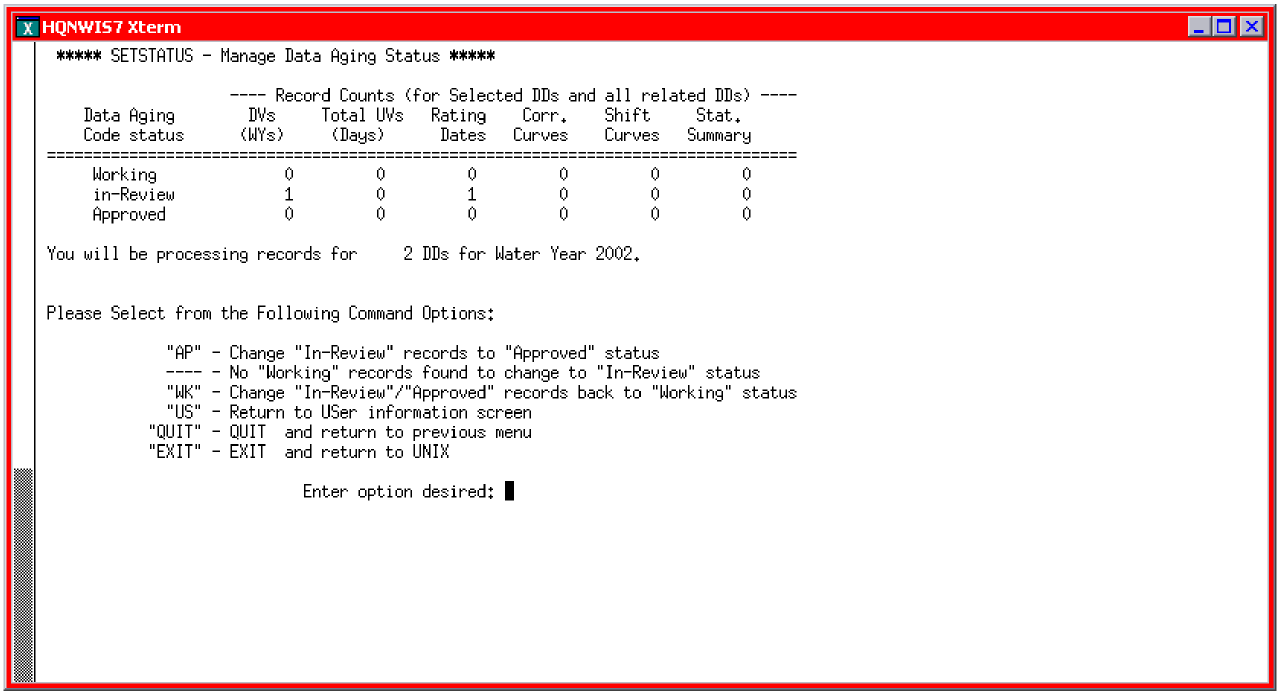
While the program is processing the updates to the database, each DD will be printed with a count of the number of records updated. While the user may have specified only a single DD, the database update may possibly affect records belonging to more than one DD and station. For example, when a Discharge DD has been selected, all related DDs for stage and any other parameters would be updated as well. Each DD updated is displayed separately with a count of the number of records changed for that DD. When multiple water years are being processed (by "SYST" users only), the sequence of DDs updated will be repeated for each year specified.

Some users may find that the record counts displayed in these progress screens are different from the actual counts of data values they have stored in the database. This is an unavoidable effect of the NWIS 4.2 database structure. For example, if there is temperature data for 200 days stored in the database for the selected period, but there are gaps comprising 165 days within that period, the record counts for the Unit-Values shown by the program will display as 365. The reason for this is that the database design requires a record in a header table and a record in a data table for Unit-Values data. When there is a gap in the actual data, a "placeholder" record is required in the header table, which has a data aging code and must therefore be updated.

When processing large numbers of records, or when a permanent record is desired of the updates, the report may be sent to a data file by means of the output path specification in the ADAPS startup screen.

After all updates have been completed for all water years, a count of the total number of changes made will be printed as well. When the report has been sent to a file instead of the screen, this will indicate completion to the user. When the report has been sent to the screen, the message will appear twice – this is to ensure that the message is always printed with the report and is also sent to the screen for the user's information even when the report is sent to a file.

Upon completion, SETSTATUS will scan the database again and calculate how many records are in each category, and then will redisplay the list and menu options.



At this point, the user may select another command to operate upon the selected data, or may return to the startup screens to select a different DD, site, or time period as desired.

Interaction with Rating Dates

The interactions between SETSTATUS and the Rating Dates records are somewhat complex and may be confusing to users. The granularity (minimum size of a data set being operated upon) for the SETSTATUS program is one water year. Any Rating Dates associated with the data and its processing, however, can extend across many years. If SETSTATUS were used to change the data aging status of an entire Rating Dates record from start to finish, it would potentially be affecting the aging status of data outside the specified water year. This would cause problems when dealing with other years of data. In order to avoid the problem, as well as to be compatible with several other ADAPS programs, the SETSTATUS program was designed to carve up multiple-year Rating Dates records into sets of single-year records. These single-year records may then be safely updated in the specified water year(s) without affecting other Rating Dates in the years not specified. If a Rating Dates record already has starting and ending dates within the same water year, however, it will be unaffected.

The process of carving up multiple-year records into single-year records takes place when SETSTATUS is checking to see if any Ratings used are in “Approved” status. If the program detects a Rating Dates record with a start date prior to the user-specified year, the Rating Dates record will be turned into a set of records which begin and end at the boundaries of the intervening water years. If the Rating Dates record had an unspecified end date and is active until sometime in the future, a record will also be created with a start date in the **next** water year from the one specified, and an end date in the year 2382.

For example, if a technician is updating data for WY 2002, and there is a Rating applied to the data with a Rating Dates start date of 01 January 1999, time 12:00:00, and no end date, the program will take the single Rating Date record and create the following Rating Dates records:

- (WY 99) A record starting at 01/01/1999 12:00:00 and ending at 09/30/1999 23:59:59
- (WY 00) A record starting at 10/01/1999 00:00:00 and ending at 09/30/2000 23:59:59
- (WY 01) A record starting at 10/01/2000 00:00:00 and ending at 09/30/2001 23:59:59
- (WY 02) A record starting at 10/01/2001 00:00:00 and ending at 09/30/2002 23:59:59
- (WY 03+) A record starting at 10/01/2002 00:00:00 and ending at 12/31/2382 00:00:00

Records created from the original record will have the same data aging status as the original. If the original record was in "Approved" status, the newly created records will also be "Approved." The record for WY 2002 will then be updated by SETSTATUS along with any other data. The data aging status of the final record extending into the future, however, will always be set to "Working" status. This is necessary to allow other programs to process, edit, and manipulate data as it comes into the system.

The segmentation of multiple-year records into sets of single-year records will only be done the first time such a record is encountered by SETSTATUS. Any subsequent checks will find only the segmented records, and nothing will be done to any records outside the specified water year.

4.5.16 Plot Time-Series Data

For more information on Plot Time-Series Data see ***Section 4.7.4.***

4.5.17 Show Site Information

by Colleen A. Babcock

The Primary Processing Menu Option "Show Site Information," runs the routine showsite, which produces a list of the contents of the Site File for selected sites. If the output is selected to go to a file, the program asks for the output file name; if no file name is entered, the output will be put into a file named SITE_FILE. The output can also be directed to the screen. The user is then asked if station numbers will be entered from the terminal. A maximum of 400 station numbers are accepted; if more than 400 are submitted, only the first 400 will be used. If the station numbers are entered from the terminal, a blank line is displayed. Enter the five-character agency code (a blank space will follow if a four-character agency code is entered) and the station number. Depending on the agency code and length of station number, the input would look like the following example:

USGS 01123456
USEPA01123457
USGS 390000110200001

If NO, the user is prompted for the name of a file that contains a list of station numbers. The input file should be in the following format:

Agency code -- 5 characters (Left-justified)
Station number -- a maximum of 15 characters (Left-justified)

The output file includes carriage-control characters, and should be spooled with the "asa" U command.

Example Output:

```
    1   SHOWSITE -  ACCESSING SITEFILE FOR DATABASE 01      RETRIEVAL DATE:  Fri,
         15 Feb 2002 @ 12:33:24        Page 0001

         STATION NAME:  Beaverhead River near Twin Bridges MT
         STATION NUMBER:  06018500
         COUNTRY:  US                                        STATE: 30
         COUNTY:  057
         LAT. / LONG. :   452301    / 1122707          LAT/LONG METHOD: M
         DISTRICT:  30
         LAT/LONG ACCURACY:                            LAT/LONG DATUM: NAD27
         ALTITUDE DATUM:  NGVD29
         RECORD CREATED:  19850531                   GAGE/SURFACE DATUM:   4809.1
         UPDATED:  20010725200019                    SITE USE CODE:  ACTIVE
         HYDROLOGIC UNIT: 10020002                   BASIN CODE:
         LAND NET LOCATION:                          ALTITUDE METHOD:
         ALTITUDE ACCURACY:                          NAME OF LOCATION MAP:
         MAP SCALE: 1:                               SOURCE AGENCY:  USGS
         SITE WEB FLAG:  Y                           UTC OFFSET: MST
         LOCAL STANDARD TIME:  Y                     DATE SITE ESTAB. OR INVENT.:
         REMARKS:
         PROJECT NUMBER:                             CONTRIB. DRAIN AREA:
         DRAINAGE AREA:   3619.000                   TYPE OF SITE
         TYPE OF DATA COLLECTED AT SITE: STATUS
         INSTRUMENTATION AT SITE: STATUS
         +     ____________
         ______________________________________
         _______________________________
                STREAM                   WATER QUALITY - INTERMITTENT: ACTIVE
```

4.5.18 Station Analysis Report

by James F. Cornwall

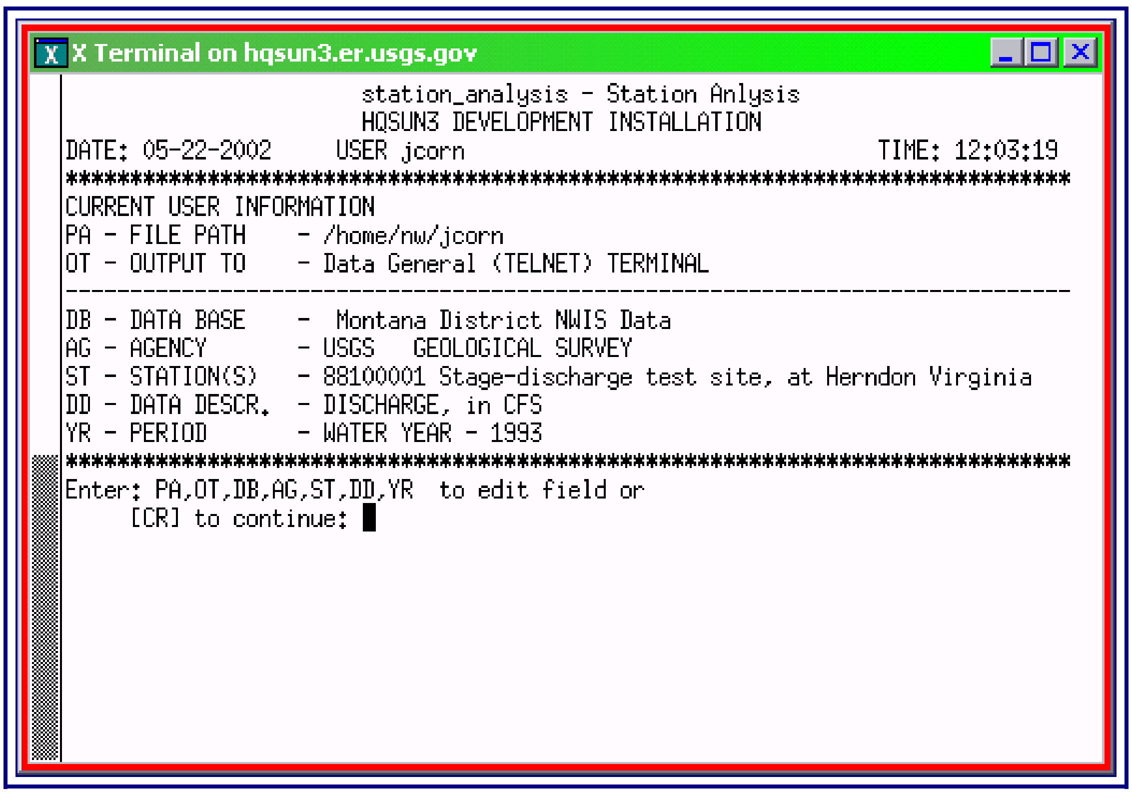
The Station Analysis program is designed to display a report summarizing the processing information used for handling data for a specified Data Descriptor (DD) at a station.

Introduction

The Station Analysis program is used to print out a report listing some of the information that affects how the data for a particular DD is processed. The report lists the computation type (stage-discharge, etc.), the different types of corrections applied to the data, the ratings and shift curves used, and gaps or periods of estimated data for daily-values. This information is used to ensure that the data processing steps performed within ADAPS are accurately representing the real-world situation at the site (i.e. – making sure that the ADAPS-calculated discharge matches the actual discharge at the station).

Program Operation

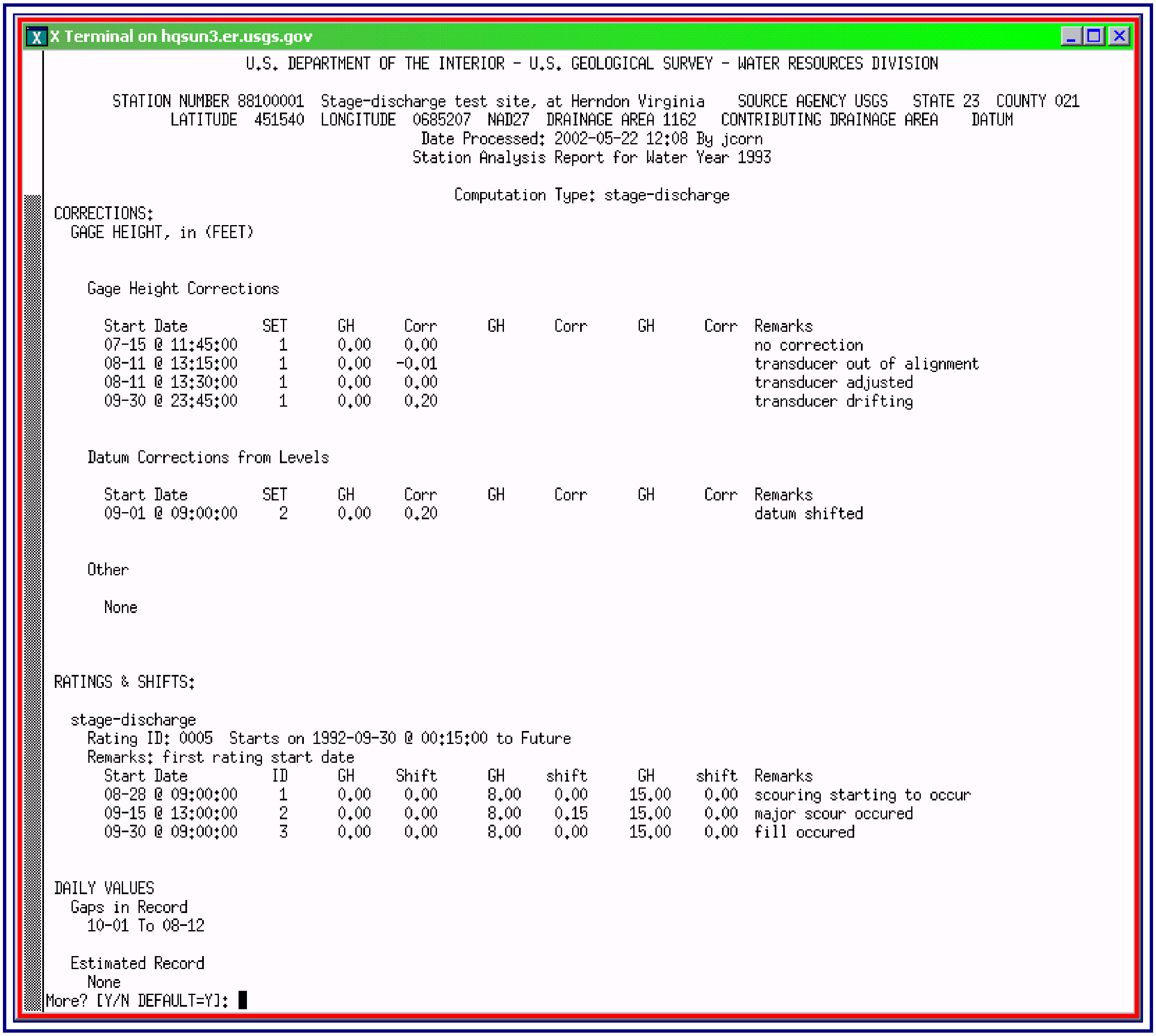
The Station Analysis program uses the standard ADAPS user startup menu for selection of user parameters such as output destination, file paths, and selection of the station, DD, and water year.



When selecting the DD for the report, the user should be sure to choose a DD that is computed from other data, such as the Discharge DD shown in the above screen. This is because the program's function is to display information from the time-series processing instructions stored in the database, and only a computed (output) DD will have this information stored in the Processor record.

If the user selects a DD, which has no Processor record, such as a Gage Height DD, the program will print an error message saying there are no processing instructions and will then exit.

If the information from the Processor record is successfully retrieved, the program will display the report as shown below:



```
X Terminal on hqsun3.er.usgs.gov
                    U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

      STATION NUMBER 88100001  Stage-discharge test site, at Herndon Virginia    SOURCE AGENCY USGS   STATE 23  COUNTY 021
             LATITUDE  451540  LONGITUDE  0685207  NAD27  DRAINAGE AREA 1162   CONTRIBUTING DRAINAGE AREA    DATUM
                                        Date Processed: 2002-05-22 12:08 By jcorn
                                        Station Analysis Report for Water Year 1993

                                             Computation Type: stage-discharge
CORRECTIONS:
  GAGE HEIGHT, in (FEET)


    Gage Height Corrections

      Start Date         SET      GH      Corr      GH      Corr      GH      Corr  Remarks
      07-15 @ 11:45:00     1      0.00    0.00                                      no correction
      08-11 @ 13:15:00     1      0.00   -0.01                                      transducer out of alignment
      08-11 @ 13:30:00     1      0.00    0.00                                      transducer adjusted
      09-30 @ 23:45:00     1      0.00    0.20                                      transducer drifting


    Datum Corrections from Levels

      Start Date         SET      GH      Corr      GH      Corr      GH      Corr  Remarks
      09-01 @ 09:00:00     2      0.00    0.20                                      datum shifted


    Other

      None


RATINGS & SHIFTS:

  stage-discharge
    Rating ID: 0005  Starts on 1992-09-30 @ 00:15:00 to Future
    Remarks: first rating start date
      Start Date          ID      GH      Shift     GH      shift     GH      shift  Remarks
      08-28 @ 09:00:00     1      0.00    0.00      8.00    0.00     15.00    0.00   scouring starting to occur
      09-15 @ 13:00:00     2      0.00    0.00      8.00    0.15     15.00    0.00   major scour occured
      09-30 @ 09:00:00     3      0.00    0.00      8.00    0.00     15.00    0.00   fill occured


DAILY VALUES
  Gaps in Record
    10-01 To 08-12

  Estimated Record
    None
More? [Y/N DEFAULT=Y]:
```

After display of the report, the program will exit to the ADAPS menu.

Note: It is strongly recommended that when entering rating date changes, correction curves, and shift curves, that the user should add comments about the reason for the rating date change, the correction, and the shift. These comments will be displayed on the station analysis report, and will become part of the permanent station record.

4.6 ADAPS STATISTICAL APPLICATIONS

by Timothy C. Stamey

This section presents the programs that are used to obtain statistics, perform analyses, inventory, and manipulate daily-values data.

```
PROGRAM NAME              TASK DESCRIPTION                      SECTION

   DVMAS  ---- Daily-Values monthly and annual statistics ... 4.6.1
   DVSTAT ---- Daily-Values duration and N-day low/high
                 value analysis ........................... 4.6.2
   DVDAYSTAT - Daily-Values Daily Summary Statistics ........ 4.6.3
   DVTABLE --- Daily-Values Tables .......................... 4.6.4
   DVINV  ---- Daily-Values Inventory ....................... 4.6.5
   DV_MANIP -- Daily-Values Manipulation .................... 4.6.6
```

Selected application programs in ADAPS, such as DVMAS and DVSTAT (and in other water data processing systems), may optionally create a data output file, called Application Programs Transfer File (APTRAF). This file contains records of several different data 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 analyses, 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 sub-column 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 such as footnotes to a table, which describe the column headings. Fortran subroutines for reading and printing APTRAF files and a simple demonstration program are available from NWIS. Because NWIS and transfer of data to applications programs are still evolving, Districts are advised to consult with NWIS regarding the data format before developing software to process these files and to design any software to be adaptable to changes in data formats.

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 decimal specifications. 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 retrieved and output according to the maximum number of decimals for most values. Some values such as logarithmic data may be output with greater precision.

4.6.1 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 are explained below. The DVMAS application consists of a preprocessor and computation programs. 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) uni-variate 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 output 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 the 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.

DVMAS Preprocessor Program

The DVMAS preprocessor program takes the user through a series of menu selections. The menu selections and user-supplied 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 may be available and accessed by keying a "?" or "HELP." Essential choices made in the preprocessor step are:

1. Accept or reject information from User File.
2. Specify control file name or accept default name for use by the computation program.
3. Specify desired printed statistical output (options are described in the next section).
4. Specify desired machine-readable statistical output.
5. Specify desired computation/transformation options.
6. Specify statistic codes.
7. Specify output data name if APTRAF formatted data are selected.
8. Specify maximum number of no-value days allowed.
9. Select computational period and begin month of annual period.

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 ***Section 6.2***. Refer to ***Section 6.2*** for record formats to manually edit records in the control file.

DVMAS Computation Program

The DVMAS computation program uses the specifications from the control file created by the preprocessor program and 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.

Descriptions of Printed Output Statistics (PO menu option)

The possible output statistics produced by the computation program are discussed in the following sections. Each section gives the option number from the PO menu (as shown on the screen) in parentheses.

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. 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.

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.

Statistics of 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:

```
          o Number (N) = the total number of months used in the analysis.

                        1   N
          o Mean (M) = - * Â M(i)
                        N  i=1

                            N           1     N
                          ( Â M(i)**2 - - * ( Â M(i) )**2 )
                           i=1          N    i=1
          o Variance (V) = ---------------------------------
                                         N-1


          o Standard Deviation (SD) =  \/ V

          o Skewness =

       N                 N        N               N
 N**2 * Â M(i)**3 - 3*N * Â M(i) * Â M(i)**2 + 2*( Â M(i) )**3
      i=1               i=1      i=1             i=1
 -------------------------------------------------------------
               N * (N-1) * (N-2) * SD**3

          o Coefficient of variation = SD/M

                                       100 * M(k)
          o Percent of Annual Total  = ----------
                                         12
                                          Â M(k)
                                         k=1
             (Note: This quantity is computed only for parameters for
                   which it is meaningful to compute an annual total.)

          where: Â   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).
```

Correlation of 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:

```
                   N              N        N
               N * Â X(i)*Y(i) - Â X(i) * Â Y(i)
                  i=1            i=1      i=1
           ------------------------------------------
         ______________________________________________________________
        /    N             N                  N             N
       / N * Â X(i)**2 - ( Â X(i) )**2 * N * Â Y(i)**2 - ( Â Y(i) )**2
     \/     i=1           i=1                i=1           i=1

          where: Â   Indicates summation,
                 N = Number of years used,
                 X = Mean for month X (statistic),
                 Y = Mean for month Y (statistic), and
                 i = A year index.
```

Serial Autocorrelation of 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:

```
                   N                N        N
               N * Â X(i)*X(i+n) - Â X(i) * Â X(i+n)
                  i=1              i=1      i=1
           ------------------------------------------
         ____________________________________________________________
        /  N             N                N                N
       /N* Â X(i)**2 - ( Â X(i))**2 * N* Â X(i+n)**2 - ( Â X(i+n))**2
     \/   i=1           i=1              i=1              i=1


          where: Â   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.
```

Quartiles of 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:

```
     N+1              2(N+1)              3(N+1)
Q1 = ---,        Q2 = ------,        Q3 = ------,
      4                 4                   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.

Quartiles of Cumulative 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.

Quartiles of Cumulative 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.

Annual Mean Values

This option (9) is a table of annual mean values for the period retrieved.

Statistics of 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.

Quartiles of 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.

Computational Options (PC menu option)

The computational options (numbered as 1 through 4 below) determine whether or not the statistical computations described in the above section are based on the following:

1. All days, untransformed
2. Non-zero days, untransformed
3. Log transformed all day's means
4. Log transformed non-zero day's means

The log transformation is base 10. Any or all of these options may be chosen. If both options 1 and 2, or both 3 and 4 are chosen and there are no zero-valued days for the period retrieved, printout for 2 and/or 4 is suppressed since it would duplicate printout for options 1 and 3.

Program Output (DO menu option)

Output from the DVMAS application program in APTRAF format (numbered as 1 through 4 below) 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

No-Value Option (ND menu 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.

Computation Period (PR menu option)

The actual begin water year of computation will be the first water year found that is equal to or greater than the begin water year entered. The actual end water year of computation will be the last water year found that is less than or equal to the water year entered (this the default option).

To specify beginning or end of period of record for begin or end water year, respectively, leave the appropriate side of the comma blank. Entry of a single comma will default to entire period of record.

Annual Computations Done on Water Years (MO menu option)

This is the begin month for the annual period to be used for annual means and for statistics on annual means. An answer of 0 or <CR> will cause standard water years to be used. If any other month is selected (including 10), the years are years beginning with the month and year combination. For example, begin month 0, year 1985 is the 1985 water year. Begin month 10, year 1985 is the 1986 water year (year beginning October, 1985.)

Process Statistic Code(s): (SC menu option)

For all station/DD combinations that do not have their own statistic code list, enter up to 10 five-digit statistic codes that are valid for Daily Values processing. The most commonly used code is 00003 for daily mean values. A response of "L" will display a list of valid codes.

All Station/DDS Use the Same Computation Period (AD menu option)

The above option is the default and to change to. Allow a different period of record for each Station/DD – key in AD.

All Station/DDS Use the Same Statistic Code List (AS menu option)

The above option is the default and to change to. Allow a different statistic code list for each Station/DD – key in AS.

4.6.2 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. This application consists of preprocessor and computation programs. 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 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 user runs the batch job and is queried to choose a batch queue on the specified 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 is asked 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.

Note: In the current release of ADAPS, a Pearson frequency-analysis program is not available in NWIS. 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 within NWIS.

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 may be available by keying a “?” or “HELP.”

Initial choices made in the preprocessor step are:

1. Specify control file name(s).
2. Accept or reject information from user file.
3. Specify overall analysis years and months.
4. Specify statistic codes (normally 00003).

Specify analysis period as yearly/partial years, or on a monthly basis. (This entry is mandatory; the type of statistics must be specified in order for processing to continue. Enter a “1” for a yearly or partial year statistics, or enter a “2” for monthly statistics. The user may enter “QUIT” or “EXIT” to exit program, or “OOPS” to back up one query.)

These options are displayed after the entry of one of the above analysis year period options:

```
1) --> Include duration table in spool file
   --> Do plots of duration data
   --> Include high-value data in spool file
   --> Include low-value data in spool file
   --> Include annual, semiannual, or monthly
       values table in spool file

2) --> Include duration data in Application Program
       Records (APTRAF) file
   --> Include high-value data in APTRAF file
   --> Include low-value data in APTRAF file
```

--> Include annual, semiannual or monthly values
table in APTRAF file

Enter “1” and/or “2,” or “ALL,” ([CR] to select options independently from an all-inclusive list)

(Enter the number(s) of the grouped selections. A choice of 1 and/or 2 will bypass the detailed shopping list selection and begin the initialization of variables; [CR] will generate the “detailed menu,” which includes all options listed in “1” and “2” and more. Enter “QUIT” or “EXIT” to exit program, or “OOPS” to backup one query.

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. The maximum number of no-value days considered acceptable for duration analysis is set to zero on [CR]. The user may enter any value desired. Enter “QUIT” or “EXIT” to exit the program or “OOPS” to back up one query.

Specify class limits or accept default (accept defaults or enter your own call limits.) Enter “QUIT” or “EXIT” to exit program, or “OOPS” to back up one query.

Select duration plot type. The type of duration plot must be specified. Enter “1” for a log-normal probability plot, enter “2” for a rectangular plot, or enter “3” for an arithmetic-normal plot. Enter “QUIT” or “EXIT” to exit program, or “OOPS” to back up one query.

For Low-Value Analysis

Specify low-value consecutive day (N-day) values or accept default. (See DVSTAT computation programs section below for further explanation of types of analyses.)

For High-Value Analysis

Specify high-value consecutive day (N-day) values or accept default. (See DVSTAT computation programs section below for further explanation of types of analyses.)

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, the DVSTAT preprocessor program requests a file name.

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. The control file records created by the preprocessor program and those required by the computation program are discussed in ***Section 6.2*** of the manual. Refer to ***Section 6.2*** for record formats to manually edit records in the control file.

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.)

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 progression 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 supplementary 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 variation 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.

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 one 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.

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 one 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.

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.

4.6.3 Daily-Values Daily Summary Statistics

The DVDAYSTAT program computes, tables, and plots daily count, minimum, mean, maximum, and median values for a period of daily values; that is, the statistics are computed for all October 1 values, then for all October 2 values, and so forth, through September 30. The results are presented as a series of daily-values style tables and a single water-year hydrograph. An RDB file containing the statistics also can be produced.

Program Operation

The program first uses the standard ADAPS startup menu for selecting the output destination, database, agency, DD statistic, and retrieval period. After exiting the standard startup, the following menu is displayed:

```
      DVDAYSTAT - DV DAILY SUMMARY STATISTICS
                 CURRENT OUTPUT OPTIONS

         PO - Printed output options:
               Daily Counts
               Daily Minimums
               Daily Means
               Daily Maximums
               Daily Medians

         PL - Plotted output options:
               Daily Minimums
               Daily Means
               Daily Maximums
               Daily Medians

         RD - Write RDB statistics to a file
         RF - RDB file: DVDAYSTAT.rdb

      Enter option code to change, or [CR] to continue:
```

Following is the action taken by the various menu options:

- **PO** - Select the desired statistics to be output to the printed tables.

- **PL** - Select the statistics to be plotted on the one water-year hydrograph using TKG2 graphics.

- **RD** - Flip from writing an output RDB file to NOT writing one.

- **RF** - Select the name of the output RDB file - not visible if the RD option is to NOT write an RDB file. All statistics are written to the RDB file if it is produced. If the user does not want all the statistics, RDB commands should be used to select the ones to keep.

4.6.4 Daily-Values Tables

The DVTABLE 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 the 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 UNIX 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.

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 options can be changed by entering the two-character identifier for 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.
- **ST** - (type 1 only) - Turn suppression of statistical summaries on/off.
- **SS** - (all table types) - Turn summary suppression when data are missing on/off.
- **SD** - (type 1 only) - Turn statistical summary monthly maximum/minimum years on/off.
- **PR** - (all table types)- Specify if a group is used, whether all of the station/DD combinations should use the same retrieval period.
- **SC** - (types 1, 2, 3, and 5) - Specify statistic codes to use.
- **DS** - (type 1 only) - Specify if a group is used, whether all of the station/DD combinations should 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 the user routes 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.

4.6.5 Daily-Values Inventory

The DVINV program produces an inventory listing of the contents of the daily-values file for a single database. The inventory is a report of all daily-values data contained in the selected database 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 one 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 no missing 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 database, batch queue, and output destination, after which a batch job is submitted to process the daily-values file (for the particular database) and produce the report.

4.6.6 Daily-Values Manipulation

See ***Section 4.5.10*** for the description of Daily-Values Manipulation.

4.7 Data Display

4.7.1 Daily-Values

See ***Section 4.6.4*** for the description of Daily-Values Tables.

4.7.2 Print/Display Unit-Values Tables (UV_TABLE)

by Glenn B. Engel

The UV_TABLE program allows the user to display the values stored in the Unit-Values tables in tabular form. Unit-Values may be displayed or sent to a file or printer. All types of Unit-Values (Measured, Edited, Corrections, Shifts, and Computed) may be displayed.

Program Operation

Using the standard ADAPS start-up screens, the user selects 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).

After all parameters are set, the program displays a list of the tabling options the user can change, with the default values shown. The user is allowed at this point to change tabling options, restart the program to select new parameters, quit the program, or enter <CR> to create the Unit-Values table with the selected options indicated. The available tabling options are discussed below.

NOTE: If the user selects output to a file or printer, the program will not generate one table, store or print the results, and then close out the file or print the table. Instead, the program will generate tables and store them into temporary files until the user exits the program or selects a new output destination or file name. At this point, the generated tables are copied into the final output file or sent to the printer, and the temporary files are closed out and deleted. The user may select other parameters (station, DD, dates, UV type, table type, etc.) without closing out the temporary files used.

This feature allows the user to generate a series of tables with related information and store them into the same file for archival or tracking purposes. For example, the user could run a series of tables with different options selected (table type, UV type, dates, DDs) covering a group of related UV data, and build a sequence of reports listing the actual measured, edited, and computed UVs, as well as an inventory table for each UV type. Closing out the sequence by quitting the program (“QU” or “EX”), selecting a new output destination (“US”, then “OT”), or a new output destination filename (“US”, then “OF”) will then store all the report tables into a single file.

TY – UV TYPE

This option provides the choice of viewing any of six unit-values types.

The available unit-values types are:

1. Raw Measured Unit-Values
2. Measured Unit-Values
3. Edited Unit-Values
4. Correction Unit-Values
5. Shift adjustment Unit-Values
6. Computed Unit-Values

The default on entering the program is to view "computed Unit-Values" data. Entering "TY" allows the user to change the type of Unit-Values viewed. Under measured Unit-Values, if there are multiple sets of measured Unit-Values with different transport codes and sensors, the user will be given a list from which to select the desired choice. If there is only one set of measured UVs, the choice is displayed and is automatically selected for the user.

> **NOTE:** If there is a type 0 (Conversion Of Input) rating to convert the actual recorded data to another format for display or processing (such as converting dial units from an ADR to engineering units), the "Measured Unit-Values" will reflect that conversion. If the user wishes to display the actual Unit-Values before conversion (to see the actual dial units, for example) the option "Raw Measured Unit-Values" must be selected.

After selecting the Unit-Value type, the user is returned to the tabling option menu.

TB – TABLE TYPE

```
 #  UNIT-VALUES TABLE TYPE
--  ------------------------------------
 0  UNIT-VALUES INVENTORY TABLE
 1  STANDARD UNIT-VALUES TABLE
 2  COMPRESSED UNIT-VALUES TABLE
 3  ON-HOUR HOURLY ONLY UNIT-VALUES TABLE
```

This option allows selecting the type of Unit-Values table to be displayed. The default is Type 2, "Compressed Table." Descriptions of the available Unit-Values (UVs) table types are:

UNIT-VALUES INVENTORY TABLE:

This option generates a table, which shows 12 columns for each of the months in a water year, with a row for each day's data. The standard report header shows station, user and selected parameter information. Each entry for a day shows the number of UVs of the selected type in the database for that day, along with flags to indicate the Data Aging status of the UVs, whether the day is flagged as a partial day, and other flags that may be set for the data to indicate editing status, "Affected" status, and other conditions. The Partial Day flagging is based upon the daily-values abort time limit stored in the processor record. Descriptions of codes and symbols are printed at the bottom of the report.

STANDARD UNIT-VALUES TABLE:

This option generates a table with the standard report header showing station, user and selected parameter information. The generated table shows the UV data values, each with the associated time, and the screening/source codes, one day per page. Descriptions of the associated codes are listed at the bottom of each page.

COMPRESSED UNIT-VALUES TABLE:

This option generates a table with the standard report header showing station, user, and selected parameter information. The generated table shows the UV data values, each with the associated time, and the screening/source codes. The main difference from the Standard Table is that the Compressed table puts as many days on one page as will fit, and the descriptions of the screening codes are printed at the end of the entire report, rather than the bottom of each page.

ON-HOUR HOURLY ONLY TABLE:

This option generates a table with the standard report header showing station, user and selected parameter information. The generated table shows a count of the total number of UVs for each day, but displays only those UV data values and screening/source codes that fall exactly on the hour (all other data values are ignored). Descriptions of the screening codes are printed at the end of the report.

CU – UV UNITS

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, the elements of a conversion equation and a label to be used for identifying the conversion units must be given.

RN -- ROUNDING

This option is used to "toggle" between the normal rounding for the UVs displayed and the rounding being suppressed for the Unit-Values table. When rounding is suppressed, an additional level of precision (one decimal place) is displayed on the output table.

4.7.3 Plot Hydrographs (HYDROGRAPH)

by David L. Kresch

The HYDROGRAPH program produces single or multiple water-year plots of daily-values for a single station. To access the HYDROGRAPH program, select the DI sub-menu from the main ADAPS menu, and then select the "Plot Hydrographs" option.

Introduction

The program runs interactively and produces hydrographs using Tkg2, a USGS graphics package. Up to four water years of data may be overlaid on a single plot. The Y (vertical) axis may be either logarithmic or linear.

Program Operation and Options

The program initially calls the ADAPS startup program in which the user specifies the station, data descriptor, and water year(s) to be retrieved. The period of record to be retrieved is indicated by entering starting and ending years. A period-of-record retrieval is specified by entering a <CR> for both the starting and ending years.

The following menu of plotting options is available:

FO – Form Choice. The user is asked to select the desires one- or two-frame plots and the desired scale (11x8.5, 17x11, or 34x22) of the plots.

NF – Plots per frame (if more than one water year of data is to be plotted). A maximum of four plots per frame is allowed.

MS – Plot Measurements. This option, which is available if only one water year of discharge data is being plotted per frame, allows the user to overlay a plot of measured discharges on the hydrograph. The discharges of the measurements are obtained from the discharge measurement file.

MN – Plot Measurement Numbers. If measured discharges are plotted, this option allows the user to annotate them with discharge measurement numbers.

LP – Axis Type. The user is given the choice of a linear or logarithmic Y (vertical) axis.

PN – Lift Pen for Missing Data. The user can select whether or not to have the plotter pen lift for missing days of record.

IY – The user is asked whether or not to invert the Y (vertical) axis.

GR – The user can select from three grid options (none, sparse, or dense). The grid option selected also affects the density of tick marks and dates that will be printed along the X-axis.

DA – The user is given the option of placing tick marks on the vertical axes of discharge hydrographs to show the value of the contributing drainage area.

After all desired plotting options are selected, the user is asked whether he or she wants to output the hydrographs to the screen or to a file. After a selection is made, the desired hydrographs are either printed to the screen or saved in a file. Output directed to the screen can then be saved to a file or sent to a printer, if desired.

The characteristics of hydrographs output to the screen can be edited by the user. The dialog boxes used for editing can be accessed in two ways. The simplest way is just to double click on the plot or desired axis. The other way is to use the Plot menu button to select the plot and then use it again to select the desired editor (plot, X-Axis, Y-Axis, or Y2-Axis). A common modification that a user may want to make is to increase or decrease the number of tick marks and dates that are labeled along the X-axis. This can be done by changing the Label Density setting on the Axis Parameters tab of the X-axis editor. The number of grid lines on the plot may be modified using the Grid and Origin tab.

4.7.4 Plot Time-Series Data (PLOTWAT)

The PLOTWAT program allows the user to display and analyze time-series data. To access the PLOTWAT program, select the DI sub-menu from the main ADAPS menu, and then select the "Plot Time-Series Data" option.

Introduction

In the course of analyzing time-series hydrologic data, either when computing the data or when performing hydrologic studies, it is important to be able to review the data graphically. It is also important 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.

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. Tkg2, a USGS graphics package, is used to produce the program displays. 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.

Program Operation

Program PLOTWAT, initially displays the following main plotting options menu:

```
      ****************************************
      *  PLOTWAT Main Plotting Options Menu  *
      ****************************************
  R) Specify or modify ADAPS time series retrieval parameters,
  L) Load previously saved parameters,
  C) Clear current parameters (change database),
  Q) Quit PLOTWAT.

Enter your selection:
```

The user should select option R to either create a new file of time-series parameters to plot or to modify an existing parameter file. The user should select option L to use the parameters saved in a previously created file.

If option R is selected, the ADAPS multiple retrieval menu is displayed. The user should begin by selecting option A)dd, which displays a menu from which the user selects the type of data (Daily-Value, Unit-Value, or measurement/CSG) that is desired to have plotted. Once the type of data has been selected, a second menu is displayed from which the user may select desired preferences and options. The third and final menu (ADAPS User Information screen) displayed for each type of data selected is used to identify the station (ST) for which data values are to be plotted. The user must also select the desired data descriptor (DD) and statistic code (SC) from this menu for daily-values plots and the desired data descriptor for unit-values plots. A <CR> returns the user to the multiple retrieval menu from which more time-series parameters can be added or the user may quit.

The following expanded main plotting options menu is displayed after the user exits the multiple retrieval menu:

```
****************************************
*  PLOTWAT Main Plotting Options Menu  *
****************************************

  R) Specify or modify ADAPS time series retrieval parameters,
  L) Load previously saved parameters,
  C) Clear current parameters (change database),
  P) Plot the time series data,
  I) Specify or modify specific time series plotting parameters,
  G) Specify or modify global plotting parameters,
  T) Edit time series labels,
  M) Set data modification parameters,
  S) Save current parameters,
  Q) Quit PLOTWAT.

Enter your selection:
```

The menu for Option I of the main plotting options menu is displayed below:

```
*  PLOTWAT Individual Retrieval Plotting Options Menu  *
 ********************************************************

    Retrieval number:                 1
    File type:                      ADAPS.DV
    Location or site:               12301300


                                     DD=   2
                                       00060
 N) Minimum Value:                        0
 I) Plotting Interval           ** DOUBLE CLICK ON Y AXIS **
 M) Maximum Value:                        0
 W) Plot Height (in):           ** USE MAIN MENU G->O **
 L) Log or Linear Plot:               LINEAR
 T) Plot type:                          LINE
 S) Symbol (or Bar) Number:               0
 C) Plotting Color:                       1
 D) Dotted, Dashed or Solid:    ** NOT SUPPORTED YET**
 U) Normal or Reversed Axes:          NORMAL
 P) Plot,                         <) Scroll left,   >) Scroll right,
 Q) Return to main menu
```

Enter your selection:

All of the options in this menu have default settings when it is first opened. As can be seen, a wide variety of plot specifications can be modified from this menu. The default setting for an option can be modified by entering the capital letter corresponding to it. Some options, such as L (Log or Linear Plot) and U (Normal or Reversed Axes), which have only two choices, simply toggle back and forth each time they are selected. Option T (Plot type) gives the user a choice of four different plot types (line, bar, step, and point) to select from. A step plot, one of the plot type options, is similar to a line plot except that 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 for each time interval. Step plots preserve the timing of the data and also clearly show that the data are non-instantaneous.

The menu for option G of the main plotting options menu is displayed below. This menu is used for setting the global specifications for plots. Once the starting and ending dates for a plot have been entered using option D, the plot can be generated from any menu in which the plot option appears without needing to re-enter the dates. The resulting plot, which is displayed on the screen, can be saved to a file or sent to a printer, if desired.

```
*******************************************
*  PLOTWAT Global Plotting Options Menu  *
*******************************************

  D) Dates plotted are: mm-dd-yyyy to mm-dd-yyyy
  O) The plotting output device is:
     X-Windows Print 11x8.5
  L) The time axis length (inches) is optimized.  ** USE OPTION O ABOVE **
  H) The character height is 0.14                 ** CHANGE ON PLOT **
  M) Multiple or single plots?  Single
  S) Multiple or single scales? Single            ** NOT SUPPORTED YET **
  G) Grid lines:   NONE
  P) Plot the time series data.
  Q) Quit this menu and return to the main menu.

Enter your selection:
```

Option G of the global plotting options menu is used to select either none, sparse, or dense grid lines. The grid option selected also affects the density of tick marks and dates that will be printed along the X-axis.

Option M (Set data modification parameters) of the main plotting options menu allows the user to perform several types of transformations on data, such as time lagging.

After all the desired plotting options have been selected, option P is selected from any menu to display the plot to the screen. The characteristics of the plot can be edited by the user. The dialog boxes used for editing can be accessed in two ways. The simplest way is just to double click on the plot or desired axis. The other way is to use the Plot menu button to select the plot and then use it again to select the desired editor (plot, X-Axis, Y-Axis, or Y2-Axis). A common modification that a user may want to make is to increase or decrease the number of tick marks and dates that are labeled along the X-axis. This is done by changing the Label Density setting on the Axis Parameters tab of the X-axis editor. The number of grid lines on the plot may be modified using the Grid and Origin tab.

Having specified retrieval and plotting information during a PLOTWAT session, the user can save this information to a Tkg2.plotting.parameters file 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.

4.7.5 Display Instrument, IN_DISP

by Glenn B. Engel

Note: This feature is only used at sites that have ADRs.

The IN_DISP program displays and/or prints the contents of Instrument (IN) file records and their associated Data Descriptor (DD) and Processor (PR) records, if any exist.

In order for ADAPS to process data from an Analog Digital Recorder (ADR), an Instrument file record must exist for each instrument installed in the field. This record is entered and maintained by the local ADAPS Database Administrator (ADBA). The IN_DISP program allows other users to display and/or print the contents of the Instrument file records and their associated Data Descriptor and Processor records.

The IN_DISP program first goes to the ADAPS startup menu, Current User Information, for selecting a database, station, and output destination. The IN_DISP option menu is then presented, with the following available options:

DI - DISPLAY INSTRUMENT RECORD(S) - This option displays the contents of the selected IN record to the selected output destination. The user can choose to display the current instrument selected (default is the current operating instrument) or display all instruments. The selected instrument will be displayed, followed by a display of DD record contents, processing information, and screening thresholds for the channels of the instrument records.

LI - LIST ALL INSTRUMENTS FOR THIS STATION - This option displays a list of instruments available for the previously selected station to the selected output destination. (**Note:** If output to a printer or to a file has been selected, the list of instruments will NOT be displayed on the terminal.)

CH - CHANGE TO DIFFERENT INSTRUMENT - This option presents a list of available instruments to display.

US – RE-START PROGRAM, DISPLAY USER INFORMATION - This option returns to the ADAPS start-up menu for changing of database, station, and output destination.

QU - QUIT THIS PROGRAM - This option exits back to the ADAPS menus.

EX - EXIT ADAPS PROGRAMS - This option exits ADAPS and returns to UNIX.

4.7.6 Display Data Descriptor, DD_DISP

The DD_DISP program displays and/or prints the contents of Data Descriptor (DD) records and their associated Processor (PR) records, if any exist.

To store ADAPS data, a Data Descriptor record must exist for each separate “set” of information stored. To process data through the primary processing program, an associated processor record must also exist. These records are entered and maintained by the local ADAPS Database Administrator (ADBA). The DD_DISP program allows other users to display and/or print the contents of the Data Descriptor records and their associated processor records.

The DD_DISP program first goes to the ADAPS startup menu, Current User Information, for selecting the database, station, and output destination. The DD_DISP option menu is then presented, with the following available options:

DI - DISPLAY OF DD RECORD(S) - This option displays the contents of the selected DD record to the selected output destination. If no DD has yet been selected, a list of available DDs is presented. The selected DD will be displayed, followed by its associated processing information and screening thresholds, if available. If the DD is used to calculate another DD, that DD and its associated processing information and screening thresholds are also displayed.

LI - LIST OF DDs FOR A STATION - This option displays a list of DDs available for the previously selected station to the selected output destination. (**Note:** If the user has selected output to a printer or to a file, the list of DDs will NOT be displayed on the terminal.)

CH - CHANGE TO A DIFFERENT DD RECORD - This option presents a list of available DDs to display.

US - RESTART PROGRAM, DISPLAY USER INFORMATION - This option returns to the ADAPS start-up menu for changing of database, station, and output destination.

QU - QUIT THIS PROGRAM - This option exits back to the ADAPS menus.

EX - EXIT ADAPS PROGRAMS - This option exits ADAPS and returns to UNIX.

4.7.7 Display Measurements (MS_EDIT)

The MS_EDIT program allows the user to update and display measurements, however only certain options are available to display the data and restrictions are in place so that the full MS_EDIT menu, which includes functions for adding to and updating the database, is not available to non-USGS users (Cooperator access). The full MS_EDIT menu was explained in ***Chapter 4.4***, so only the display functions will be explained here.

The program allows the user to list and retrieve/print discharge measurement data, crest-stage gage (CSG) inspection data, and gaging station inspection data.

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

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

Only the options 0, 5, and 6 are used for displaying data and will be described in the following sections.

Change Setup Specifications - This option restarts the program and at the ADAPS startup screen (Current User Information) allows the user to change information such as station ID, pathnames, and output medium.

List Measurement/Inspection Data - This option prints a summary of all discharge measurements, CSG inspection data, and gaging station inspection data stored for a single station or for a group of stations. The summary display is a list showing measurement number and date for all measurements stored for the station. 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.

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.

4.7.8 Display Rating Table Dates

by James M. Caldwell

The display menu allows the user to view the start and end dates of a given rating for a given station. This display is not an expanded table of the rating.

Valid rating types are:

- Conversion of input
- Standard rating
- Stage-fall (slope) rating
- Fall/discharge ratio rating
- Stage-area rating
- Stage-velocity correction factor rating
- Deflection-velocity rating
- Conversion of auxiliary input

Note: in ADAPS 4.2, multi-parameter ratings have been removed from the input parameter to the computed parameter. For example, with stage-discharge ratings, the data descriptor used is discharge.

To display the rating table dates select "Display Rating Table Dates" from the DI-Display menu (RT_DATES). In the "Current User Information" menu verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer. If outputting to a file the file path can be specified with PA.

After these items have been specified, a carriage return will display a table with the rating ID numbers associated with the given data descriptor and the starting and ending dates for those ratings. If a rating does not exist for the given data descriptor no table will be displayed and an option to list more ratings (Y/N DEFAULT=Y) will be displayed.

4.7.9 Display Ratings

The display menu allows the user to view a given rating for a given station.
Valid rating types are:

- Conversion of input
- Standard rating
- Stage-fall (slope) rating
- Fall/discharge ratio rating
- Stage-area rating
- Stage-velocity correction factor rating

- Deflection-velocity rating
- Conversion of auxiliary input

NOTE: In ADAPS 4.2 and later releases with standard ratings or stage-discharge ratings, the data descriptor used is discharge.

To display a rating, select "Display Ratings" (RT_DISPLAY) from the DI-Display menu. In the "Current User Information" menu verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer. If outputting to a file the file path can be specified with PA.

After these items have been specified, a carriage return will display a rating selection list. This list displays the ratings available. The currently active rating is flagged with a "*". If a rating does not exist for the given data descriptor the DI submenu is displayed.

Select the desired rating and carriage return:

EP - Rating Expansion: No
CU - Units Conversion: No

DI - Display rating table
RD - Output Rating in RDB format

Enter option desired or key [CR] to
return to main rating

One of the options in the rating table program is to expand a rating - EP. The rating expansion can also be obtained using the menu option PR "Update/Display Rating Tables." 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 output to the device selected in the Startup menu (i.e., terminal, file, or printer).

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 one for the expanded rounding (except for discharge). For discharge, the recommended significant figures for rounding in expanded rating tables are as follows:

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	3
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.

Choosing CU- Units Conversion from the menu above brings up the following menu:

Units Conversion of Rating Points Options

IN – Input Parameter: None
OU – Output Parameter: None

Enter option desired or key [CR] to continue:

Input parameter is gage height with a standard rating and the choices are to convert from feet to meters, or to a user-supplied conversion (or leave as feet by not typing IN).

Output parameter is discharge with a standard rating and the choices are to convert from cubic feet/second to any of the following from the list provided after typing OU:

1 ACRE-FT/DAY
2 ACRE-FT/HOUR
3 ACRE-FT/MIN
4 ACRE-FT/s
5 CUBIC METERS/S
6 CUBIC METERS/M
7 CUBIC METERS/H
8 CUBIC METERS/D
9 MGD
10 GALLONS/DY
11 GALLONS/HOUR
12 GALLONS/MIN
13 GALLONS/S
14 LITERS/DAY
15 LITERS/HOUR
16 LITERS/MINUTE
17 LITERS/S
18 USER SUPPLIED CONVERSION

These conversion options can be converted to "None" simply by retyping IN or OU again in the conversion menu. If no expansions or conversions are chosen the "DI" option to display the rating will display the input points for the rating as in the example below:

```
                        STATION NUMBER 01010000  St. John River at Ninemile Bridge, Maine    SOURCE AGENCY USGS
         LATITUDE  464200  LONGITUDE  0694259  NAD27  DRAINAGE AREA  1341.00  DATUM   931.26  NGVD29  STATE 23  COUNTY 003
                                                Date Processed: 2002-04-19 08:50 By jmcald
                                                 Rating for Discharge (well-DCP), in cfs
                      RATING ID: 5.0   TYPE: stage-discharge    EXPANSION: logarithmic    STATUS: approved record
                 Created by sbarthol on 09-05-2001 @ 12:40:26 EDT,    Updated by sbarthol on 09-05-2001 @ 12:40:26 EDT
                                      Remarks: New low end and refinement of high end of rating 4

BASED ON _______ DISCHARGE MEASUREMENTS, NOS ________, AND ________, AND IS ______ WELL DEFINED BETWEEN ______ AND ______ CFS
                                                                      COMP BY _____ DATE ________     CHK. BY _____ DATE ______

     Stream   Dis-    |  Stream   Dis-    |  Stream   Dis-    |  Stream   Dis-    |  Stream   Dis-    |  Stream   Dis-
     stage,  charge,  |  stage,  charge,  |  stage,  charge,  |  stage,  charge,  |  stage,  charge,  |  stage,  charge,
      feet     cfs    |   feet     cfs    |   feet     cfs    |   feet     cfs    |   feet     cfs    |   feet     cfs

      0.50      80       0.98      230       2.09     1000       4.90     6650       8.20    20000
      0.62     110       1.20      330       2.55     1550       5.60     8960       8.80    23000
      0.76     150       1.35      410       3.20     2550       6.00    10400      10.00    30000
      0.82     170       1.65      616       3.60     3300       7.00    14500      11.00    36000
      0.92     205       1.90      824       4.40     5200       7.80    18000      13.05    50000

                                                          LOG OFFSETS
                                   Breakpoints:           ---             ---
                                   Offsets:       ---             ---             ---


Rating Type:                            Rating Type: stage-discharge
 ID   Starting Date                   Ending Date                  Comments
----  -------------------------      -------------------------     ------------------------------------------------------------------
 5.0  10-01-1993 @ 01:00:00 EDT      12-30-2382 @ 19:00:00 EST
```

Another output option is the RDB (relational-database) format. These are tab-delimited ASCII files, which can be used for other applications (***see section 6.4***). After choosing the DI option in the rating menu choose "RD – output rating in RDB format." The next prompt is for a file name. The output (OT – output to) should be specified in the "Current User Information" menu at the initial startup. Options are: to file, to terminal, or to a printer. If outputting to a file, the file path can be specified with PA

4.7.10 Plot Ratings (RATPLOT)

by Addis M. Miller, III

The RATPLOT program plots ratings, along with selected measurements, on blank or pre-printed forms after first plotting to the terminal screen where the user can develop the plot for the desired presentation. To access the RATPLOT program, select the DI sub-menu from the main ADAPS menu, and then select the option "Plot Ratings (RATPLOT)."

Introduction

The RATPLOT program plots ratings on pre-printed forms or blank paper. When printed on blank paper the program draws the grid lines. Both the log-log and rectilinear parts can be plotted. The program plots on the large (4 cycles by 3 cycles) or small (3 cycles by 2 cycles) pre-printed rating forms. Optionally, selected measurements can be plotted on the rating curve. Tkg2, a USGS graphics package, is used to produce the program displays.

Program Operation and Options

The RATPLOT program operates interactively. From the ADAPS startup menu select the database, agency code, station, and data descriptor where the rating is stored. Ratings are tied to the output DD in ADAPS 4.2. When the RATPLOT program is executed, it lists the available ratings for plotting and indicates which rating is currently active. After the rating is selected, the program prompts for which discharge value in the measurement file (first or second discharge), is to be plotted. After selection of which discharge value to plot, a menu of plotting options is displayed.

```
RATPLOT [1.27] - PLOT RATINGS/MEASUREMENTS
 1)   PAPER SIZE:          11x8.5
 2)   PLOT GRID:           Dense
 3)   MEASUREMENTS SUBSEQUENT TO 10/01/2001
      PLUS ALL ABOVE 5000 CFS WILL BE PLOTTED
                  LOG-LOG PLOT
 4)   X-MIN: 1000.00       X-MAX:  99300.00
      Y-MIN:  0.10         Y-MAX:  [30.52]*
 5)   OFFSET:  -1.00
 6)   X-LABEL: "Discharge IN cfs"
      Y-LABEL: "Gage height IN feet"
                 RECTILINEAR PLOT
 7)   SHOW RECTILINEAR PLOT
      X-MIN:   2100.00       X-MAX:  10000.00
      Y-MIN:   0.70          Y-MAX:  3.00

 9)   PLOT
 0)   EXIT RATPLOT

      *[Y-MAX auto-set to maintain square axes.]

ENTER OPTION:
```

Following is a brief description of the menu options:

Option 1 Paper Size: User is instructed to use the space bar to toggle through the paper size options. When the desired paper size is displayed, a <CR> sets the paper size.

Option 2 Plot Grid: User is instructed to use the space bar to toggle through the plot grid options. The grid choices are 1) no grid, 2) sparse grid, and 3) dense grid. When the desired plot grid is displayed, a <CR> sets the plot grid.

Option 3: Allows selection of measurements to be plotted. When three (3) is entered, a sub-menu is displayed:

```
MEASUREMENT PLOTTING OPTIONS
 1 - Measurements Subsequent to 10/01/2001
 2 - All Measurements Above 5000 cfs
 3 - Measurement Labeling Filter Value: 20
 4 - Meas. Control Condition(s) to Ignore: 6
 5 - Do Not Plot Measurements
------------------------------------------------------
Choose (1-5, <return>=done):
```

Measurement Plotting Options

 # 1: Plots and flags all measurements in the measurement file subsequent to the date entered.

 # 2: Plots and flags all measurements above the given discharge. Measurements above this value prior to the date entered are plotted, in addition to all measurements from # 1. These measurements represent carry-over high-water measurements from year to year.

 # 3: The measurement labeling filter is used to reduce crowding of measurement labels. The default value of 20 represents a percentage of the change in Q and GH between one point and the next. A value of 20 means a measurement can be labeled if the change in Q and GH from the previously plotted measurement is 20% or more.

 # 4: This allows the user to filter measurements based on the Control Condition code in the measurement file. One or more codes can be selected with [6] ICE COVER being the default.

 # 5: This toggles plotting of measurements on/off.

RATPLOT Menu Options – (continued)

Option 4: Selects the plot limits for the X and Y axes. The user is allowed to set the X-MAX/MIN and the Y-MIN. The Y-MAX is auto set to maintain square axes.

Option 5: Selects a scale offset that would best yield a straight line. The user is prompted for the scale offset.

Option 6: Labels the X and Y axes. The user can use the program defaults or enter a custom label.

Option 7: The user has the option of toggling the rectilinear plot on/off. If "yes" is selected the user is prompted for the Max and MIN discharge and MAX and MIN gage height. **Note:** A beginning value of less than 0.00 is valid, and sometimes this is useful when positioning the plot.

Option 8: This option does not show up unless the RATPLOT default menu parameters are modified by the user; it will prompt to save the changes upon exiting. Thereafter, if saved parameters exist for a station, the menu will have this option:

" 8 LOAD PREVIOUSLY SAVED RATING PARAMETERS"

Option 9: Generates the plot to the terminal screen allowing the user to view the rating and possibly make changes before plotting a paper copy. The user can then use the Tkg2 displayer to select a plotter, send the plotting instructions to a file, or exit the display to edit the plot at the plotting-options menu.

Option 0: Exits the RATPLOT program's menu and returns the user to the DI sub-menu.

4.7.11 Display Data Correction Records

by Sarah E. Giffen

Data corrections are applied to recorded water data parameter readings to compensate for erroneous recording. These corrections can vary by both time and data value. They are usually applied for short durations of time. There are three separate sets of data corrections available, which can be applied independently of one another. For stage data these sets are referred to as the "Gage Height Correction," "Datum Correction from Levels," and "Other" and are displayed as such in ADAPS. Gage Height Corrections are defined as corrections applied to the gage height due to instrument errors. Datum Corrections from Levels are defined as corrections applied to that gage height to correct for vertical movement of the gage documented by levels run at the station. Other corrections refer to any other corrections that need to be applied to the gage height that don't fall within the other two categories. For data other than stage data, the three sets of corrections have not been named in ADAPS. The user should define the correction sets based on what is relevant for that type of data. For example, for water quality data the correction sets may be defined as "Calibration correction," "Cleaning correction," and "Other." The three correction sets are displayed separately. All three sets of data corrections can vary both by time and parameter, and can consist of up to three points, each point being an input data point and the corresponding data correction at that point. The interpolation between these points is linear. The first correction value will be used for data below the first input point and the last correction value will be used for data above the last input point.

The proration of data corrections between values is done as an unweighted linear calculation between the individual user-supplied input and correction value pairs. This proration process also occurs automatically across water year boundaries. The last value in the previous water year and the first values of the current water year are used for the proration. If there are no entries in the previous water year's file, the data correction values from the previous water year are not applied and the data correction begins at the time and with the values available in the current water year.

Up to 100 datum corrections can be stored for each water year, and are displayed as 28 entries per page.

To display the data correction table select "Display Data Correction Records" from the "DI-Display" menu. In the "Current User Information" menu verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. For multi-parameter processing, the data descriptor must be an input parameter, since data corrections are not applied to computed parameters (for example, discharge in stage-discharge processing). The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer. If outputting to a file, the file path can be specified with PA.

After these items have been specified, a carriage return will display a list of the number of corrections that have been entered for each of the three types of corrections for three consecutive water years: the water year previous to the specified year, the specified water year, and the year following the specified water year. Select the number 1-3, for the desired correction set. The figure below is an example of this menu. In this case a stage data set was selected so the three correction sets are labeled as Gage Height Corrections, Datum Corrections, and Other. There are three Gage Height Corrections in the 1999 water year and six Gage Height Corrections in the 2000 water year; therefore the user must select number 1, for Gage Height Corrections, in order to display any corrections.

```
   USGS 01010000        St. John River at Ninemile Bridge, Maine

                                ID MENU
                               =========

             NUMBER OF  CORRECTIONS
     NUM     1999    2000    2001     NAME
     ---     ----    ----    ----     ------------------------------

       1        3       6       0     Gage Height Corrections
       2        0       0       0     Datum Corrections from Levels
       3        0       0       0     Other

   Enter the set number of the correction desired:
```

In the next menu, the "Data Correction" menu, the options are: "VI-View correction values," "LI- list selection on screen or printer," "ID- return to ID screen," "US- return to user information screen," "QUIT," and "EXIT." Selecting "VI" will display the data corrections as shown below.

```
                              CORRECTION SET    1
    USGS 01010000         St. John River at Ninemile Bridge, Maine
    Gage height (well-DCP), in feet                         WATER YEAR: 2001
             DATES VALID FROM: 10/01/2000 00:00 TO 09/30/2001 23:59
  Enter one of the commands from the menu
********************************************************************************
    START DATE TIME  ZONE   INPUT     CORR     INPUT     CORR     INPUT     CORR
    END   DATE TIME  ZONE  COMMENT
PRV:1999/05/04 1357 EDT       0.00    -0.02
    1999/05/04 1358 EDT
--------------------------------------------------------------------------------
  1:2000/10/01 1400 EDT       0.00     0.02     1.00     0.32     5.00     0.40
    2000/10/15 1000 EDT    this is the first correction for the water year
  2:    /__/__ ____ _____  ________ ________ ________ ________ ________ ________
        /__/__ ____ _____  _____________________________________________________
  3:    /__/__ ____ _____  ________ ________ ________ ________ ________ ________
        /__/__ ____ _____  _____________________________________________________
--------------------------------------------------------------------------------
NXT: None

 "Q"= return to menu    "E"= exit program
 "F"= forward 1 page    "M"= down 1 line
 "B"= backward 1 page   "U"= up 1 line                           "S"= quit view
```

The display menu allows the user to view the input points of the corrections applied to a given parameter for a given station. This display is not an expanded table (described in ***Section 4.7.13*** Display Expanded Shifts and Corrections). The example above shows the data correction input points with dates, times, time zones, input points, and correction values. The correction set (1-3 selected in the "ID menu"), station number, station name, and water year are listed at the top of the table. Listed next, with the line heading "PRV," is the last data correction (for the specified correction set) for the site from a previous water year.

In this example, the first correction is a three-point correction with a starting time of 10/01/2000 at 1400 EDT and an ending time of 10/15/2000 at 1000 EDT. The three input points are 0.00, 1.00, and 5.00 and the corrections, 0.02, 0.32, and 0.40, will be prorated between these values respectively. The last correction value of 0.40 will be applied to any values greater then 5.00. If no end date had been specified, the correction would be prorated forward to the next correction. The comment shown after the ending time is for descriptive purposes only and is not used by the system.

In the "Data Correction menu," selecting "LI- List selection on screen/ print," will display or print (depending on the output specifications) the data corrections for the specified year in the format shown below.

```
                    U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

                  STATION NUMBER 01010000  St. John River at Ninemile Bridge, Maine    SOURCE AGENCY USGS
      LATITUDE  464200  LONGITUDE  0694259  NAD27  DRAINAGE AREA  1341.00  DATUM   931.26  NGVD29  STATE 23   COUNTY 003
                                       Date Processed: 2002-04-17 08:51 By sgiffen

                                                       CORRECTION CURVES

 Correction set #1                                      2000 Water Year

                                             Gage height (transducer-DCP), in feet

                  STARTS                         ENDS                INPUT    CORR.      INPUT    CORR.      INPUT    CORR.
      ____________________________    ____________________________  _______  _______    _______  _______    _______  _______
 PRV: 1999/09/01 15:32:00 EDT        1999/10/01 00:01:00 EDT          0.00     0.01


    1 1999/11/16 15:15:00 EST                                         0.00    -0.04
    2 2000/04/25 12:15:00 EDT                                         0.00    -0.04
    3 2000/05/17 11:15:00 EDT                                         0.00    -0.16
    4 2000/05/17 11:30:00 EDT                                         0.00    -0.04
    5 2000/08/14 11:30:00 EDT                                         0.00    -0.06
    6 2000/08/14 14:15:00 EDT        2000/08/14 14:30:00 EDT          0.00    -0.04

 NXT: None

More? [Y/N DEFAULT=Y]:
```

Again the correction set (1-3 selected in the "ID menu") station number, station name, and water year are listed at the top. Listed next, with the line heading "PRV," is the last data correction (for the specified correction set) for the site from a previous water year. All of the corrections for the specified correction set and water year are listed next. The start date and time, end date and time, input point and correction value pairs are listed in columns from left to right. Any comment fields will be shown on the line following the correction for which it applies.

4.7.12 Display Variable Shifts

by James M. Caldwell and Sarah E. Giffen

Shifts in the stage-discharge rating reflect the fact that stage-discharge relations are not constant but vary from time to time because of changes to the physical features that form the control. Variable shifts vary by both stage and time. Variable shifts can consist of up to three points. The interpolation between these points is linear.

In ADAPS 4.2 and later releases, variable shifts are used exclusively with stage-discharge ratings. These shifts are fixed (hard-wired) to a particular rating.

The data descriptor used is discharge. The input points refer to gage height.

The "Display Variable Shifts" option allows the user to view the input points of the shift applied to a given rating for a given station. This display is not an expanded table (available with display Expanded Shifts and Corrections, ***Section 4.7.13***).

To display the variable shift table select "Display Variable Shifts" from the DI-Display menu. In the "Current User Information" menu, verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. The DD-Data descriptor must be set to discharge. The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer.

After these items have been specified, a carriage return will display the ratings available for the selected station. Select the ID number for the desired rating and carriage return. This will display the “Shift Correction” menu with the following options: “VI- VIEW correction values,” “LI- LIST selection on screen/printer,” “ID- Return to ID screen,” “US_ Return to user information screen,” “QUIT,” and “EXIT.” Selecting “VI” will display the variable shifts for this rating, if they exist. The shifts for the specified water year will be numbered sequentially with the first shift of that water year being number one. Selecting “LI” will list on the screen/printer the variable shifts for this rating for the specified water year but the numbering will reflect all of the shifts for that rating, as the rating and shift are a pair. For example, if there are five shifts for the rating in previous water years, the first shift for the selected water year will be number six.

Below is an example of a variable shift table with dates, times, zones, input points, and shifts as seen in the “VI- View” option.

```
                      SHIFTS FOR RATING # 5.0     TYPE: stage-discharge
    USGS 01010000         St. John River at Ninemile Bridge, Maine
    Discharge (well-DCP), in cfs                         WATER YEAR: 2001
             DATES VALID FROM: 10/01/2000 00:00 TO 09/30/2001 23:59
  Enter one of the commands from the menu
********************************************************************************
    START DATE TIME  ZONE   INPUT    SHIFT    INPUT    SHIFT    INPUT    SHIFT
    END   DATE TIME  ZONE  COMMENT
PRV:1997/04/19 1200 EDT       0.00    -0.04     1.75    -0.04     2.50     0.00
    1997/04/19 1215 EDT
--------------------------------------------------------------------------------
  1:2000/10/01 0001 EDT       0.00     0.00     1.75     0.00     3.00     0.00
    2000/10/20 1230 EDT    -----------------------------------------------------
  2:2000/10/12 0400 EDT       1.00    -0.20     1.80    -0.06     3.00    -0.04
    2000/10/20 1230 EDT    meas #32, removed log from storm on 10/12
  3:2001/04/01 1000 EDT       1.20    -0.04     1.80    -0.02     3.00     0.00
    2000/10/20 1230 EDT    -----------------------------------------------------
--------------------------------------------------------------------------------
NXT: None

 "Q"= return to menu   "E"= exit program
 "F"= forward 1 page   "M"= down 1 line
 "B"= backward 1 page  "U"= up 1 line                          "S"= quit view
```

The station number, station name, and water year are listed at the top of the table. Listed next, with the line heading “PRV,” is the last shift for that rating from a previous water year.

The first shift for the selected water year (the 2001 water year in this example) is displayed with the line heading “1:”. The start date and time (24-hour time) and time zone are listed on the first line, followed by the input points and corresponding shift values (the + or – correction to gage height). For the first shift there are three input points and corresponding shift values. On the next line, the end date and time are followed by any comments pertaining to this shift. This shift is applied to the period between the start time and the end time.

The second shift for the water year (again the 2001 water year) is displayed with the line heading “2:”. The start date and time (24-hour time) and time zone are listed on the first line, followed by the input points and corresponding shift values (the + or – correction to gage height). On the next line, unlike shift number 1, no end time has been specified. Therefore shift number 2 will be prorated forward to the next shift (shift number 3 in this case).

In the example described above there are three variable shifts for the 2001 water year. The number of shifts possible, however, is not limited.

See the following section for more options on viewing variable shifts.

4.7.13 Display Expanded Shifts and Corrections

Expanded shift or correction tables are tables generated from the variable shift or data correction input points. The expanded tables are the interpolated values between those input points. The expanded data correction table displays the values that are the result of combining the three types of available data corrections: data corrections, datum corrections, and other corrections.

To display the expanded shift or data correction table, select "Display Exp Shifts/Corrections" from the DI-Display menu. In the "Current User Information" menu, verify or change DB-database, AG-agency, ST-station, DD-data descriptor and YR-year options as needed. Discharge is the data descriptor used to display shift tables, whereas data correction tables are displayed by choosing any data descriptor to which data corrections could be applied to edited unit values. If discharge is the selected data descriptor, make sure to choose the appropriate rating as shifts are fixed to a particular rating. The output (OT – output to) should also be specified. Options are: to file, to terminal, or to a printer. After these items have been specified, a carriage return will display the "Table data range selection" menu. Enter a new begin date for the table at the prompt and carriage return. Enter a new end date for the table at the prompt and carriage return. Enter the interval for the table at the prompt, which is the time increment between variable corrections to be shown, then carriage return. The prompt appears like this: (NN D/H/M/S). For the interval, choose the number (NN) of days (D), hours (H), minutes (M), or seconds (S) desired for the interval. For example, "08 h" would produce a table of variable corrections for every 8 hours and "02 d" would produce a table of values for just every two days. The default is one set of corrections per day. The "Correction table" menu has the following options: "DT" – Select New Date Range, "DC" – Data Correction Table or "SV- Shift Table," "US" – Return to User information screen, "QUIT," and "EXIT." Selecting "DC" or "SV", whichever is applicable for the data descriptor selected, will display the view shown below. In the "Table column values selection" menu, select the number of columns from 0 to 12 to be displayed. Specify the maximum and minimum values to display. An example of an expanded shift is shown below.

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

STATION NUMBER 01010000 St. John River at Ninemile Bridge, Maine SOURCE AGENCY USGS
LATITUDE 464200 LONGITUDE 0694259 NAD27 DRAINAGE AREA 1341.00 DATUM 931.26 NGVD29 STATE 23 COUNTY 003
Date Processed: 2002-04-04 14:42 By sgiffen
EXPANDED SHIFT CORRECTION TABLE

Gage height (well-DCP), in feet

DATE/TIME		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
10/10/2000	10:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	11:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	12:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	13:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	14:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	15:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	16:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	17:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	18:00:00	-0.17	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
10/10/2000	19:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/10/2000	20:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/10/2000	21:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/10/2000	22:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/10/2000	23:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/11/2000	00:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/11/2000	01:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/11/2000	02:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
10/11/2000	03:00:00	-0.18	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04

The station information is displayed at the top of the expanded shift table. The date and time are displayed in the two left-most columns. The first date and time were specified by the user, as was the interval. In this case the interval was set to one hour. The headers on the ten columns to the right indicate the gage height (in this case). The user specified the number of columns to be ten, minimum value to be one, and the maximum value to be ten. The program uses the difference between the maximum value and the minimum value divided by the number of increments between columns to determine the equally-spaced values of the DD (gage height in this case) for each of the headings.

4.7.14 Primary Status Report

by Addis M. Miller, III

This program is designed to produce a report listing the Ratings, Shifts, and Corrections that are applied to a list of Data Descriptors (DDs) in an input file. The program uses the standard ADAPS startup menus, allowing the user to select the path for files and the destination for the program output. Once these selections have been made, the program queries the user for the name of the input file listing the DDs to be checked.

```
X XTerm on hqsun3
              PRIMSTAT - STATUS OF PRIMARY DATA - RATING, SHIFT, DATUM
                         HQSUN3 DEVELOPMENT INSTALLATION
DATE: 06-28-2002     USER jcorn                              TIME: 11:48:24
******************************************************************************
CURRENT USER INFORMATION
PA - FILE PATH    - /home/nw/jcorn/test2
OT - OUTPUT TO    - OUTPUT TO A FILE
OF - OUTPUT FILE  - O.PRIMSTAT.695.20020628.1148
------------------------------------------------------------------------------
DB - DATA BASE    -  Montana District NWIS Data
******************************************************************************
Enter: PA,OT,OF,DB  to edit field or
     [CR] to continue:
Enter SITE/DD list file name: █
```

The Site/DD list file is a file which lists the Agency code, Site number, and DD number for each DD to be listed. The format of each record is a 24-character string, which may be followed by optional comments if desired, as shown in the example below:

```
AAAAAsssssssssssssssDDDD  optional short comments

USGS 05014500           1  # Water Temp DD
USGS 05014500           2  # Primary Discharge DD
USGS 05014500           3  # gage ht DD
USGS 05014500           4  # gage ht from logger DD
USGS 05014500           5  # Discharge from logger DD
USGS 05014500           6  # gage ht from DCP DD
USGS 05016000           1
USGS 05016000           2
USGS 05016000           3
```

Columns 1 through 5 in each record are the Agency code, left-justified. Columns 6 through 20 are the Station number, left-justified. Columns 21 through 24 are the DD number, right-justified. Comments may be added to the records after Column 25 if desired. These comments will not be read or processed by the PRIMSTAT program; however, they may be useful for keeping the input files maintained.

Once the user has supplied the input file name to the program, the output report will be generated and either displayed to the screen or written to the location specified at startup. A sample report from the input file above is shown below:

```
X xterm
                                  UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY
REPORT OF CURRENTLY ACTIVE RATINGS AND SHIFTS                                                      06/28/2002 12:08:35

                                        ACTIVE  RATINGS                         SHIFTS AND CORRECTIONS
                                   ---------------------------  ---------------------------------------------------------------
SITE IDENTIFICATION   DDID AND          ID    BEGIN DATE/TIME  ZONE  TYPE(SET)  BEGIN DATE/TIME  ZONE  VALUE1 SHIFT1  VALUE2 SHIFT2
NAME (PARTIAL)        DESCRIPTION       RATING TYPE                                                    VALUE3 SHIFT3
--------------------  -----------------  ---- ---------- ----- ----  ---------  ---------- ----- ----  ------ ------  ------ ------

USGS 05014500            1 - WATER TEMP  No Active Ratings Found
Swiftcurrent Creek a  ERATURE, IN (DEGR  for this Station/DD

USGS 05014500            2 - DISCHARGE,    10  10/01/1983 00:30 MDT   Shift      10/01/2000 00:00 MDT    1.94   0.05    2.43   0.00
Swiftcurrent Creek a   IN CFS            stage-discharge                                              3.00   0.08

USGS 05014500            3 - GAGE HEIGH  No Active Ratings Found
Swiftcurrent Creek a  T, IN (FEET)       for this Station/DD

USGS 05014500            4 - GAGE HEIGH     1  10/01/2001 00:00 MDT   No Active Shifts Found
Swiftcurrent Creek a  T FROM A/F LOGGER  input conversion             for this Station/DD/Rating

USGS 05014500            5 - DISCHARGE     10  10/01/1983 00:30 MDT   No Active Shifts Found
Swiftcurrent Creek a  FROM A/F LOGGER,   stage-discharge              for this Station/DD/Rating

USGS 05014500            6 - GAGE HEIGH  10.0  10/01/2001 00:00 MDT   No Active Shifts Found
Swiftcurrent Creek a  T FROM DCP, in (F  input conversion             for this Station/DD/Rating
                                                                      Corr. (1)  07/18/2001 16:30 MDT    0.00   0.00     --     --
                                                                                                           --     --

USGS 05016000            1 - DISCHARGE,    24  03/01/1995 00:15 MST   Shift      11/02/2000 12:00 MST    2.59  -0.08    4.98  -0.05
Swiftcurrent Creek a   IN CFS            stage-discharge                                              7.50  -0.05

USGS 05016000            2 - GAGE HEIGH  No Active Ratings Found
Swiftcurrent Creek a  T, IN (FEET)       for this Station/DD

USGS 05016000            3 - DISCHARGE,  No Active Ratings Found
Swiftcurrent Creek a   IN CUBIC METERS/  for this Station/DD
{jcorn} hqsun3: %
```

4.7.15 Daily-Values Inventory

The DVINV program produces an inventory listing of the contents of the Daily-Values File for a single database. The inventory is a report of all Daily-Values data contained in the selected database and cannot, at this time, be restricted to a single station or combination of selected stations. To access the DVINV program, select the DI sub-menu from the main ADAPS menu, and then select the option "Daily-Values Inventory."

The program is a preprocessor that uses the standard startup menu to let the user select the database, batch queue, and output destination, after which a batch job is submitted to process the Daily-Values File (for the selected database) and produce the report.

Program Report

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 one non-missing 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 non-missing 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. See the following sample report:

```
1PAGE  1 UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY             PROCESS DATE 06/28/2002
INVENTORY OF DAILY VALUES DATA - DATA BASE  1 -  Montana District NWIS Data               TIME 09:39:52
DAILY VALUES FILE
0 PARM  STAT   BEGIN     END       NO.  MISSING PROV.  FINAL  TOTAL
CODE  CODE  YEAR MO  YEAR MO    DAYS   DAYS   YEARS  YEARS  YEARS     MAXIMUM     MINIMUM        MEAN
0STATION USGS  01000001        Test site in Maine
STATE 23 DISTRICT 23  COUNTY 003 SITE ME   DR AREA =          SQ MI
0 DATA DESCRIPTOR NUMBER    1 - PRECIPITATION (incremental), in INCHES
00045 00006  1999 10  1999 10       8      23      1      0      1       96.00        0.00       24.06
0 DATA DESCRIPTOR NUMBER    2 - PRECIPITATION cumulative, in INCHES
(WORK DD)
00045 00006  1999 10  1999 10       7      24      1      0      1        7.10        0.00        1.92
0STATION USGS  01010000        St. John River at Ninemile Bridge, Maine
STATE 23 DISTRICT 23  COUNTY 003 SITE SW   DR AREA =  1341.00 SQ MI
0 DATA DESCRIPTOR NUMBER    1 - DISCHARGE (well-DCP), in CFS
(WORK DD)
00060 00003  1986 10  1987 05     119     124      1      0      1    16100.00      928.00     3585.19
00060 00003  1987 08  1988 01      75     109      2      0      2     7400.00        6.00     1883.28
00060 00003  1988 03  1988 08     122      62      1      0      1    17300.00        1.40     3202.58
00060 00003  1988 10  1990 10     723      38      4      0      4    23000.00        0.00     3859.43
00060 00003  1991 01  1991 03      39      51      1      0      1    30400.00    28400.00    28923.08
00060 00003  1991 06  1996 10    1676     304      4      3      7    30400.00      102.00     3647.43
00060 00003  1999 08  2001 09     751      41      3      0      3    31200.00      114.00     3214.28
0 DATA DESCRIPTOR NUMBER    2 - GAGE HEIGHT (well-DCP), in (FEET)
(WORK DD)
0 DATA DESCRIPTOR NUMBER    4 - PRECIPITATION (FROM DCP), in INCHES
(WORK DD)
00045 00006  1992 03  1992 04      17      44      1      0      1        0.36        0.00        0.13
00045 00006  1992 06  1992 09      29      93      1      0      1       80.00        0.00        4.70
```

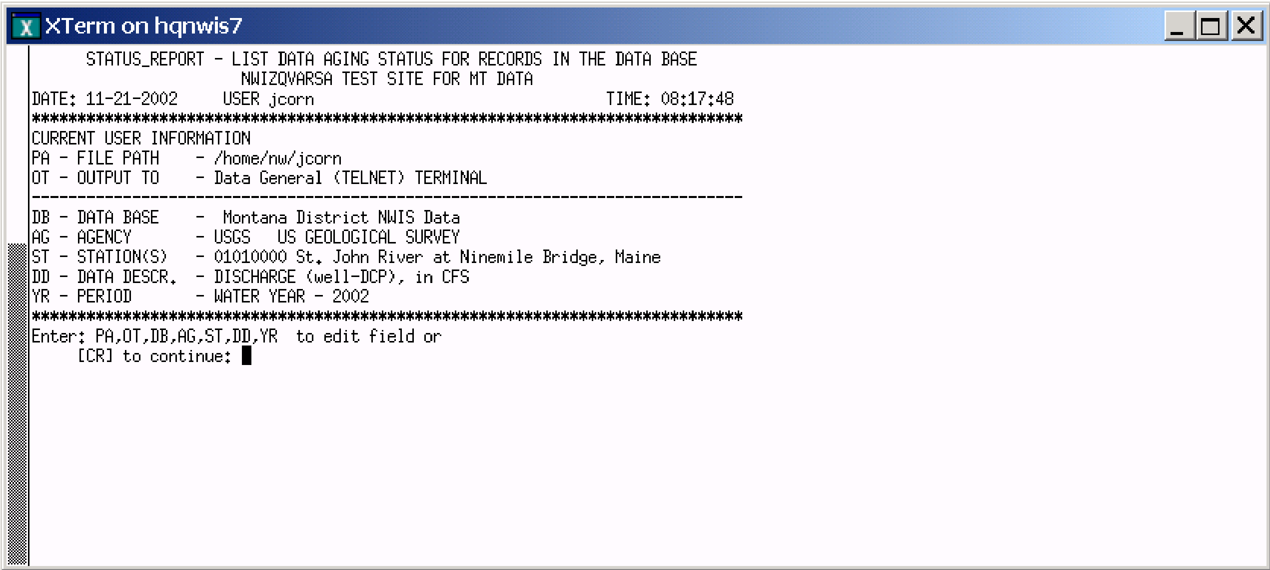
4.7.16 Display Data Aging Status

by James F. Cornwall

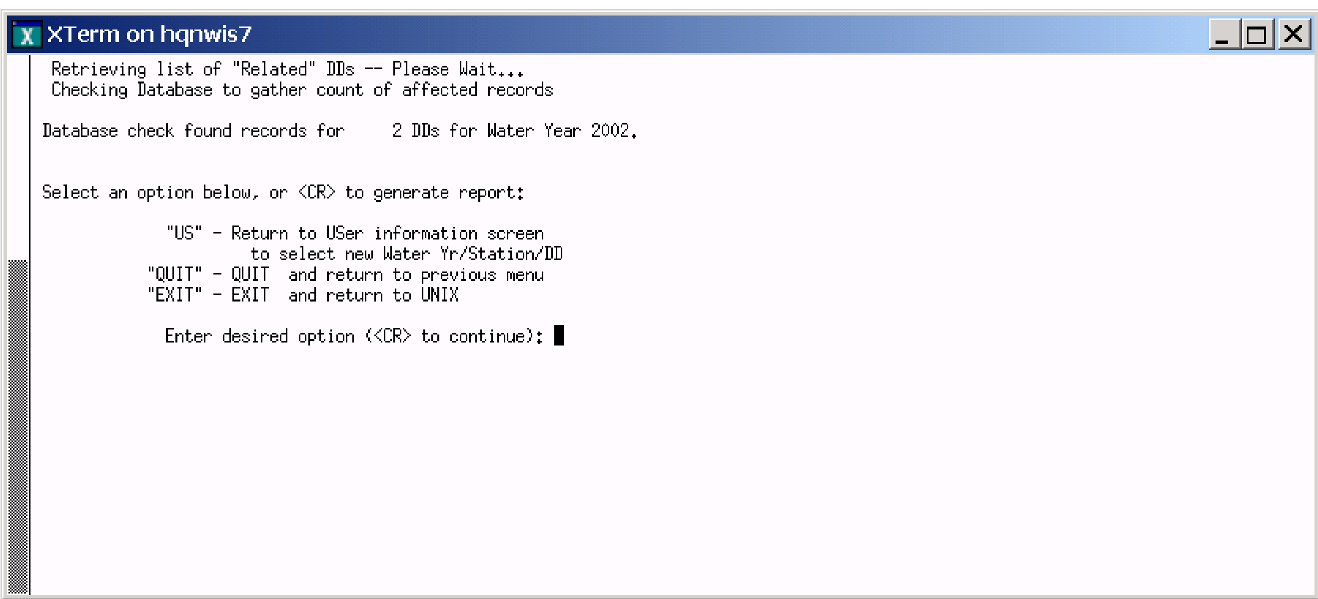
The STATUS_REPORT program, new for NWIS 4.3, produces a listing of the number of database records found in each data aging category for the specified station/DD (or ADAPS Group) and water year. This allows managers to more easily keep track of the aging status of the data.

Program Operation

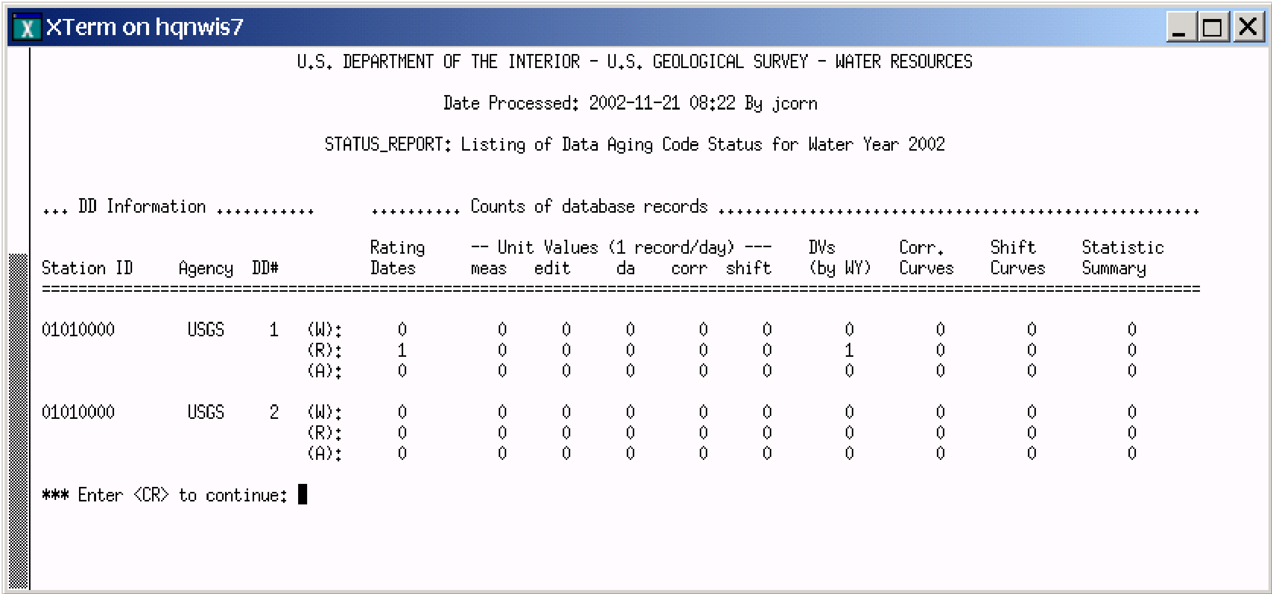
The program first uses the standard ADAPS startup menu to select the output parameters, database, agency, station, DD, date range, and mode of operation. After selecting these parameters, the user enters <CR> to continue.



When the user enters the <CR> to continue, the program will display informational messages and the available commands, as shown below. At this point, the user should set the terminal window to a width of 132 columns if the report will be displayed to the screen instead of being written to a file.



After entering <CR> to generate the report, the program scans the database and counts the number of records for each DD in the various data aging status categories, and displays them as shown below:



```
XTerm on hqnwis7
                         U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

                                      Date Processed: 2002-11-21 08:22 By jcorn

                           STATUS_REPORT: Listing of Data Aging Code Status for Water Year 2002

... DD Information ...........      .......... Counts of database records .....................................................

                                    Rating    -- Unit Values (1 record/day) ---    DVs      Corr.     Shift     Statistic
Station ID     Agency  DD#          Dates     meas    edit     da     corr  shift  (by WY)  Curves    Curves    Summary
===============================================================================================================================

01010000        USGS     1   (W):     0         0       0       0       0      0      0        0         0          0
                             (R):     1         0       0       0       0      0      1        0         0          0
                             (A):     0         0       0       0       0      0      0        0         0          0

01010000        USGS     2   (W):     0         0       0       0       0      0      0        0         0          0
                             (R):     0         0       0       0       0      0      0        0         0          0
                             (A):     0         0       0       0       0      0      0        0         0          0

*** Enter <CR> to continue:
```

In this report, the number of records found in each aging category are displayed for each DD. The format of this report is quite similar to the status displayed in the SETSTATUS program, which updates the aging codes, allowing the user to see what the codes are set to prior to making updates.

After the report has been generated, the program will return to the startup screens to select new parameters.

4.8 Data Retrieve/Write

4.8.1 Retrieve ADAPS Data in RDB Format (rdb_out)

by Addis M. Miller, III

The RDB_OUT program allows the user to retrieve rating tables, daily-values, unit-values, measurements, shifts, data corrections, and peak flow information from ADAPS in RDB format, which then can be used in other programs such as plotting routines. RDB is a simple format of arranging tabular data. The RDB tables consist of two parts: the NWIS comment lines which describe the NWIS record retrieved and the actual data retrieved including the data column headers. For a description of the RDB format and complete descriptions of the RDB tables available from NWIS with examples, refer to ***Section 6.4 RDB Format***.

To access RDB_OUT, choose the RT sub-menu and the option "Retrieve ADAPS data in RDB Format." The user startup screen at this point only presents the user File Path and the Database which may be changed. A <CR> at the startup screen then presents a request to the user to type in a file name for the RDB table that will be retrieved.

As each RDB table is created using the different options as explained below, the user is sent back to the RT sub-menu so that the sequence of choosing the Retrieval to RDB format, approving the user File Path and Database screen, and naming an RDB file must be done. After the RDB file is named, the following menu then appears:

```
        RDB retrieval options

1 - NWRT2RDB - Retrieval of ratings
2 - NWRT2RDB - Retrieval of expanded ratings
3 - NWTS2RDB - Retrieval of UVs, DVs, measurements,
          peak flows, corrections, or shifts
4 - NWTS2RDB - Retrieval of UVs, DVs, measurements, peak flows,
          corrections, or shifts with the -c option enabled

Select the desired option:
```

Option 1, NWRT2RDB - Retrieval of ratings

This option provides an RDB table of the rating table points stored in NWIS. Selection of this option produces another user startup screen where the station and data descriptor, DD, can be selected. The DD selected must be the output DD such as discharge in a stage/discharge rating as ratings are tied to the output DD. Next appears a rating selection list of the available stored ratings with the rating currently in use marked with an asterisk. After the rating is chosen, the RDB table is written and the user is sent back to the RT sub-menu screen. The user must go to the path name location that had been designated to obtain the RDB table under the file name given earlier. An example of an RDB retrieval for a stage/discharge rating is shown below:

```
# //FILE TYPE="NWIS RATING"
# //DATABASE NUMBER=   DESCRIPTION=""
# //STATION AGENCY="USGS " NUMBER="01010000      "
TIME_ZONE="EST" DST_FLAG=Y
# //STATION NAME="St. John River at Ninemile Bridge, Maine"
# //DD NUMBER="   1" LABEL="DISCHARGE (well-DCP), in CFS"
# //PARAMETER CODE=""
# //RATING ID=" 5.0" TYPE="STGQ" NAME="stage-discharge"
# //RATING REMARKS="New low end and refinement of high end of rating 4"
# //RATING EXPANSION="logarithmic"
# //RATING_INDEP ROUNDING="0223456782" PARAMETER="GAGE
HEIGHT in (FEET)"
# //RATING_DEP ROUNDING="0222233332" PARAMETER="DISCHARGE in
CFS"
# //RATING_DATETIME BEGIN=19931001010000 BZONE=EDT
END=23821230190000 EZONE=EST
INDEP   DEP    STOR
16N     16N    1S
0.50    80     *
0.62    110    *
0.76    150    *
0.82    170    *
0.92    205    *
0.98    230    *
1.20    330    *
1.35    410    *
1.65    616    *
1.90    824    *
2.09    1000   *
2.55    1550   *
3.20    2550   *
3.60    3300   *
4.40    5200   *
4.90    6650   *
5.60    8960   *
6.00    10400  *
```

Option 2, NWRT2RDB - Retrieval of expanded ratings

This option provides an RDB table of the rating table in expanded form, for every hundredth foot of stage in the case of a stage/discharge rating. Each point stored in NWIS is identified with an asterisk.

Option 3, NWTS2RDB - Retrieval of UVs, DVs, measurements, peak flows, corrections, or shifts

This option is used to produce RDB tables of time-series data from the NWIS database. Selecting this option displays the following menu:

```
Valid data types are:
   DV – Daily-Values
   UV – Unit-Values
   MS - Discharge Measurements
   PK - Peak Flows
   DC - Data Corrections
   SV - Variable Shift
Enter desired data type:
```

Daily Values

Choosing the DV – Daily-Values option presents a user startup screen that allows the user to choose the station, DD, statistic code, and dates for retrieval. A <CR> produces an RDB table at the pathname designated and the user is put back to the RT sub-menu. The RDB table contains the NWIS comments which document what data is retrieved, the header for the data table which includes the names of the data columns in the first line and the data definitions (column width and a letter designation as to whether the data is a date, number, or other string of variables) in the second line. The data starts in the third line and will contain the date, the data value, precision (number of significant places), possibly a remarks code, type of data (computed or final), and a quality assurance code as to whether the data is labeled “working,” “in review,” or “approved.”

Unit Values

Choosing the UV– Unit-Values option brings up a choice of unit-values type:

Unit-values type (M, N, E, R, S, or C):
The choices are: M= measured
N= raw measured
E= edited
R= data corrections
S= shifts
C= computed

After the unit-values type is selected, the user startup screen appears which allows the user to select station, DD, and dates or even to change file path, database, or agency if desired. After the information is correct on the user startup menu, a <CR> may produce a screen that shows a list to choose from of the stored unit-values for the type selected or may indicate that the program found only one available UV data set for the DD and type selected as shown below:

GAGE HEIGHT (well-DCP), in (FEET)
From 01/01/2001 to 01/10/2001

1. **Measured Unit-Values: transport = UNS, sensor = unspecified**

Only Available Measured UV type has been selected.

A <CR> here immediately creates the RDB table at the file path and file name designated and the user is sent back to the RT sub-menu. The user must be aware that all unit-values types are not available for each DD. For instance, measured unit-values would not be available for a discharge DD at a station where only gage height is recorded at the site and unit-values of shifts would only be available for a discharge DD. The program alerts the user if no unit-values are found as indicated:

**** No Measured Unit-Values data found ****

Discharge measurements

If the MS – Discharge Measurements option is picked, the first screen gives the user the following choices:

Measurement file retrieval type –
Crest Stage Gage measurements (C),
Discharge Measurements (M),
Gage Inspections (G), or
Both Measurements and Inspections (B) -
Please enter C, M, G, or B:

Once the choice of measurement file type is made, an RDB table is written and the user is sent back to the RT sub-menu. The RDB table produced from this retrieval contains the NWIS comment information at the beginning of the table defining what the table contains, such as the station number and name, and the time period requested. The data portion of the table contains all the information stored in the NWIS measurement file for the time period selected and is similar to a measurement summary that would be retrieved from ADAPS using the Display Measurements function.

Peak flows

If the PK- Peak flows option is chosen, the user first has to choose the type of peaks from the following menu:

Peak flow file retrieval type -
Full peaks only (F),
Partial peaks only (P),
Both Full and Partial peaks (B) -
Please enter F, P, or B:

After the choice of peak type is made, the startup menu appears where the user selects the station and time period. When the record is correct, a <CR> creates the RDB table at the file path and file name provided and the user is sent back to the RT sub-menu.

The RDB table contains the NWIS comments defining the record such as station name and number and the time period selected. The data portion of the table contains information stored in the peak flow file. This information includes peak discharge date and time, peak discharge, peak discharge qualification codes, gage height of peak discharge and qualification codes, maximum gage height and date if different than the gage height of the peak discharge with gage height qualification codes. If the recorded peak is the highest since a known year prior to the period of gage record, that year is listed.

Data corrections

If the DC- Data Corrections option is chosen, the user startup screen appears where the user can select a station, DD, and the time period for retrieval of data corrections. The data corrections must be retrieved using the input DD in NWIS, such as gage height. After the user startup menu is correct, a <CR> creates the RDB table of data corrections at the file path and file name provided by the user and the user is sent back to the RT sub-menu.

The RDB table contains the NWIS comments at the beginning of the table defining the record retrieved. The data portion of the table includes the starting date, time, and time zone code of corrections, the ending date, time, and time zone code if available, the input DD value and corresponding data correction. It is possible in ADAPS to use from one to three data correction values in a variable-correction diagram for each of three different types of data corrections, as explained in other sections of this document. The RDB table may contain up to three types of corrections (gage height corrections, datum corrections from levels, and other corrections), which would be designated as sets 1 through 3. Each set could have up to three pairs of input parameter and corrections, which would be identified as sequence numbers 1 through 3. Each data correction will be on a separate line identified by set and sequence number.

Variable shift

If the SV – Variable shift option is selected, a user startup menu appears allowing the user to select the station, DD, and time period to retrieve shifts. The output DD, discharge, must be selected because shifts are tied to individual ratings and ratings are tied to the output DD, discharge in this instance. Shifts are only used with stage-discharge ratings and are applied to the stage. When the user startup menu is correct, a <CR> will create the RDB table and send the user back to the RT sub-menu.

The RDB table contains the NWIS comments at the beginning of the table defining the record retrieved. The label of the DD selected will show "discharge," but the parameter identified as the independent variable to which the shift is applied is "gage height." The data portion of the table includes three lines of data for each shift diagram retrieved from the database, which are the three points of the variable-shift diagram. Each line contains the rating-type code which is stage-discharge (STGQ), the rating number, sequence number (1 through 3 for the three points), begin date with time and time zone code, end date with time and time zone code, if used, and the gage-height/shift pair constituting each point of the variable-shift diagram.

Option 4 - NWTS2RDB - Retrieval of UVs, DVs, measurements, peak flows, corrections, or shifts with the -c option enabled

This option creates the same RDB tables as described for Option 3 except when using the –c option and daily-values are being output, only computed daily-values will be retrieved. If unit-values are being output, date and time are combined into a single datetime column. This option is ignored if the datatype is not "dv" or "uv."

4.8.2 Retrieve/Write Daily-Values Data (RETR_DV)

by David L. Kresch

The RETR_DV program allows the user to retrieve and write daily-values data as machine-readable output in the following formats:

- 80-column Types 2 and 3-card formats
- 80-column Types Z, H, N, 2, and 3-card formats

To access the RETR_DV program, select the RT sub-menu from the main ADAPS menu, and then select the "Retrieve/Write Daily-Values Data" option.

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 records in an output file.

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.

Program Operation and Options

Program RETR_DV initially calls the ADAPS startup program in which the user specifies the station, data descriptor, and year(s) to be retrieved. The type of year and period of record shown on the startup menu can be modified by entering YR. The type of year can be either a water year or a user-defined year defined by entering a starting month. The period of record to be retrieved is indicated by entering starting and ending years. A period-of-record retrieval is specified by entering a <CR> for both the starting and ending years.

Next, the program queries the user for the output file name as shown below:

```
Enter output file name (<CR> = DV.RETR.020424.145901):
```

If no file name is given, a 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 will be written into the user's ADAPS origin directory after the desired data have been retrieved.

After the output file name is entered, the program then displays the following menu from which the user selects the desired output file format:

```
Available output formats:

 D - DV Card output - Type 2 and 3 cards only
 N - DV/Header Card output - Type Z, H, N, 2, and 3 cards


 Enter your choice (D or N [CR]=D:
```

The output file formats are described below:

1. **DV Card output**. This option outputs 80-column Types 2 and 3-cards. All data are in a character format. The Type-2 card contains site/data identification information, and the Type-3 cards contain year/month/sequence information, along with the daily values.
2. **DV/Header Card output**. This option, which is the same as the DV Card output option except that it also includes header cards, outputs 80-column Types Z, H, N, 2, and 3-cards. All data are in a character format. The Type-Z card contains the Agency Code for the station, and the H and N-cards contain selected Site File information.

The record layouts for these formats are discussed in the next section. The RETR_DV program output file records are created as formatted character records.

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. It is the responsibility of the user to know what statistic code(s) are applicable to stored Daily-Values File data. Statistic Code 3 (mean) is the most common one used. Others commonly used are 1 (maximum), 2 (minimum), 6 (sum), and 30000 plus the hour (in military time), e.g., 32400 to designate a midnight reading. Users may specify up to 10 statistic codes to be used.

Finally, the program queries whether the user wants to retrieve only records flagged as FINAL data. If not (the default), 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 the selected records. The output file is created in the user's ADAPS origin directory. Additional retrievals can be generated before exiting the RETR_DV program. Each additional retrieval creates a separate and independent output file. Created files may be empty if no data were retrieved.

Descriptions of Output Daily-Values Records

Descriptions for each type of output record created from retrieved daily-values records are given in table 1. In the table, 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 that is five characters (bytes) long, and SUM (the end-column number) is the running total of bytes or characters in the record. For character variables in the records, a field is usually left blank if no data are available. Descriptions of selected fields are footnoted in the following tables:

Table 1: 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

- **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 **(a)**	C2	22
Card Sequence Number **(b)**	C2	24
Daily Values **(c)**	C56	80

(a) Month designation. Use 01 thru 12 to represent January thru December.
(b) Card sequence number. Two-digit code representing the portion of the month that the daily values represent.

Code	Days represented
01	1-8
02	9-16
03	7-24
04	25-31

(c) Daily-values. Eight 7-column fields that contain the daily-values data for the days in the portion of the month indicated by the card sequence number two-digit code. Blank fields indicate no data are available for that day.

4.8.3 General Retrieval of Time-Series Data (OUTWAT)

The OUTWAT program allows the user to retrieve time-series and measurement file data. To access the OUTWAT program, select the RT sub-menu from the main ADAPS menu, and then select the "Retrieve DV/UV/Measurement/Shift/Rating/Site Data" option.

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 (*Section 4.7.4*), 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 in one retrieval.

Program Capabilities

The OUTWAT program can be used to retrieve the following:

- Time-series data (which include Unit-/Daily Values and Measurement/Inspection data),
- Measurement records from database (complete data for each station),
- Site File records,
- Shift records
- Rating data

Data can be retrieved and output in the following formats:

- 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.
- RDB 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 retrieve ADAPS data. These programs can also be used by user-written UNIX shell-scripts. P-STAT macros are available for using these subprograms to access ADAPS data from within P-STAT.

Program Operation

The OUTWAT program initially displays the following main retrieval options menu:

```
****************************************
*  OUTWAT Main Retrieval Options Menu  *
****************************************

  R) Specify or modify time-series retrieval parameters,
  L) Load previously saved OUTWAT or PLOTWAT control file,
  C) Clear current parameters (reset database),
  Q) Quit OUTWAT.

Enter your selection:
```

The user should select option R to either create a new file of time-series parameters to retrieve or to modify an existing parameter file. The user should select option L to use the parameters saved in a previously created file.

If option R is selected, the ADAPS multiple retrieval menu is displayed. The user should begin by selecting option A)dd, which displays a menu from which the user selects the type of data (daily-value, unit-value, or measurement/CSG) that is desired to retrieve. Once the type of data has been selected, the ADAPS Startup menu is displayed to identify the station (ST) for which data values are to be retrieved. The user may also select the desired data descriptor (DD) and statistic code (SC) from this menu for daily-value retrievals and the desired data descriptor for unit-value retrievals. The third and final menu displayed for each type of data selected is used to select desired retrieval options.

The following retrieval options menu is displayed for daily values retrievals:

```
Daily-Value Retrieval Options:

  S) Daily-value statistic code: 00003
  F) Retrieve data or data flag: all data
```

The user can enter a daily-values statistic code by selecting S and can limit the retrieval to data that is flagged a certain way by selecting F, which displays the following choices:

```
Select the data or data flag preference:

  A) all data                    N) non-flagged data
  W) write-protected data        F) flag: 1=W,2=E,3=<,4=>
  E) estimated data              P) provisional data flag
  <) less than data              R) rounding code
  >) greater than data

Enter selection:
```

The following retrieval options menu is displayed for unit-values retrievals:

```
Unit-Value Retrieval Options:

  T) Type of unit-value: computed
  M) Method of detecting missing data: none

  F) Retrieve data or data flag: all data
```

The user can select (T) to toggle between edited and computed unit-values. Option (M) allows the user to select a method for detecting missing data. The choices displayed are:

```
Select the method for detecting missing values:

                  N) none
                  D) time change
                  P) pattern
```

The user can limit unit-value retrievals to data that is flagged a certain way by selecting retrieval option (F), which displays the following choices:

```
Select the data or data flag preference:

  A) all data                    F) flag: 1=W,2=E,3=<,4=>
  W) write-protected data        P) provisional data flag
  E) estimated data              R) rounding code
  <) less than data              1) screening code
  >) greater than data           2) source code
  N) non-flagged data
```

After the desired retrieval options are selected, the variable to be retrieved is given a default name or a name supplied by the user. The user is then returned to the multiple retrieval menu from which he may either add more time-series parameters or quit.

The following expanded main retrieval options menu is displayed after the user exits the multiple retrieval menu:

```
****************************************
*  OUTWAT Main Retrieval Options Menu  *
****************************************

  R) Specify or modify time-series retrieval parameters,
  L) Load previously saved OUTWAT or PLOTWAT control file,
  I) Type of retrieval: Time-series (UV,DV,MS,ST) data
  T) The time step is daily.
  D) Dates retrieved are: 00-00-0000 to 00-00-0000
  M) If any data is missing: Retain ALL observations
  K) Do not compress repeated cases
  F) Output file type: FLAT
  N) Output file name:
  S) Create an OUTWAT control file,
  P) Put out data,
  J) Submit a batch job to put out data,
  C) Clear current parameters (reset database),
  Q) Quit OUTWAT.


Enter your selection:
```

When retrieving unit-values data, the user must remember to set the time step (option T) equal to the time interval at which the data was collected to ensure that all of the recorded unit-values will be retrieved. After the user selects his or her desired options and enters a name (option N) for the output file, option P is used to retrieve the data and place it into the output file. Having specified retrieval information during an OUTWAT session, the user can use option S to save this information to an outwat.control.file for later retrievals.

The following menu lists the types of output files available:

```
Available file types:

   PS) P-STAT SYSTEM FILE
   DI) DIF FILE
   DV) DIF FILE WITH "LABEL" HEAD ITEMS
   FL) FLAT FILE
   SC) S2020 FILE
   RD) RDB FILE
   BC) BCARDS, WATSTORE UNIT VALUE "B" CARDS

Select a file type (default is FLAT):
```

Description of BCARDS (Type-B) Output of Unit-Values Records

Extensive use is made of BCARD output files created from retrieved unit-values. One Type-2 card and a series of Type-B cards are created for each time-series retrieved. The contents and format of Type-2 cards are described in *Section 4.8.2*. The contents and format of Type-B cards (80 bytes each) are described in table 5.

Table 5: 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(a)	C42	80

(a) Unit-values. Six seven-column fields that contain the unit-values for successive time increments for the designated date and time. Blank fields indicate no data are available for that day and time.

Unit-values are sometimes stored in ADAPS 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 per card.

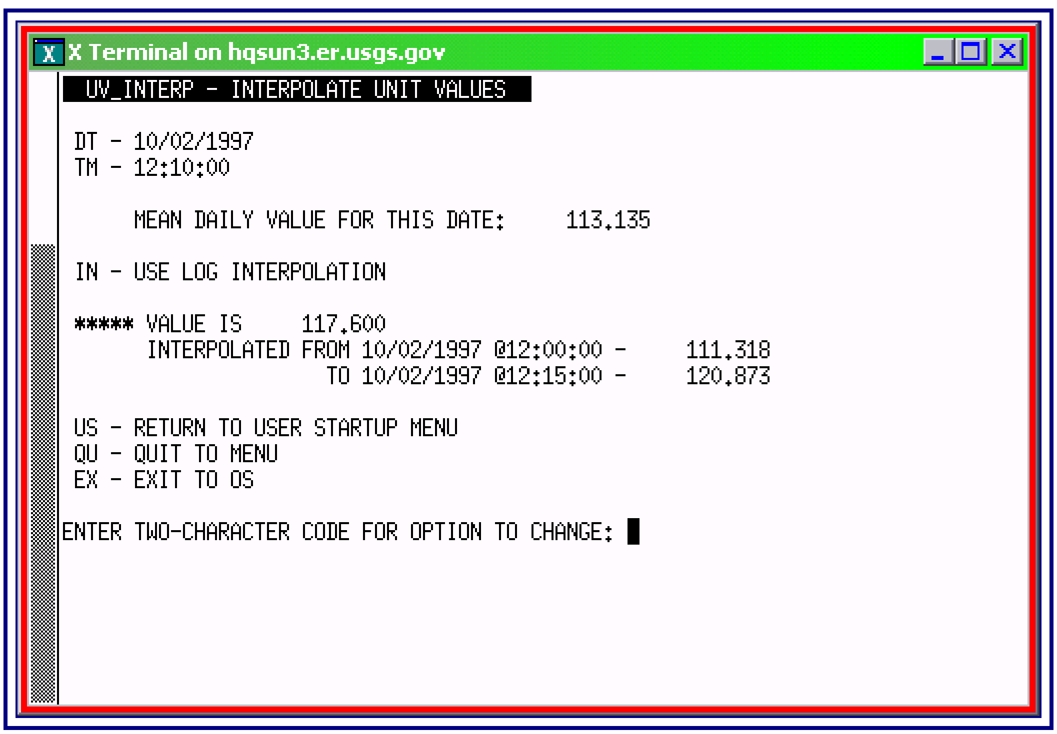
4.8.4 Interpolate Unit-Values at Specified Times

by James F. Cornwall

The UV_INTERP program is used to produce interpolated unit-values at user-specified times. The program uses the standard ADAPS startup screens to obtain user information such as agency, station number, and DD number. It queries the user for date, time, and interpolation type (linear or log), and then interpolates a unit-value (of type "Computed") at the specified date/time. This program was originally written to support a sediment program that required an interpolated discharge at the time a sediment sample was taken.

Program Operation

The program first uses the standard ADAPS startup menu to select the database, agency, station, and DD. After selecting these parameters, the user enters <CR> to continue. The program then queries the user for a date and time. An interpolated unit-value is then calculated by the program from the unit-values before and after the specified time, and the following screen is displayed:



The following are the actions taken by the various menu options:

DT - Change the date. The user is also prompted for a new time.

TM - Change the time.

IN - Flip the interpolation type from log to linear and back. The initial interpolation type is log for discharge, linear for other parameters.

US - Return to the standard ADAPS startup menu to change database, agency, station, DD, and so forth.

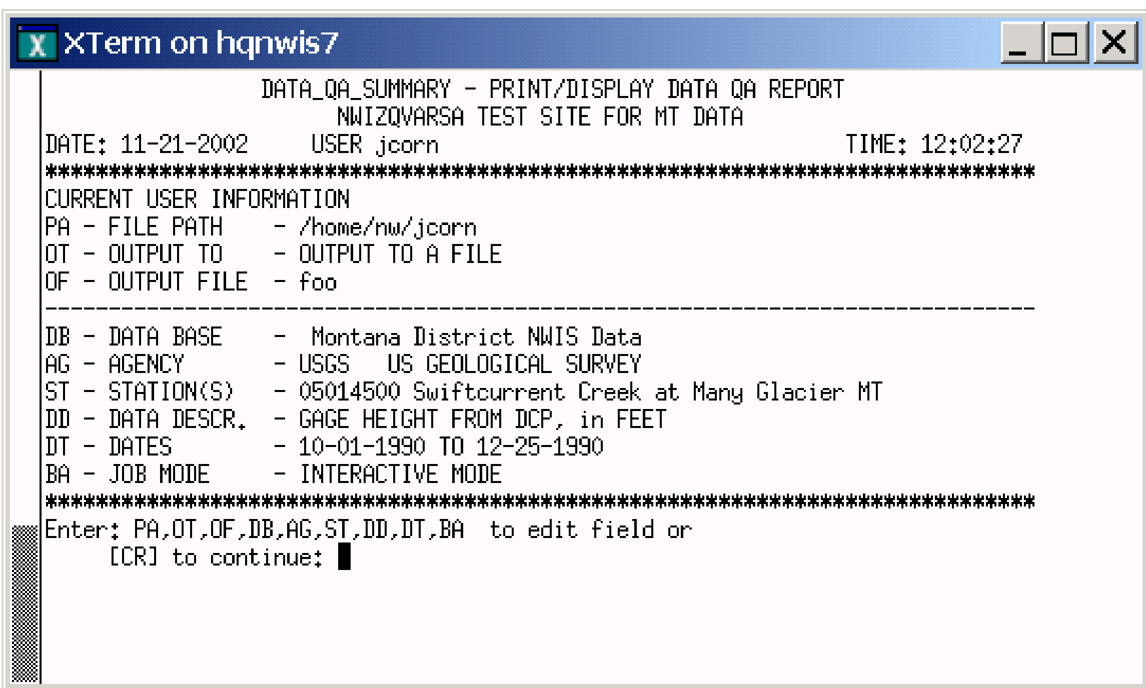
QU and **EX** - Standard ADAPS actions.

4.8.5 Retrieve Data Quality-Assurance Summary Report

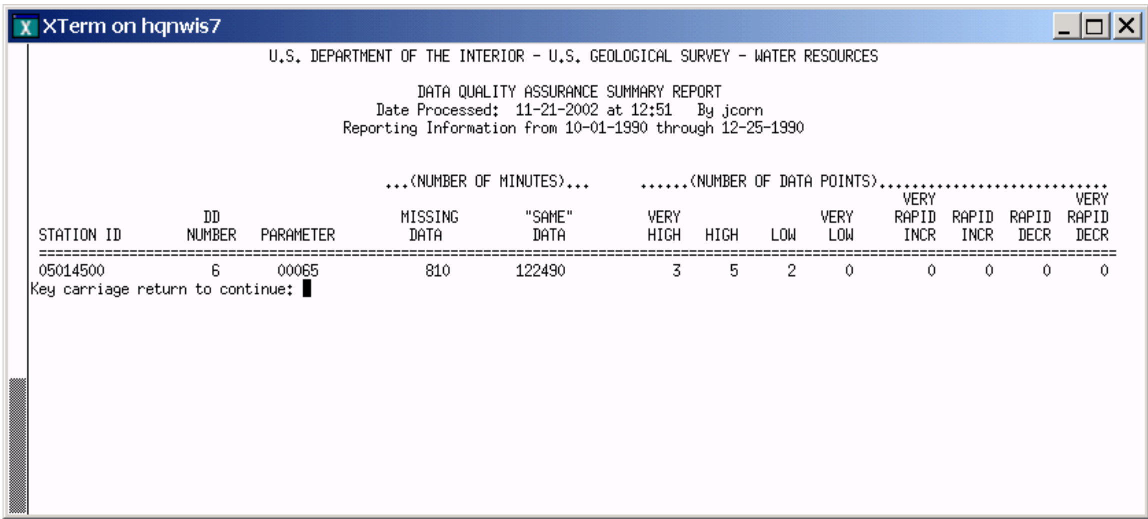
The DATA_QA_SUMMARY program generates a report which lists information on the Unit-Values ("Computed" type) which have exceeded the UV screening thresholds specified for the selected DD(s). The program uses the standard ADAPS startup screens to obtain user information such as agency, station and DD number (or ADAPS Group), and a date range. It then scans the data to determine the number of exceptions in the specified period where the UV screening threshold values (as defined for each DD in the THRESHOLD_EDIT program) have been exceeded and displays the report to the screen or a file. The program is accessible to ADAPS users with database access levels of "USER" or higher.

Program Operation

The program first uses the standard ADAPS startup menu to select the output parameters, database, agency, station, DD, date range, and mode of operation. After selecting these parameters, the user enters <CR> to continue.   The date range specified must be no greater than 365 days. Mode of operation may be either Interactive or Batch. An ADAPS Group file may be specified for the Station.



The program then scans the database and generates a report as shown below, which lists the number of database records found for the specified station/DD combination(s) in the specified date range which have the flags set to indicate that they have exceeded the thresholds.


XTerm on hqnwis7

```
                  U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

                                  DATA QUALITY ASSURANCE SUMMARY REPORT
                               Date Processed:  11-21-2002 at 12:51   By jcorn
                            Reporting Information from 10-01-1990 through 12-25-1990


                                ...(NUMBER OF MINUTES)...      ......(NUMBER OF DATA POINTS)..........................
                                                                                            VERY              VERY
                   DD                         MISSING      "SAME"      VERY                 VERY   RAPID  RAPID  RAPID  RAPID
STATION ID       NUMBER   PARAMETER            DATA         DATA       HIGH   HIGH    LOW   LOW    INCR   INCR   DECR   DECR
============================================================================================================================
05014500            6       00065               810        122490         3      5      2     0       0      0      0      0
Key carriage return to continue:
```

The columns under the “Number of Data Points” heading indicate the actual number of unit-values with the flags set for each condition. In this example, 3 Computed UVs have been flagged as exceeding the “Very High” threshold, 5 as exceeding the “High,” and 2 as exceeding the “Low” threshold. The columns under the “Number of Minutes” heading indicate an estimate of time instead.

The “Missing data” column is the number of minutes during the specified time period when no unit-values could be found. This is estimated by comparing the times between each pair of subsequent values. Whenever the time between values exceeds the DVABORT limit, the time span is added to this number for display. This number should be considered only an estimate, as any missing unit-values will not be detected if the gap left does not exceed the DVABORT limit.

The “Same data” column is computed very much like the “Missing data.” For this check, the actual rounded unit-values are compared rather than the time difference between subsequent UVs. When a rounded value is identical to the previous value, the time between them is added to this number for display. It too should be considered an estimate. If the values remain the same for a period of time, then fluctuate, the counter will be saved until the next time two consecutive values match. If more consecutive values are found to match, the greater length of time will be saved. The result of this scheme is that **the number displayed will be the length of the longest “flat” period within the user’s specified date range, not of the total “flat” periods**. Users should view this number as an indicator that the unit-values need to be inspected in greater detail using the UV tabling or editing programs. After generating this report, the program gives the user the option to create more reports with different parameters selected.

4.9 Update Support Files/Record Flags

4.9.1 Manage Record Data Aging Status

See ***Section 4.5.15*** for the description of Manage Record Data Aging Status.

4.9.2 Update Location Information (LOC_EDIT)

by Susan C. Grams

Location is one of the design features of the ADAPS software that allows the user to better define the point at which data are collected at a station. This program allows the user to enter, display, update, and delete locations for a station. If time-series data collection at a station occurs at only one location, then that point is automatically designated as the ***default location***, 0. If data for a data descriptor (DD) are collected using sensors located at more than one point in a cross-section at a station, or at differing elevations, then these data-collection points need to be differentiated and defined by assigning each of them a unique location.

Program Concepts and Information

The LOC_EDIT program is available in the "SU" sub-menu; it can be accessed from any menu in ADAPS by typing loc_edit, or locations can be created or updated from the DD_EDIT program by selecting the "LO" field for editing. A default location exists in the system for each station, numbered 0, and cannot be edited or updated by the user. The location code, cross-section code, and elevation code for the default location is set to "unspecified." Users are not obligated to use the default location definition even if there is only one data-collection location at a site. If there is only one data collection location at a site, but the user wants to add descriptive information about this one location, a new location must be created and it is this new location that must be specified when data descriptors are created for the one location.

The software permits up to 999 locations to be created for a station. A new location can be entered using the add function, AD; modified using the edit function, ED; or deleted using the delete function, DE. All locations for a station may be viewed using the list function, LI; or details about a specific location may be viewed using the display function, DI.

(AD)—Add a New Location for this Site

Selecting the "AD" option first prompts the user to enter a name for the new location that is to be created. The system automatically assigns a location number to the new location. Once the new location is entered, a data entry screen is displayed from which the user can enter a location description, DS; a cross-section code, XC; and an elevation code, EC. The default cross-section code XC, and elevation code EC is "unspecified."

```
                          Location for
        02213700 OCMULGEE RIVER NEAR WARNER ROBINS, GA

    Location #          1
    Created by:         scgrams   on 23-may-2002 20:39:30
    Modified by:        scgrams   on 23-may-2002 20:39:30
 NM - Location name:        QWMonitor
 DS -  Location description:

 XC - Cross-section code:     unspecified
 EC - Elevation code:         unspecified
 SA - Save location:


 Enter code of field to change, or [CR] to continue:
```

LOC_EDIT: Add mode (AD) Display at initial entry step

The location name (NM) is an alphanumeric field 1 to 30 characters in length. The location description (DS) is an alphanumeric field which can hold up to 300 characters. The cross-section code XC is selected from the available menu of system codes for that attribute as is the elevation code EC.

The **cross-section codes** for option XC are:

- 1 UNSP unspecified
- 2 CNTR center
- 3 FMLB distance from left bank
- 4 FMRB distance from right bank
- 5 LFBK left bank
- 6 RTBK right bank

If the cross-section code selected is "3 FMLB distance from left bank" or "4 FMRB distance from right bank," then the user may specify a cross-section location in units of feet using the XL option. If the cross-section codes 1, 2, 5 or 6 are selected, then the XL option is not available.

The **elevation codes** for option EC are:

- 1 UNSP unspecified
- 2 TOP top
- 3 BTTM bottom
- 4 FTOP distance from top
- 5 FBTM distance from bottom

- 6 CNTR center
- 7 EL29 elevation to NGVD29
- 8 EL88 elevation to NAVD88
- 9 DALS Distance above land surface
- 10 DBLS Distance below land surface
- 11 DAGD Distance above gage datum
- 12 DBGD Distance below gage datum

For the all of the elevation codes except "1 UNSP unspecified," "2 TOP top," "3 BTTM bottom" and "6 CNTR center," the user may specify an elevation offset in units of feet using the EL option.

```
                          Location for
        02213700 OCMULGEE RIVER NEAR WARNER ROBINS, GA

      Location #           1
      Created by:            scgrams  on 23-may-2002 20:39:30
      Modified by:           scgrams  on 23-may-2002 20:39:30
NM - Location name:          QWMonitor
DS - Location description:    Water-quality monitor sonde location

XC - Cross-section code:      distance from right bank
XL - Cross-section location:   25.0
EC - Elevation code:          elevation to NGVD29
EL - Elevation location:       125.0
SA - Save location:


Enter code of field to change, or [CR] to continue:
```

LOC_EDIT: Add (AD) mode display showing all entry options

Once a new location is added, type SA to save the location, then <CR> to return to the LOC_EDIT sub-menu.

ED - Edit an Existing Location for this Site*

The edit (ED) option allows the user to edit the location information in any one of the fields shown in Figure 2. NM, location name; DS, location description; XC, cross-section code; XL, cross-section location; EC, elevation code and EL, elevation location may all be updated by typing the two-letter character to select the item to be updated and then changing the information as necessary. Typing SA saves the changes made to the location information in the system. Then type <CR> to leave the program and return to the LOC_EDIT sub-menu.

DI - Display a Location

The display (DI) option displays all of the location information entered for a selected location.

LI - List the Locations for a station

The list (LI) option lists all of the locations for the station specified in the user display upon starting the LOC_EDIT program.

DE - Delete a Location for this Site*

The delete (DE) option allows the user to delete a location for the station specified in the user display upon starting the LOC_EDIT program.

Warning: Executing this option will delete all data descriptors (DDs), measurements, ratings, shifts, data corrections and unit and daily values associated with this location. Use with great caution.

CH - Change to a Different Location at this Site*

The change (CH) option allows the user to select a location from the list of all locations for a station after starting the LOC_EDIT program, or to change to a different location for the same station once in the program.

* The menu options "ED," "DI" and "CH," when selected upon start-up of the loc_edit program, prompt the user to "add" a new location and a new location can be added from each of these sub-menu selections, if desired.

US - Restart Program, Display User Information

Selecting this option returns user to the ADAPS user display within the LOC_EDIT program.

QU - Quit this Program

Returns user to the "SU" sub-menu in ADAPS.

EX - Exit ADAPS programs

Exits the ADAPS programs and returns user to the UNIX window.

4.9.3 Update Data Descriptor Information (DD_EDIT)

The ***data descriptor*** (DD) is used to identify the parameter code for which time-series data are collected at a location at a site. The DD record contains the information about that unique data set from a site which defines what it is and where it is located; establishes how the time-series data are processed, computed and stored in ADAPS; specifies the screening thresholds for the data; and designates whether or not the data are to be viewed on NWISWeb, although this feature is not used by NWISWeb at the time of this documentation.

Program Concepts and Information

The DD_EDIT program is available in the "SU" sub-menu, or it can be accessed from any menu in ADAPS by typing dd_edit. Users must have access level "ADBA" or higher to use this program. There are three parts to a data descriptor: 1. the definition of the descriptor, 2. the processing information, and, 3. the screening thresholds. The user can also set the status of a processor record from working to in-review or approved using the DD_EDIT program. Up to 9,999 DD records may be created for a station/location.

AD - Add a New Data Descriptor

When creating a DD record, the user-defined variables for a new DD are established using the AD option. In the first screen, the user defines the DD. These user-defined variables in the first step are:

- Parameter, **PC,** defines the parameter code for the data descriptor; the Location, **LO,** defines the location of the sensors from which the data are collected (see ***Section 4.9.2***);
- DD description, **DS**, is an alphanumeric variable with a field 30 characters in length allowing the user to embellish the description of the DD;
- Unit-values statistic code, **SC**, defines the unit values statistic for the DD;
- Primary/Work data, **PF**, is a flag which defines whether the data are the primary (official record) for a parameter or whether the data are working data (back-up, non-final, un-reviewed) ;
- Web Display, **WW**, sets the flag determining whether the data are displayed to the public via NWISWeb. Note: At the time of this documentation, NWISWeb does not use these flag settings in ADAPS to control access but the DD-level access is being controlled by settings established through nw_edit directly in NWISWeb;
- Rounding codes, **RN**, provides user-access to the default rounding array for the specified DD parameter and allows the user to alter that array if necessary for records computation; and,
- DV table summary options, **DT**, allows the user to select the summary statistics options for the daily-values (DV) table, to select the type of DV table produced, and, to select whether a summary is produced for a water year, a calendar year, or both.

The second step in creating a data descriptor is to define the computation type and processor record. There are several computation-types available when creating the processing information for the DD. They are:

1. Direct Daily Values Computation—these unit values are not used to compute other computed unit values for another data descriptor
2. Standard Rating Computation

3. Standard stage-discharge computation
4. Slope-discharge Computation
5. Velocity/Deflection meter discharge computation
6. Difference Computation

Not all of these computation-types will be available for every DD. Computation-types 3, 4, and 5 are exclusive to the stage-discharge computation, the slope-discharge computation and the velocity-discharge computation, respectively.

Once the computation-type is selected, the user then creates the processor instructions for the data-descriptor. Some of the user-defined processor variables are:

- **SD**—starting date
- **ED**—ending date
- **RP**—Default primary report type; the user has the option of selecting either the historical primary report type or the standard primary report type.
- **GP**—Unit values missing gap time; this establishes the maximum gap between unit values that is acceptable for daily-value statistics computation.
- **DV**—Compute DVs; this defines the daily-value statistics that will be computed.
- **IN**—Input DD; this defines the input DD used to compute the computed unit and daily values for the computed DD. This variable only needs to be specified when data from a data descriptor are used as input values to compute unit values of a computed data descriptor.
- **IR**—In-review; used to set the status of a processor record.

The third step in creating a data descriptor is to assign screening thresholds for the unit value data stored under this DD. The use of screening thresholds is optional; however, if data for the DD being created are displayed on the Web, it is recommended to use those thresholds that screen data for display on the Web. The user may select from the following list of options to establish screening thresholds in this step:

- **VHI** - Very High Condition (units) *
- **HI** - High Condition (units)
- **LO** - Low Condition (units)
- **VLO** - Very Low Condition (units) *
- **SD** - Value To Value Test Difference
- **BK** - Define zone breakpoints (units)
- **VI** - VERY RAPID INCREASE (UNITS/MINUTE) *
- **RI** - RAPID INCREASE (UNITS/MINUTES)
- **RD** - RAPID DECREASE (UNITS/MINUTES)
- **VD** - VERY RAPID DECREASE (UNITS/MINUTE) *

*** Identifies thresholds that are used to screen data from the public for the WEB display**

Alternate labels may be used for the condition thresholds and the standard difference threshold listed above. The user may redefine these labels using the following options:

- **LVH** - Label: very high condition threshold
- **LHI** - Label: high condition threshold
- **LLO** - Label: low condition threshold
- **LVL** - Label: very low condition threshold
- **LSD** - Label: standard difference threshold

Example:

If LVH is chosen, then the following screen appears:

```
Enter alternate label for VERY HIGH CONDITION,
 (carriage return for default):
```

The user can supply an alternate label such as "above instrument shelf." Then the threshold screen would show: LVH- Label: above instrument shelf. This label would then be assigned to the data if that condition was exceeded.

Once the information in these three steps is entered, the information required by ADAPS to establish a data descriptor is completed.

ED - Edit a Data Descriptor

Selecting the ED option allows the user to update or edit any of the user-defined variables for the data descriptor (see those mentioned in the "AD—Add a Data Descriptor" section). The user may also use this option to change the "In-review" status of the data descriptor.

DI - Display a Data Descriptor

Selecting the DI option displays to the user in list format the definition, the computation instructions and the screening thresholds

LI - List the Data Descriptors for a station

The list (LI) option lists all of the data descriptors for the station specified in the user display upon starting the DD_EDIT program.

DE - Delete a Data Descriptor

The delete (DE) option allows the user to delete a data descriptor for the station specified in the user display upon starting the DD_EDIT program.

Warning: Executing this option will delete all data descriptors (DDs), measurements, ratings, shifts, data corrections and unit and daily values associated with this data descriptor. Use with great caution.

PF – Create DCP Performance Data Descriptors

The PF option allows the user to create data descriptors used to store data about DCP performance. When the PF option is selected, the user is prompted to enter a DCP ID. When the DCP ID is entered, the following list of DDs are created for the station/location and output is generated to the screen:

DD 3 FOR PARAMETER CODE 70969 ADDED. (Battery Voltage)
DD 4 FOR PARAMETER CODE 72116 ADDED. (DCP Bad Characters)
DD 5 FOR PARAMETER CODE 72114 ADDED. (DCP EIRP)
DD 6 FOR PARAMETER CODE 72113 ADDED. (DCP Modulation Index)
DD 7 FOR PARAMETER CODE 72115 ADDED. (DCP Frequency Drift)
DD 8 FOR PARAMETER CODE 72112 ADDED. (DCP (S + N)/N)
DD 9 FOR PARAMETER CODE 72111 ADDED. (DRGS Error Code)
DD 10 FOR PARAMETER CODE 82292 ADDED. (DRGS Source Node)
DD 11 FOR PARAMETER CODE 72117 ADDED. (DCP Del. Delay Time)

CH - Change to a Different Data Descriptor

The change (CH) option allows the user to select a data descriptor from the list of all data descriptors for a station after starting the DD_EDIT program, or to change to a different data descriptor for the same station once in the program.

US - Restart Program, Display User Information

Selecting this option returns user to the ADAPS user display within the DD_EDIT program.

QU - Quit this Program

Returns user to the “SU” sub-menu in ADAPS.

EX - Exit ADAPS Programs

Exits the ADAPS programs and returns user to the UNIX window.

4.9.4 Update ADR Instrument

by James F. Cornwall

The IN_EDIT program is used to display and update the information for Analog-Digital Recorder (ADR) instruments. ADR instrument information describes the setup and configuration parameters for processing data from an ADR. The information stored in the NWIS database for an ADR instrument is used to read, review, and edit data recorded by an ADR. The instrument record stored for an ADR describes the recorder instrument and the specific fields recorded for each data item (channel) on the instrument. The record includes fields such as an instrument identifier (ID) number, update dates, number of channels, flags for processing data values, and information about each data channel recorded by the ADR, such as a link to a specific Data Descriptor (DD) at the site, a channel ID, and threshold values for specific conditions.

Program Operation

The instrument update program allows the user to add, display, edit, list, delete, and print the instrument records. 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 latest changes 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 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 menu options for the instrument updating program are described below. Each two-letter option code is given in parentheses preceding the action to be taken.

(AD) - Add a New Instrument Record

Allows users to create a new ADR instrument record for the processing of data. Previous versions of the IN_EDIT program allowed users to make use of existing DD and processor records associated with a new ADR record, or create new ones if they did not already exist. With the release of NWIS 4.2, the capability to create new DD records has been removed from IN_EDIT, so the user must ensure that all DD and processor records have already been created (using DD_EDIT) before attempting to add an ADR instrument. 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 PARAMETER	AUXILIARY COMPUTATION
FALL STAGE	STAGE (00065)
DEFLECTION METER	VELOCITY (00055)
INTEGRATING VELOCITY	VELOCITY (00055)

(ED) - Edit an Existing Instrument Record

Allows users to display and edit a selected instrument record. The editing may consist of changing or adding any instrument data, or moving instrument channels. 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 a current instrument record may be edited. Old instrument modifications (dated) may be displayed but not edited.

(DI) - Display of Instrument Record(s)

Allows users to display the information stored in one or all instrument records for a site. The destination of the output depends upon the output destination that was previously selected in the ADAPS startup screens. The destination can be the user's terminal, an output file, or a selected printer.

(LI) - List of all Instruments for a Site

Allows users to send a list of instruments and modifications for a selected site to the output destination specified at startup. The destination can be the user's terminal, or an output file, or a selected printer.

(DE) - Delete an Existing Instrument Record

Allows users to delete the selected instrument record and all its modifications from the system. Be careful when deleting an instrument record from the system because the instrument record is considered to be a permanent 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.

(CH) - Change to Different Instrument

Allows users to change from the currently selected instrument to a different instrument by selecting from a list of all the 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.

(US) - Restart Program and Display User Information

Allows users to restart the program, display the default user information, and make changes to any of the desired items such as site, output destination, etc.

4.9.5 Manage Preferred Input

by Susan C. Grams

Data for a Data Descriptor (DD) may originate from more than one source or type of instrument. For each DD at a location, the data from each transport method are stored in the measured unit-values table for that DD and are flagged according to the transport method used to enter the data into the database. Each transport method is identified using a transport method code, one of which is selected as the ***preferred input***. The preferred input transport code for a DD may change during the operation of a station as equipment is upgraded, modified or changed. The PFIN_EDIT program allows the user to modify the preferred input for each station data descriptor.

Program Concepts and Information

The PFIN_EDIT program is available in the "SU" sub-menu or it can be accessed from any menu in ADAPS by typing PFIN_EDIT. Users must have access level "ADBA" or higher to use this program. The transport method codes available for use in this program are:

- **S** GOES DCP (Data Collection Platform)
- **E** EDL (Electronic Data Logger)
- **A** ADR (Analog-Digital Recorder paper tape)
- **C** digitized analog Chart
- **O** Observation data
- **U** Unspecified (Applied to data transferred from the 4_1 database)

To serve real-time data on NWISWeb, the preferred input transport method code must be set to either of the two real-time transport codes, "**S**" or "**E**". Data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web.

Unit-value data from the preferred input transport method are written to both the measured and edited unit values (UV) tables. Data from any other transport methods for a DD will be written only to the measured UV tables, and will not be stored into the edited UV tables unless manually brought in during the editing process. The preferred input data stream is the one used as the beginning point for processing time-series data. The data from other transport methods, once stored in the measured unit values tables, may be called up as reference curves, used to fill in gaps, or used to correct erroneous edited unit-values that were collected by the preferred input sensor. PFIN_EDIT allows the user to change to a different preferred input method, delete a preferred input, or add a new preferred input for a data descriptor.

CH - Change Existing Preferred Input

This option allows the user to modify the transport method code for the preferred input sensor for the selected data descriptor. The user selects the preferred input to change by the corresponding number in the column left of the "sensor id" column. Once selected, the user is prompted to select a new transport method code from the list in parentheses. Typing a <CR> will list the transport code definition associated with each letter code (see the following table).

```
                    SET PREFERRED INPUT
       02213700 OCMULGEE RIVER NEAR WARNER ROBINS, GA
              PH, WH, FIELD, in (STANDARD UNITS)

   SENSOR  TRANSPORT  START DATE   END DATE
     ID       CODE
   ------  ---------  ----------   ----------
 1   0         U          --       09/30/2001
 2   0         E      10/01/2001       --
   ----------------------------------------
 CH) Change Existing Preferred Input    AD) Add New Preferred Input
 DE) Delete Existing Preferred Input    RE) Refresh Screen

 US) Select New Site or DD              QU) Quit

SELECT PROGRAM OPTION (CR=CONTINUE): ch

Select a preferred input to edit: 2

TRANSPORT CODE (S,E,A,C,O,<CR>=LIST DEFINITIONS):

 S = DCP
 E = EDL
 A = ADR
 C = CHA
 O = OBS

TRANSPORT CODE (S,E,A,C,O,<CR>=LIST DEFINITIONS):
```

DE - Delete Existing Preferred Input

This option is used to delete a preferred input. The user selects the preferred input to delete by the corresponding number in the column left of the “sensor id” column. Once this number is entered, the selected preferred input is deleted and the list of preferred inputs is refreshed and displayed to the user.

AD - Add New Preferred Input

This option allows the user to add a preferred input for a data descriptor. After typing “AD” <CR>, the user is prompted for a starting date for the new preferred input. Enter the date in the format MM DD YYYY. Once the date is entered, the user is prompted to select the transport method used for the new preferred input. When the transport method code is entered, the screen is refreshed and the new list of preferred inputs is displayed to the user.

RE - Refresh Screen

This option refreshes the “SET PREFERRED INPUT” screen.

US - Select New Site or DD

Selecting this option returns the user to the user display where another station or data descriptor may be selected.

QU - Quit

Selecting this option exits the program and returns the user to the “SU” sub-menu.

4.10 Maintain Database

4.10.1 Manage Record Data Aging Status

Please see ***Section 4.5.15*** for details on this section.

4.10.2 Update DIS Node Configuration

by James F. Cornwall

The ND_EDIT program is used to update the Node Configuration information in the NWIS database. This information is used to specify node hardware descriptions and configurations. This section briefly discusses how to update Node File information.

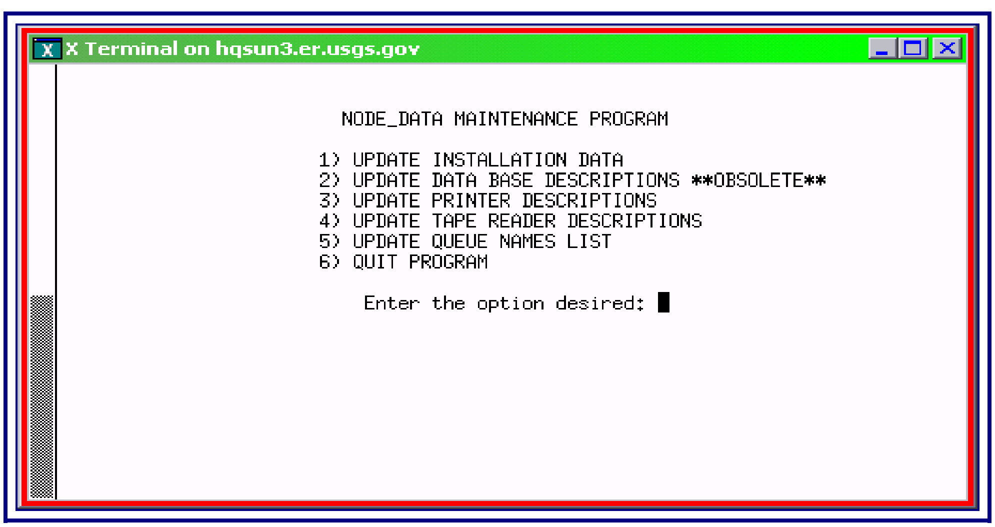
Introduction

The Node Configuration tables contain local node information. This information specifies the printers, tape readers, and batch queues that are available to the users. Additional information to describe the characteristics of the local installation, network node identification, and maintenance control parameters may also be set using the ND_EDIT program. The Node Configuration information must be set up by the Database Administrator (DBA) before users can access any programs or data.

Program Operation

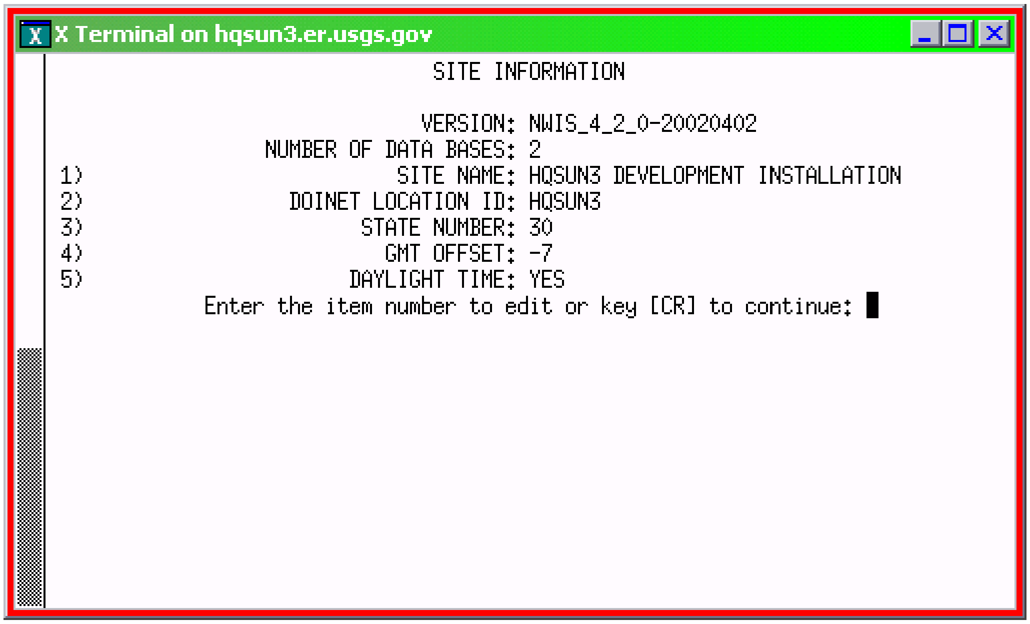
The ND_EDIT program allows the DBA to display, list, update, add, and delete data in the Node Configuration file. The program's submenus provide the ability to list, update, add, or delete relevant items in each function. Once the Node Configuration information has been entered, very little updating of the file is necessary. An example of an update requirement would be to create new entries for printers, or to modify a parameter to meet new processing requirements.

The screen shot below is the main program menu. Sub-menus and their options are discussed in following sections:



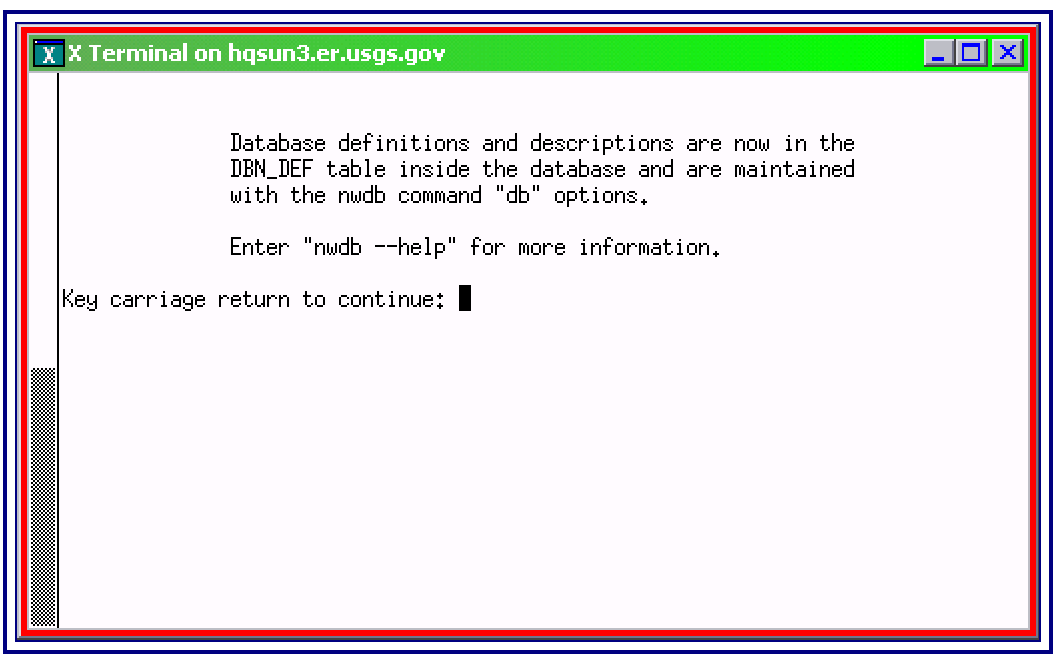
Selection of a menu option will present the user with one of the following screens:

Update Installation Data



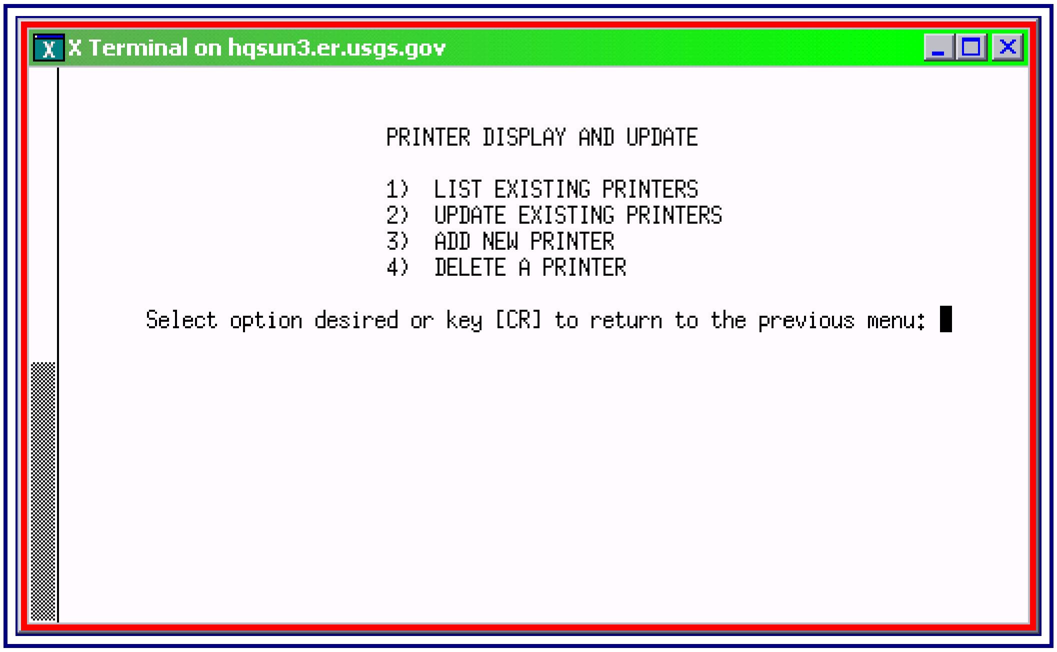
The Installation data consists of general information that describes the ADAPS installation. Any of the fields displayed may be edited, except for the ADAPS Release Number and the number of databases that are established on the system.

Update Database Descriptions **Obsolete**



This menu option is obsolete with the release of NWIS 4.2. The user is presented with a message on the new program used for defining database information.

Update Printer Descriptions



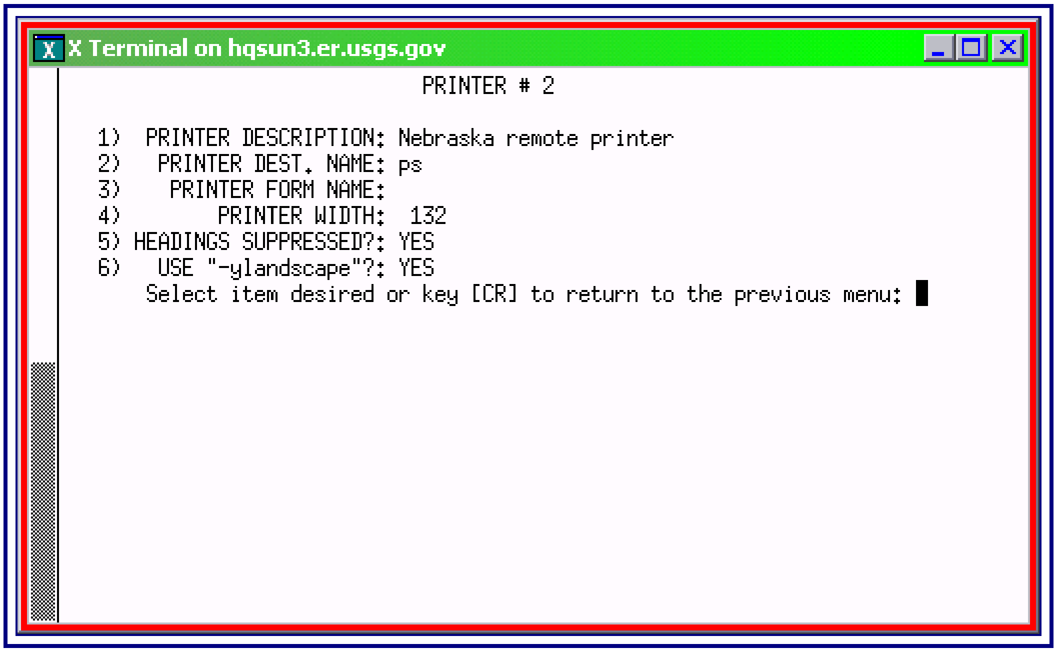
ADAPS requires that all printers have the following information stored: 1) a printer description, 2) a printing width, 3) whether or not there is to be header suppression, and 4) how communication is carried out. This information allows the users to select their output destination. Communications with each printer is specified by a system destination name, form name, or user number, and thus allows for a wide range of printers to be available including system printers, remote printers, and printers tied to user terminals. The available submenu options are as follows:

List Existing Printers

This option provides a list of all printers stored in the Node file.

Update An Existing Printer

This option allows the DBA to change any or all of the printer information in order to meet new needs. First, the user is given a list of available printers defined in the system, and when one is selected, the screen below is shown with the editable parameters:



The user may change any of these parameters as needed.

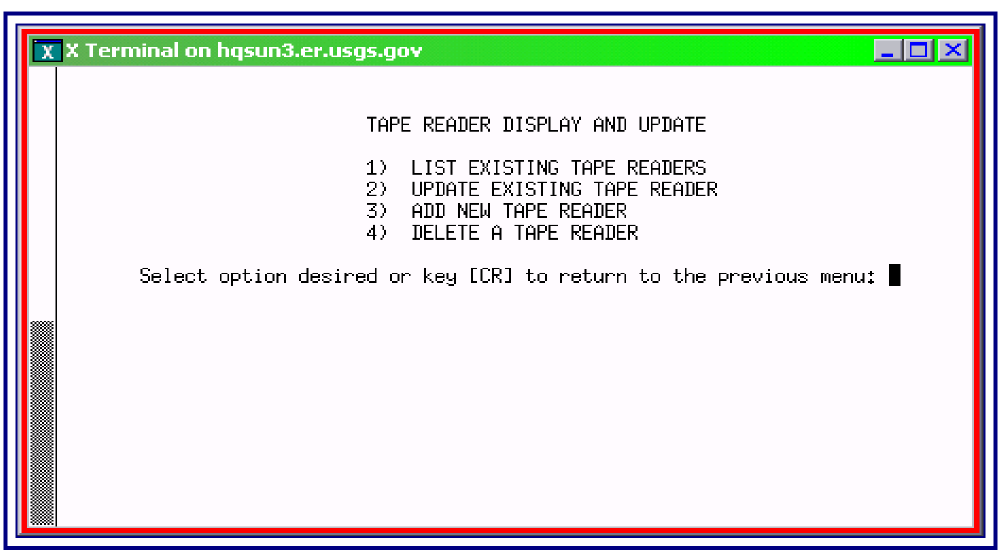
Add New Printer

When adding a new printer to the Node file, the DBA is defining how the printer is described in printer lists, what its characteristics are, and how ADAPS communicates with the printer. The printer name or the form name, if supplied, defines where to send the output. The ND_EDIT program will prompt the user to enter all required information.

Delete An Existing Printer

This option is used by the DBA to delete a printer no longer in use.

Update Tape Reader Descriptions



In order to translate ADR 16-channel paper tape data, ADAPS requires that certain configuration information be available. The information needed is a description of the tape reader, the reader type, the path to the assigned port, and communications protocol information (parity, baud rate, stop bits, and XON/XOFF usage). The available sub-menu options are as follows:

List Existing Tape Readers

This option provides a list of all ADR paper tape translators defined for the system. If there are no tape readers defined on the system, the user is given a warning message telling him so.

UPDATE EXISTING TAPE READER

This option allows the DBA to change any or all of the selected tape translator information in order to meet new needs.

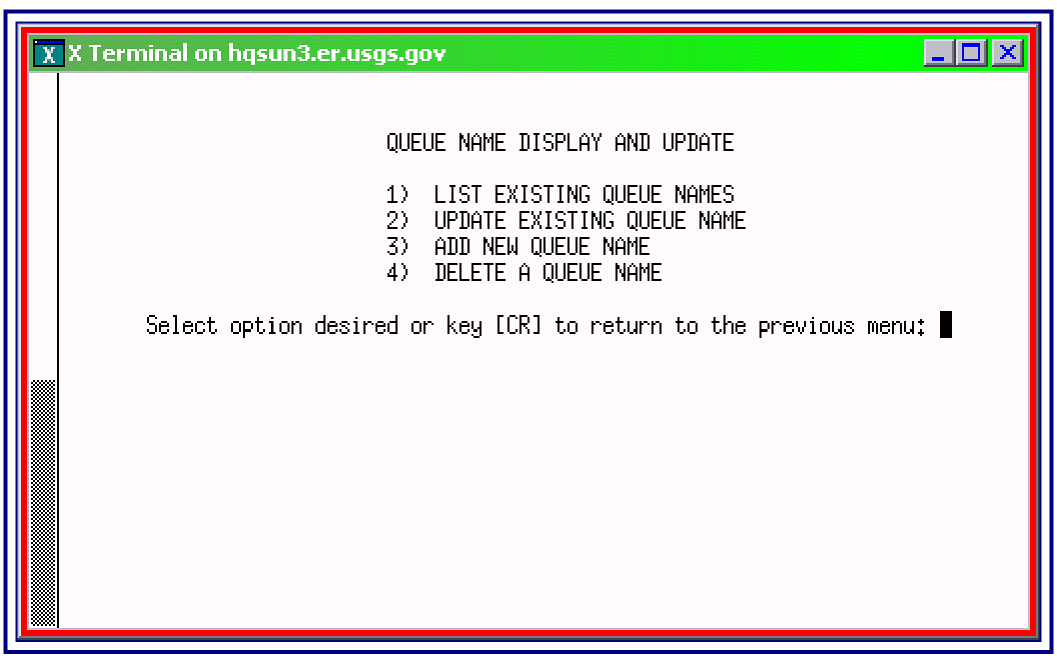
ADD NEW TAPE READER

This option allows the DBA to enter the information that defines a new ADR paper tape translator. The program will prompt for all items required to define the tape reader (description, reader type, host name, path to port, etc.)

DELETE A TAPE READER

This option allows the DBA to delete an ADR paper tape translator that is no longer in use.

UPDATE QUEUE NAMES LIST



ADAPS uses the system's batch queues to run a variety of programs in batch mode. This is done to avoid overloading the system. The DBA must establish which batch queues are to be available to the users. These batch queue names must be entered into the Node configuration tables. The available submenu options are as follows:

LIST EXISTING QUEUE NAMES

This option provides a list of the available defined batch queue names.

UPDATE EXISTING QUEUE NAME

This option allows the DBA to change any of the existing queue names.

ADD NEW QUEUE NAME

This option allows the DBA to enter a new queue name.

DELETE A QUEUE NAME

This option allows the DBA to delete queue names that are no longer in use.

4.10.3 Review/Delete User File Entries

The US_EDIT program is used to add, delete, and update user information for ADAPS. The program allows the system or Database Administrator to review the settings for a user (useful when attempting to resolve problems), and to delete non-users of ADAPS from the database. It also allows the administrator to add new users, although this usually happens automatically the first time a new user runs the ADAPS software. The user's group files may also be optionally deleted by use of this program.

Program Operation

The US_EDIT program displays a list of all the users defined in the ADAPS database. The user is queried for a user name to review, or <CR> to quit. If the user name is in the list of existing entries, the program will display the user's settings and query what action to take (No action, Delete User, or Delete User and his Groups). If the user's name is not in the list, the program will query if it should be added. Answering "yes" will add the user to the ADAPS database with default settings. The list of user names is then repeated and the user queried for the desired action again.

4.10.4 Archive Unit-Values to Disk for Tape Storage

The UV_ARCHIVE program is used to dump unit-values (UV) data from the NWIS database to disk files suitable for archival to tape or CD-ROM for long-term offline storage. The data may optionally be deleted from the database after archival in order to reclaim and conserve disk space used by the database.

Introduction

Due to the large number of unit values which are accumulated and stored in the NWIS database, it may be necessary from time to time to dump portions of the data out to disk files so they can be archived to offline storage media (tapes, CD-ROM, etc.) to conserve disk space. The UV_ARCHIVE program allows an administrator to do this when required.

The UV_ARCHIVE program operates on a complete water year, writing the unit-values data for the specified year to a series of disk files, one per station. The program allows the user to delete the data from the database to reclaim disk space, or the data may be left intact and just copied to the disk files. The disk files can then be backed up to tape or CD-ROM and deleted from the disk.

Depending on the number and size of the UV sub-files, the program can either be run for all unit-values sub-files at once, or it can be with only selected unit-values sub-files. This mode allows the user to make repeated sets of archival files, which can be copied to offline storage media and deleted from disk after each run if there is insufficient storage space to dump all the UV sub-files at once.

Users (including sentry) can continue to use ADAPS during the archival process as long as they do not attempt to process data in the water year being archived. There is, however, nothing in the program to enforce this restriction. The user needs to know what is taking place in the database and decide accordingly whether to allow access while the UV_ARCHIVE is running.

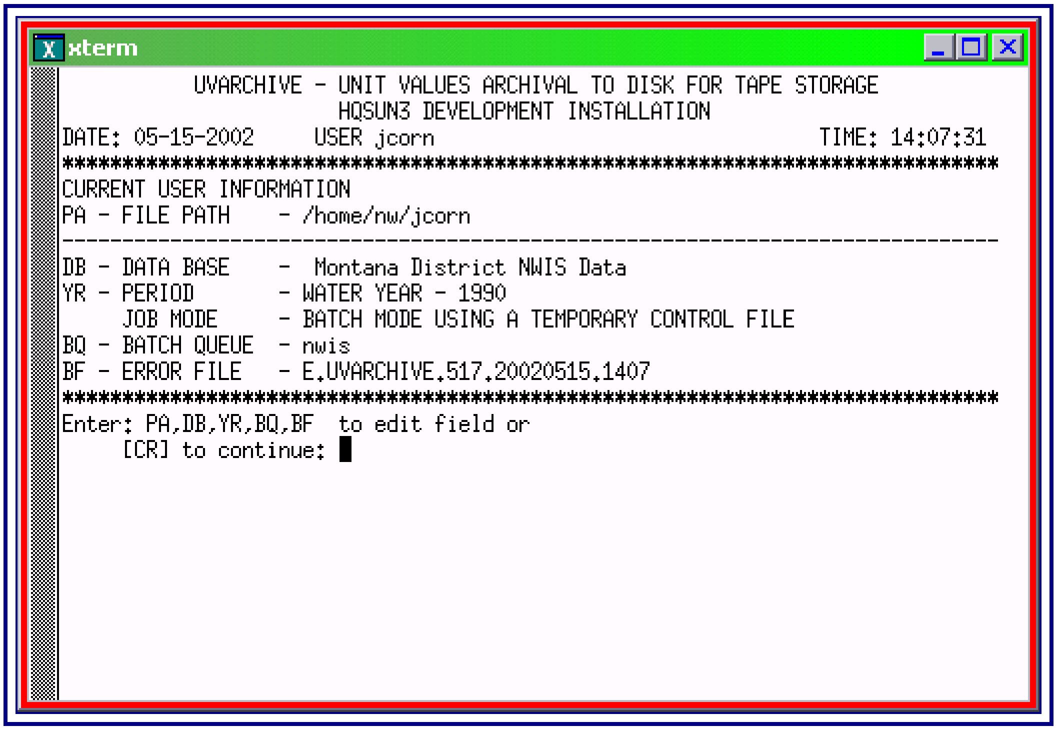
Archival Procedures

When archiving unit values, follow these steps:

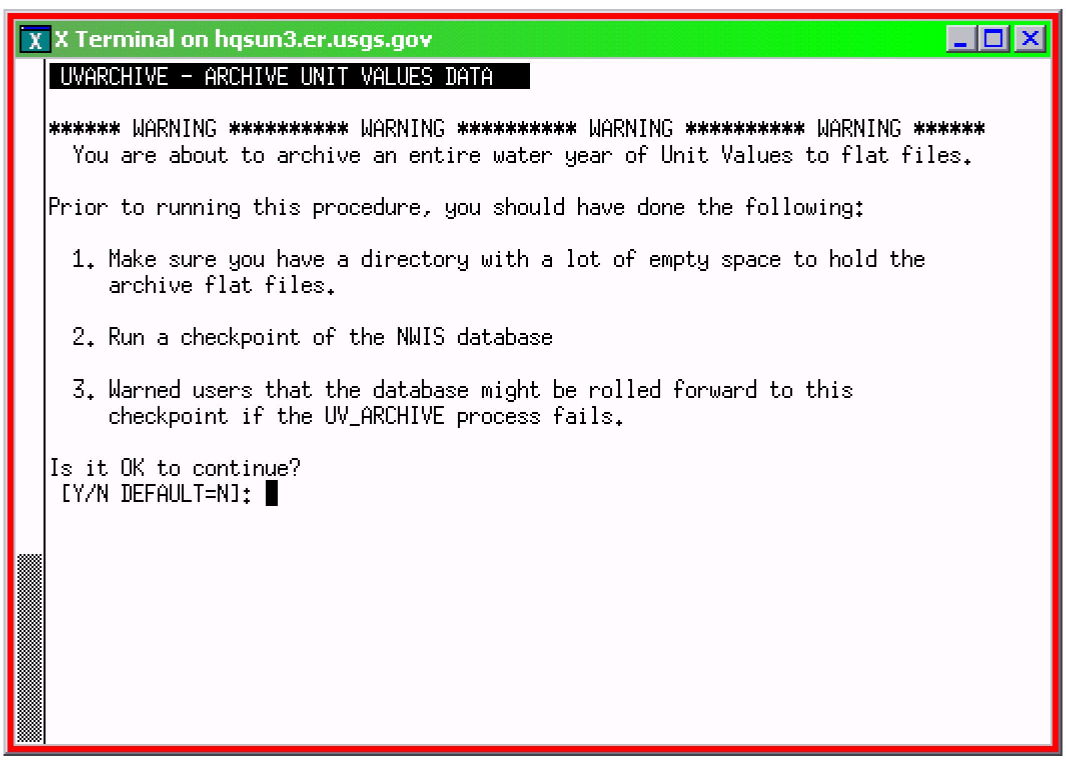
- Select (or create) a directory to hold the archive files. Ensure that this directory is on a partition with a large amount of free space.
- Exclude all other users from NWIS using the "**locknwis**" command.
- Stop SENTRY for all database numbers.
- Manually run a checkpoint of the NWIS database.
- Warn users that in the event the UV_ARCHIVE process fails, the database may have to be rolled forward to the checkpoint just taken.
- Start SENTRY for all database numbers.
- Allow users back in with the "**unlocknwis**" command.
- Run the UV_ARCHIVE program, as described in the next section.
- After the UV_ARCHIVE processing is finished, run the Ingres **schema_editor** utility to compress the unit-values tables and recover the disk space freed by the archival.

Archive Program Operation

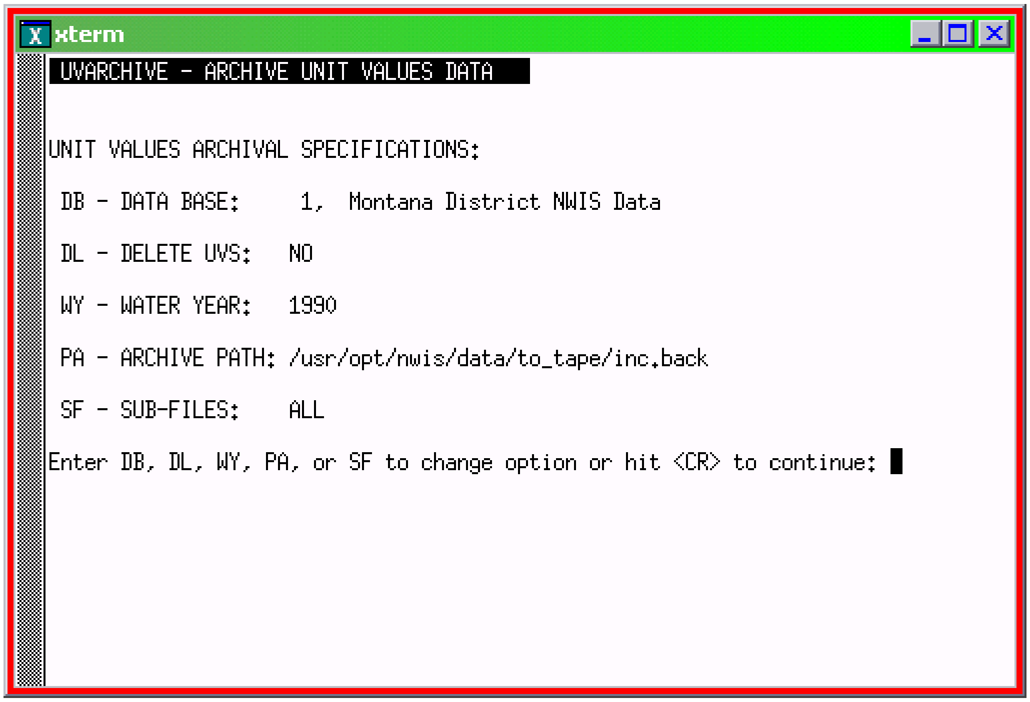
The UV_ARCHIVE program is an interactive preprocessor program for the actual processing, which is done in batch mode. The program receives program options from the user, builds a control file, and submits a batch job to do the actual work. The program uses the standard ADAPS startup routines, which allow the user to select a database, water year, and work directory for program operation and control files.



The user is then presented with a warning screen and a list of items that should have been performed.



Finally, the program will query the user for the options desired for the run.



At this point, the user may choose a new database or water year, select specific UV sub-files to archive, or specify the path to another directory where the archival disk files will be written. All the archive files will be placed in the specified directory. The “DL” option allows the user to specify whether the UV data will be deleted from the database after the archival disk files are written. The default choice is to retain the data rather than deleting it. If the data is to be deleted, the user must run an Ingres utility **schema_editor** in order to reclaim the space in the database. Entering a <CR> at this screen will submit the batch job to do the archiving, and the user is returned to his previous menu screens.

The batch postprocessor will read every record in the selected UV sub-files and will write the records to a series of disk files in the target directory. If the user opted to delete the UV data, the unit values are then deleted from the database after the file has been written. Each station which is being archived, will have the UV data written to a separate file. File names are generated in the format "**UDBnn.agncy.station.yyyy**" where:

```
nn      = the database number,
agncy   = the agency code (up to 5 characters),
station = the 8-15 character station number, and
yyyy    = the water year.
```

All file names are uppercase. This may be a cause for errors if the files are transferred via FTP or another mechanism onto systems and the file names change case. The ADAPS program used to restore the data into the NWIS database, UV_RESTORE**,** expects the file names to be in uppercase.

The files are written using the WRD Standard Format as described in ***Section 4.4.8*** of this manual. Although the UV restoration program, UV_RESTORE, would normally be used to retrieve data from archival files, the use of this standard record format allows data from these files to be recovered with the STD_STOR utility program as well.

4.10.5 Restore Unit-Values from Archive Files

The UV_RESTORE program is used to restore unit-values (UV) data from disk files created by the unit values archival program UV_ARCHIVE. The data are read from these disk files and stored into the NWIS database.

Introduction

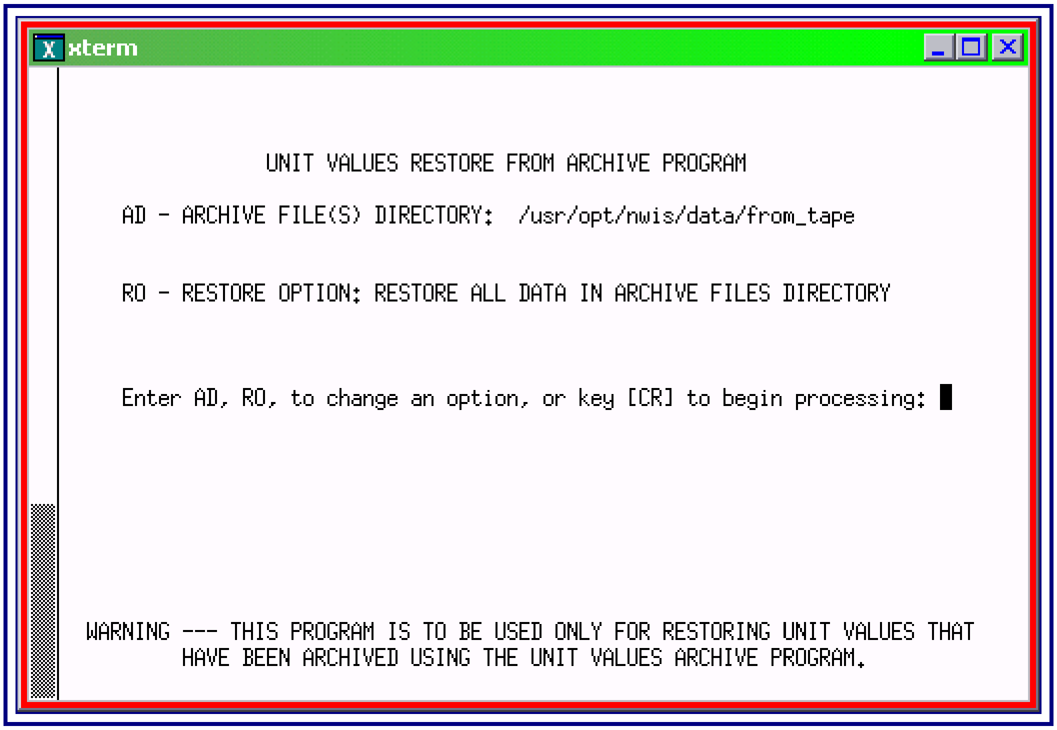
The ADAPS unit-values archive files are produced using the UV_ARCHIVE program, which retrieves all unit values for a specified water year from the NWIS database and stores them into disk files (one station per file) using a WRD standard archive format. The UV_ARCHIVE program then (optionally) deletes those unit values from the database. When these unit values are needed in the database for some purpose, the UV_RESTORE program allows the user to read the data from these disk files and store them back into the NWIS database. The UV_RESTORE program allows the user to either restore the data from all archive files in a specified directory, or to specify certain files (sites) to be restored from the archival files. The WRD standard unit-values archive format is described in ***Section 6.3*** of this manual.

Note: Since file names are case-sensitive on UNIX systems, the user must ensure that the file names specified for restoring of unit values data exactly match the file names specified when the archives were created. The UV_ARCHIVE program creates all file names in uppercase; however files may have been renamed or changed case during FTP or other transfer operations. If a restore operation fails, check to see that file names are in uppercase as expected within the UV_STORE program. The uppercase can be done with the following Korn-shell script:

```
#!/bin/ksh
for afil in udb01.*
do
mv $afil UDB01.${afil##udb01.}
done
```

Program Operation

The UV_RESTORE program uses the standard ADAPS startup routine to specify the database, mode of operation (Batch/Interactive) and the user's ADAPS work directory. A menu of default options is then displayed:



The first option, "AD," allows the user to select the directory where the archive files reside.

The second option, "RO," allows the user to change the restore option. The default specification is to restore all standard archive files in the specified directory. To restore only certain files in the specified directory, select the RO option. This menu option is not displayed if the user selected Batch mode operation. In Batch mode, all files in the specified directory will be processed. If satisfied that these two options are correct, enter a <CR>.

If the program is in Interactive mode, and the option to specify selected files (sites) is selected, the program:

- searches the specified directory for all archive files, then
- displays each site found, queries if the user wishes to reject the site or load the data into the database, and if any existing data is found queries the user if it is OK to overwrite the data with the archived values, then
- Loads the UV data from the file into the database (or skips the load if not OK to overwrite existing data), and displays the next site found in the specified directory.

If the program is in Batch mode, then all files in the specified directory will be processed. Before submitting the batch job, the program will query the user if any existing data should be overwritten. If the user answers "Yes," then the archived data will be stored into the database over the existing data for all input files. If the user answered "No," the occurrence will be logged and the next input file processed.

If the option to load all archive files in the directory is selected, the user is not queried for other options. The program then processes the unit-values archive files as specified. The progress of the program is written to a log file, along with any generated error messages. For each file processed, site and parameter that has data processed, a summary including the site name, the parameter name, the type of data, and number of data values is printed.

4.10.6 Split a UV Sub-file in two

Prior to the release of NWIS version 4.2, the ADAPS Unit-Values data (UVs) were stored in a collection of disk files which consisted of a UV Index file, an active file, and several sub-files. Though these disk files were replaced by attributed database tables in the NWIS 4.2 release, the term “sub-file” will still be used within ADAPS. When too many values are stored in a sub-file, the database cannot maintain acceptable data access speed, and efficiency and response times will suffer. The UV_SPLIT program allows the Site Administrator to select a UV sub-file and divide the data into two sub-files, reducing the data size roughly by half and increasing efficiency. This is done by copying every other site from an existing sub-file into a new, empty sub-file, and deleting the copied sites from the old sub-file.

Preliminary Steps required before running UV_SPLIT

To run the UV_SPLIT program, the user (a Site Administrator) must have a database access level of “SYST.” Before running UV_SPLIT**,** the Administrator must complete these preliminary steps:

(a) Log in as user “ingres” and determine Ingres data areas and UV sub-file sizes.

- Use the program ACCESSDB to determine the Ingres data areas in use (see accessdb documentation).
- Use the command line function ***nwis nw_list_ingres_file_sizes*** (for detailed instructions see the NWIS Database Administrators Guide) to determine the sizes of the Unit Values sub-files. To sort the resulting report by the database table name, use:

  nwis nw_list_ingres_file_sizes > output.file.name

  To sort the report by file size instead, use the “-s” option:

  nwis nw_list_ingres_file_sizes -s > output.file.name

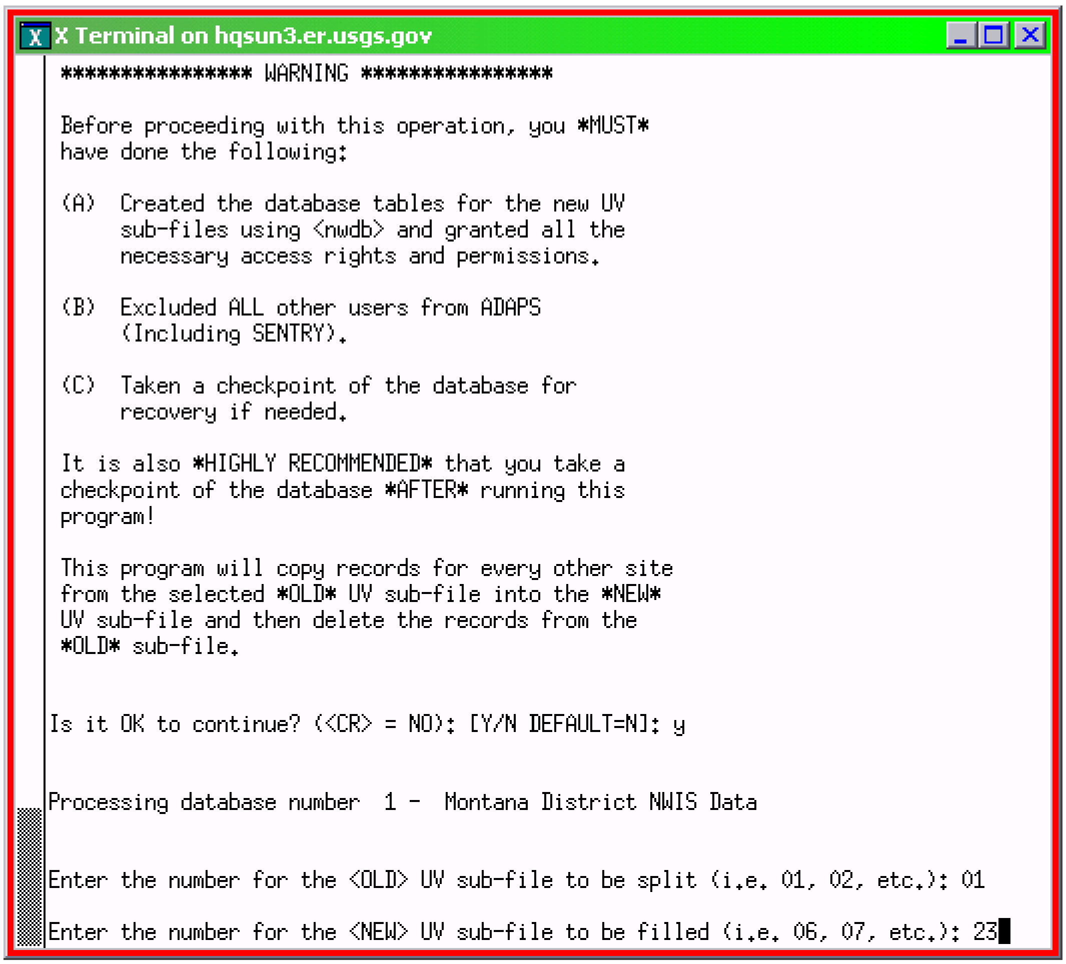
(b) Use the program NWDB to create the new UV sub-file tables in the database, and to grant all necessary rights and permissions for the new sub-file tables (***see nwdb documentation***.). The specific commands are listed below (***db_no*** is the database number {01, 02, etc.}, ***uv_no*** is the new UV sub-file number {01, 12, etc.}, and ***data_area*** is the Ingres data area where the database is located).

- **nwdb -v create tables AD *db_no* UV *uv_no* --data *data_area***
- **nwdb -v modify tables AD *db_no* UV *uv_no***
- **nwdb -v create procs AD *db_no* UV *uv_no***
- **nwdb -v create rias AD *db_no* UV *uv_no***
- **nwdb -v grant all AD *db_no* UV *uv_no***

(c) Exclude ALL other users from ADAPS, including SENTRY.
(d) Take a checkpoint of the database for possible recovery if there are problems with the UV split.
(e) Run **uv_split**.

Program Operation

The UV_SPLIT program first displays the standard ADAPS startup menu, allowing the user to select the database. Next, a screen is displayed that reminds the user of the preceding steps that must already have been done. If the preceding steps have not been done, the user may now halt processing.



```
X Terminal on hqsun3.er.usgs.gov
**************** WARNING ****************

Before proceeding with this operation, you *MUST*
have done the following:

(A)  Created the database tables for the new UV
     sub-files using <nwdb> and granted all the
     necessary access rights and permissions.

(B)  Excluded ALL other users from ADAPS
     (Including SENTRY).

(C)  Taken a checkpoint of the database for
     recovery if needed.

It is also *HIGHLY RECOMMENDED* that you take a
checkpoint of the database *AFTER* running this
program!

This program will copy records for every other site
from the selected *OLD* UV sub-file into the *NEW*
UV sub-file and then delete the records from the
*OLD* sub-file.


Is it OK to continue? (<CR> = NO): [Y/N DEFAULT=N]: y


Processing database number  1 -  Montana District NWIS Data


Enter the number for the <OLD> UV sub-file to be split (i.e. 01, 02, etc.): 01

Enter the number for the <NEW> UV sub-file to be filled (i.e. 06, 07, etc.): 23
```

The user is then prompted for the numeric identifiers for the “FROM” and “TO” sub-files (i.e. – “01” for Sub-file 1). The program will validate the information to ensure that table names for both the old and new sub-files exist, that the user has write-access to the tables, and that there is no data already in the “TO” data tables. Error messages will be displayed to the screen if the new sub-file tables do not exist, or if the new sub-file is found to contain data already. When these errors occur, the program execution is aborted with an error message telling the user what happened. Once the user’s access level and the status of the old and new sub-files have been validated, the split process begins. Every other site is read out from the “FROM” sub-file and written to the “TO” sub-file. Once the writes have been verified as successful, the index record for each moved site is updated to indicate the correct sub-file for that site, and the site is deleted from the original “FROM” sub-file. At completion of the process, the count of site records copied is displayed at the user's terminal.

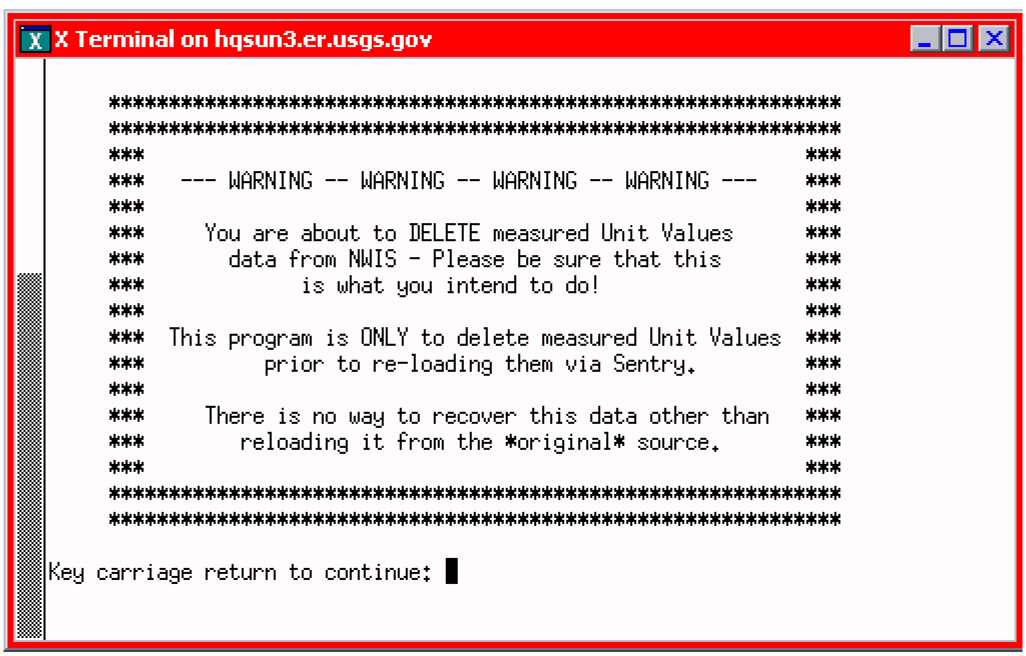
4.10.7 Delete Measured Unit-Values

The UV_DELMEAS program allows the user to delete the “Measured” Unit-Values data for a specified Data Descriptor (DD) for a user-specified time period. Access level of “ADBA” or “SYST” is required. This program deletes the actual sensor data from the database, and should be used with caution.

Introduction

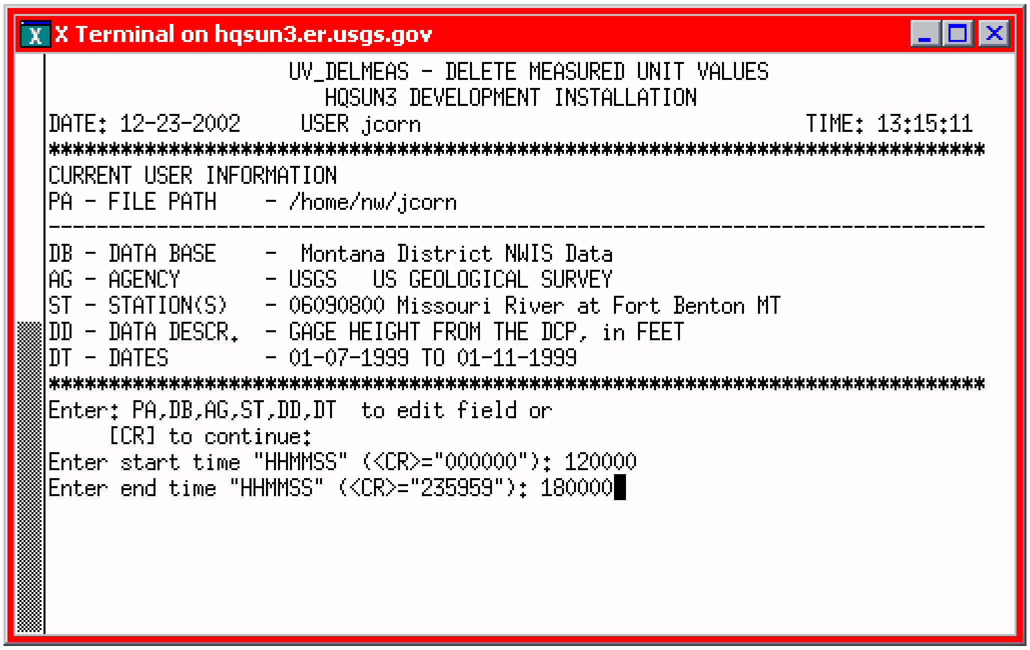
This program is designed to delete from the database the raw measurements from a sensor. This may be required when there are transmission errors from an automated data input connection (DCP satellite link, EDL upload, etc.) or other problems that require reloading the raw data.

Unless the measured data is being deleted in preparation for reloading the raw inputs from the original source (satellite reprocessing, EDL, chart, etc), the sensor data will be obliterated from the database. For this reason, access to the program is restricted, and a warning message is presented to the user (see below) to make certain that the user understands the impacts of what the program will do.



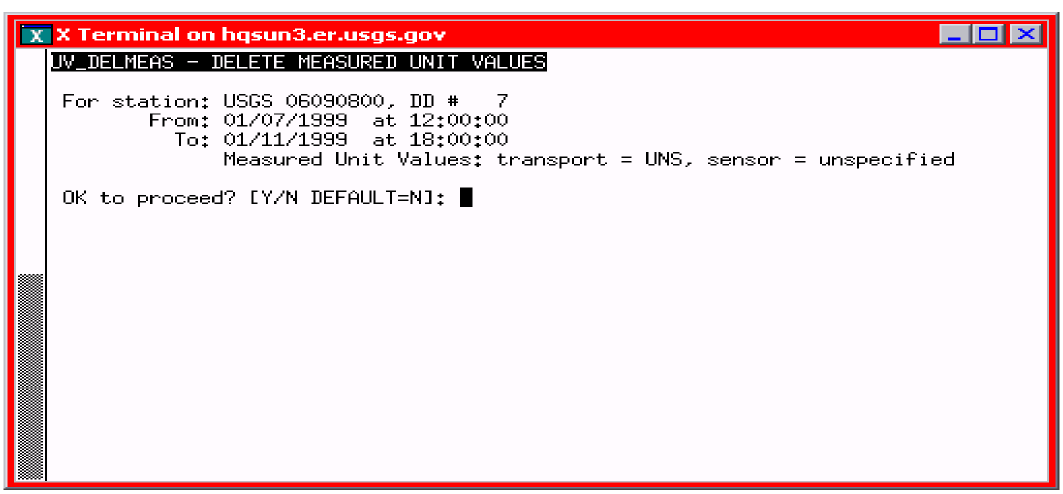
Program Operation

After the warning screen is displayed and acknowledged, the UV_DELMEAS program uses the standard ADAPS startup screens to let the user choose the station, DD, dates, and output file destination, as shown below:



```
X Terminal on hqsun3.er.usgs.gov
                   UV_DELMEAS - DELETE MEASURED UNIT VALUES
                      HQSUN3 DEVELOPMENT INSTALLATION
DATE: 12-23-2002     USER jcorn                                  TIME: 13:15:11
******************************************************************************
CURRENT USER INFORMATION
PA - FILE PATH    - /home/nw/jcorn
------------------------------------------------------------------------------
DB - DATA BASE    -  Montana District NWIS Data
AG - AGENCY       - USGS   US GEOLOGICAL SURVEY
ST - STATION(S)   - 06090800 Missouri River at Fort Benton MT
DD - DATA DESCR.  - GAGE HEIGHT FROM THE DCP, in FEET
DT - DATES        - 01-07-1999 TO 01-11-1999
******************************************************************************
Enter: PA,DB,AG,ST,DD,DT  to edit field or
     [CR] to continue:
Enter start time "HHMMSS" (<CR>="000000"): 120000
Enter end time "HHMMSS" (<CR>="235959"): 180000
```

When the user has chosen the correct parameters for the data to be deleted, and entered a <CR> to continue, the program will ask for a starting and ending time, then scan the database to determine what “Measured” UV data sources are present. If there is more than one transport method found for the DD (for example, the Preferred Input is DCP, with an EDL defined for backup data), the program will display a list of the available transport methods and query the user to select one. Once the transport method has been chosen, or if there is only a single transport method for the DD, the program will display the following screen:



```
X Terminal on hqsun3.er.usgs.gov
UV_DELMEAS - DELETE MEASURED UNIT VALUES

 For station: USGS 06090800, DD #    7
        From: 01/07/1999  at 12:00:00
          To: 01/11/1999  at 18:00:00
             Measured Unit Values: transport = UNS, sensor = unspecified

 OK to proceed? [Y/N DEFAULT=N]:
```

To delete the “Measured” UV data, answer this query with <Y>, or enter <CR> to cancel the operation. After the data has been deleted from the database, the program will automatically perform a recomputation of the period deleted to maintain data consistency. ***This recomputation will wipe out all “edited,” “shift,” “corr,” and “computed” Unit-Values and any Daily-Values in the database, unless the DV data is “in Review” or “Approved” status.*** After the recompute is completed, the program returns to the ADAPS startup screens where another station, DD, or date range may be selected. Once the “measured” UV data has been deleted, the raw data must be reloaded via Sentry or manual downloads and reprocessed to generate the “edited” and “computed” UVs and the DVs for the period.

4.11 Miscellaneous Utility Functions

by Joseph P. Nielsen

This section presents the programs used to perform system utility functions or to perform data editing functions using older programs that are being phased out by graphical editing tools.

4.11.1 Update Site/Data Descriptor Groups

The GR_EDIT program is used to create and update site/data descriptor groups.

Introduction

A site/data descriptor group is a collection of individual records, each of which is a concatenation of the agency code, site identifier, and data-descriptor number. This collection of data is stored in a Group File under ADAPS and is used primarily in data retrievals. The user can have more than one Group File with different sets of stations selected, each stored as a separate Group File, and probably will have several in order to have greater retrieval flexibility. These multiple files may be considered as entries in a group list.

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. The user then selects 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, the user must select a group from a list of user-owned groups. The available options are explained below.

Group File Update Options

Each available update option is discussed separately below.

Build a Group

To build (create) a group file, 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 DDs are added to the group list and are stored in each group list record.

5. If option 2 or 3 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: The type of data record is not stored in the Group File, but is used as part of the selection process.

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. Only alphanumeric (a-z, A-Z, 0-9) and the characters "_", "-", and "." are allowed.
- 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, the user may perform another edit of the group. If another edit is not requested, quit and return to the program menu.

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, the user is returned to the program menu.

Display a Group

This option displays the user's currently selected group. If the group is not available, the program queries for one.

Display the Group List

This option displays a list of the user's group file names and descriptions on the screen.

Copy Another Group

This option asks for a user login identifier, then displays the groups found for that ID and allows selecting a group from the list. The selected group is then copied to form a new group under the user's own login ID.

Select a Group

A list of user's groups is displayed. Select the desired group to be edited, deleted, or displayed.

Manual Update and Format of Group File

If the Group File editing program GR_EDIT (described above) does not provide the needed capability, the user can build a group file manually. It is recommended, however, that the program be used whenever possible.

ADAPS Group Files are composed of simple sequential 80-column records and may be created or updated using a text editor or a user program. Each file contains a single group, and resides in a directory under NWIS with the following name:

/usr/opt/nwis/data/auxdata/groups/databaseX
where X is the database number being used (i.e. …/database1).

Each group file 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: The file name may contain only alphanumeric characters (A-Z, 0-9) and the special characters "-", "_", and "." No spaces are allowed in the file name, and there is a period connecting the two parts. Also, the file name must be a valid UNIX file name of 32 total characters or less.

The format of each Group File is as follows:

Columns	Contents	Description
First record:		
1-5	/DESC	Record identification
6	Blank	
7-56	A*50	Group description
Succeeding records (as many as needed):		
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

4.11.2 Edit Unit-Values

The UV_EDIT program allows the user to view, edit, and screen (**verify**) edited unit-values (UV) data. Of the five types of UV data (measured, edited, shifts, corrections, and computed), only "edited" UV data is directly manipulated by this program. Program-specific information (output designation, database, etc.) is set by the user at the standard ADAPS start-up menu. The actual UV data editing and display screen consists of three regions: the center region is filled with rows of time and UVs 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 UVs that exceed the screening thresholds and allowing the user to edit the values around the value in question.
(b) Allow for the deletion of single "edited" unit-values, consecutive values and/or all values between a starting date and time and an ending date and time.
(c) 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.
(d) Optionally recompute (apply data and shift corrections and perform **primary** computations) for time periods when an update of "edited" unit-values was made.

The following functions **cannot** be done using UV_EDIT:

(a) Set unit-value check flag (@). Hydra (***Section 4.5.2***), or the program set_checkflag (***Section 4.11.4***), must set this flag.
(b) Set unit-value remark codes, including flags for ice and other backwater affects (A, B, &), undefined rating (R), and instrumentation issues (K and X). Hydra (***Section 4.5.2***) must set these remark codes.
(c) Edit data where the Data Aging Status has been set to in-review or approved.
(d) Edit or delete "measured," "shift," "correction," or "computed" unit-values.

When the user starts up the UV_EDIT program, all data will be processed using the time zone code (EST, EDT, etc.) in effect on the starting date. The program will not change time zones when reading data forward or backward in time, regardless of whether the dates processed cross over a change from Daylight Saving time to Standard or back. This is the same method of time zone handling as found when editing unit-values in Hydra.

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
```

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>

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

S - STOP EDITING  will stop the editing session and return you to the
                  previous menu. It will prompt the user whether or not
                  to recompute the record. If the response is yes, a
                  complete recomputation will be done for the entire
                  set of unit values used for the editing session.

F - FORWARD    will move forward through the unit values by one screen.

B - BACKWARD   will move backward through the unit values by one
               screen.

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).

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 UVs. 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 UVs to. For example, an interval of 60 minutes would produce prompts for UVs 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, the user is prompted on how many values 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, maximum 100) to search for the previous (P) and/or next (N) values. If the user selects the I or N option and no next value is located within the time interval of the number of values to be inserted, the add will not work and the user is 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 how many values were inserted.

The verification proceeds with the value immediately following any added/changed/deleted values. After verification is complete, the user has a chance to initiate a recomputation prior to returning to the UV_EDIT main option menu.

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.

Delete a Period of Record (DE)

Delete UVs (of type “edited”) 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.

After deleting the edited UV data, the user is given the option to recompute the record. A recomputation after deleting “edited” UVs will delete the corresponding “shift,” “correction” and “computed” UVs and DVs for this DD and its related DDs. 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 UVs and DVs should reflect the modifications to the edited data. Note that deleting UVs affects only the “edited” UVs and those values derived from them in the primary computation. The “measured” UVs are **NOT** deleted from the database. If “measured” UVs must be deleted, normally done only to reload satellite telemetry for reprocessing, the program UV_DELMEAS must be used instead. Refer to ***Chapter 4.10.7*** for more information on this program.

Change User Information (US)

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

Close Editing Session (CL)

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

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

In ADAPS, the number of unit-values are limited to 2,880 per day.

4.11.3 Merge/Replace Unit-Values Data

The UV_MERGE program is used to merge and replace edited unit-values from one DD with either edited or measured unit-values data from another DD at a single station. It cannot be used with computed unit-values.

Introduction

This program allows the user to take certain unit-values data from one DD and add, merge, or replace the data with data from another DD at the same site. The program can read either measured or edited UVs from the Source DD, and merge these UVs with the edited UVs of the Destination DD. The source and destination DDs must be at the same site and must have the same parameter code. Whether the input data stream from the Source DD is measured or edited UVs, the output data stream will **always** be stored into the ADAPS database as edited UVs under the Destination DD. The edited UVs that are moved from the source DD will be stored under the destination DD with the transport codes and sensor type indicators of the source DD in order to identify the instrument from which the data originated. The measured UVs for the Destination DD will be left untouched in the database during this operation.

If the program UV_ENTER has been used to create new “measured” UVs for a DD, the UV_MERGE program may also be used to copy the “measured” UVs into the “edited” UV tables for the same DD, by specifying the source and destination DDs the same and specifying the correct source UV type option (“measured,” then selection of the desired transport code).

When the program has finished merging the source UVs (either “edited” or “measured”) into the destination DD’s “edited” UV tables, the user is queried whether to run a Primary Recomputation. Answering “Yes” will generate new “shift,” “correction,” and computed “da” unit-values of the merged data stream, as well as daily-values. The default answer to the query is “No,” allowing the user to perform multiple merges without performing recomputations between each one. After doing all required merges, running a computation at the conclusion of the UV_MERGE session is strongly recommended, in order to force synchronization of the edited and computed unit-values and the daily-values for the destination DD.

Program Operation

This interactive program (option) goes through the standard ADAPS startup routine and allows the user to select a site. At this point, the user is also shown a listing of the DDs at the selected site and is prompted to choose the Source and Destination DDs. After the DDs are selected, a display of eight program options with sub-options is presented, and any or all of the options may be changed. The options and sub-options are as follows:

- **Option 1 is the ADD/MERGE/REPLACE option**.

  ADD ONLY NEW DAYS: This sub-option will only store data under the Destination DD for a day if there are no UV data for that day for the destination DD.

  ADD/REPLACE EXISTING DAYS: This sub-option adds data from the Source DD to the Destination DD for days that do not currently exist for the destination

DD, and replaces existing days for the destination DD with the available data from the source DD.

ADD/REPLACE EXISTING DAYS, MERGE FIRST AND LAST DAYS: This sub-option is the default. It operates much the same as the Add/Replace sub-option, 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 sub-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 sub-option adds data for days from the source DD unit-values records that do not currently exist in the destination 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 overwrite the existing values in the source DD unit-values record.

- **Option 2 is the SOURCE DD option.**

The user selects from a list of DDs 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 DDs 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.

- **Option 8 is the SOURCE UV TYPE option.**

  The default is “edited” unit-values. The user can switch to “measured” unit-values, and will then be prompted to select the desired transport code from a list of the available transport codes from the Source DD. Only unit-values from the Source DD that have the same transport code as that chosen will be available for merging.

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. After the merged data stream has been stored into the “edited” UV tables, the user is prompted to perform a recomputation. After performing (or skipping) the recomputation, the user is then given the option to quit the program or to restart and process another merge operation.

4.11.4 Set Edited UV “Checked” Status Flag

The program SET_CHECKFLAG is used to set the check flag “@” on a specific set of unit-values for a station or group of stations. The @ flag (chosen to represent an eye) is an indication that the unit-values have been reviewed by USGS personnel. At the time unit-values are flagged with the @, obviously inaccurate data should be removed from or correctly flagged in the system using the appropriate unit-value data-quality flags. It is intended that the NWISWeb system will make use of the @ flag to differentiate realtime data that has passed through a review by USGS personnel from that which has not.

The intended program for setting the @ flag is HYDRA, because it allows for viewing, editing, and flagging of unit-value data within one program. Any edited unit-value data that is saved from within a HYDRA session will automatically receive the @ flag. The SET_CHECKFLAG program is intended as an easier mechanism to set the flag at a site or group of sites if another program, such as NWISWeb, is used to review the unit-value data. **SET_CHECKFLAG should not be used to set the @ flag without a review of the unit-value data by qualified USGS personnel.**

Regardless of whether set by HYDRA or SET_CHECKFLAG, the @ flag is only directly set on edited unit-values. The flag is passed to computed unit-values only upon recomputation of the record.

Program Operation

The startup routine is used to select the file path, output destination, database, agency code, site ID, and data descriptor. A group may be used to set the checked flag on multiple stations/data descriptors at one time. After entry past the startup routine, the user is prompted for the starting date, time, and time zone, and then the ending date, time, and time zone of the period for which the flag will be set. The default time zone will be that set in the site file for the station selected.

After entry is complete, a summary of the date range is given and the user is given the option to continue or leave the program without setting the flags. If the program is continued, a summary of the number of edited unit-values flagged is shown and the user is given the option to re-compute the record. If the record is not re-computed, the edited unit-values retain the @ flag, but the computed unit-values of both the data descriptor(s) chosen (for example, computed stage) and any output parameter (for example, discharge) will remain un-flagged. Because NWISWeb only displays computed unit-values, this will mean that the data shown on NWISWeb will remain un-flagged. If the user chooses to re-compute the record, a full re-computation will be done, including application of data corrections, shifts, and primary processing of all processors that use the chosen data descriptor(s) as an input parameter. No printed output will be generated, but the @ flag will be propagated to the computed unit-values of both the input data descriptor and any output data descriptors.

4.11.5 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. Within the edit program, no outside messages are sent to the screen.

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, the user is 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 flag will be displayed on the daily values table (the small e is always printed).**
<	**Less than. The flag will be displayed on the daily values table.**
>	**Greater than. The flag will be displayed on the daily values table.**
1	**Value is "Write" protected and cannot be changed unless the flag is removed. Nothing is shown on the daily value table.**
&	**Value is computed from affected unit values. Nothing is shown on the daily value table.**

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 the user is queried if this is the record to be deleted. If YES, the entire water year of daily-values is deleted.

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.

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 eight days, the second column contains the next eight 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 to the month immediately preceding the current one. Note that the program does not allow data editing outside of the water year.

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 the user 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>.

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 the user 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.

Exit the Daily-Values Update Program

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

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 the user enters the daily-values edit program. After saving the daily-values, the user is returned to the program menu level.

4.11.6 Edit Public Access Flags

Note: At the time of this documentation, NWISWeb does not interface with ADAPS to apply these flag settings to control access, but the measurement and peak-flow data access is being controlled by settings established through NW_EDIT directly in NWISWeb.

The program WEBFG_EDIT is used to set which user class is able to view measurement and peak-flow data from a station or group of stations on NWISWeb. Five user class options are available as follows:

0 Public
1 Cooperator
2 Non-district USGS
3 District USGS
4 Proprietary

The user class of an individual viewing data is set based on the IP address of the computer being used. The IP addresses associated with each user class are set within the NW_EDIT program. See the NWISWeb documentation for more information.

The program WEBFG_EDIT is only used to set access to measurement and peak-flow data. The display of daily and unit-values on NWISWeb is set in a similar fashion within the data descriptor setup in the SU menu (program DD_EDIT).

Program Operation

The startup routine is used to select the file path, database, agency code, and site ID. A group may be used to set the public access flags on multiple stations at one time. After entry past the startup routine, the following options are available:

MS) Set Measurement File Flag to: 0 = Public
PK) Set Peakflow File Flag to: 0 = Public
BO) Set Both Flags

UP) Update the Flags in the Database

US) Select New Site or Group
QU) Quit

Use the MS, PK, or BO options to set the flag(s) to the desired user class. Once satisfied with the display, use the UP option to save the flags to the database. If the US or QU options are used prior to UP, any changes will not be saved.

5 Command Line Functions

by Barbara C. Hoopes and James F. Cornwall

This chapter describes ADAPS command line functions. These are functions that are executed from the UNIX command line instead of from ADAPS menus, and which may be run manually or by automated means such as "cron" jobs. Most of these functions are NOT accessible from the ADAPS menus. These command line functions are described in detail below.

5.1 Hydra

Although Hydra is available from ADAPS at the PR sub-menu, Edit Time Series Data using Hydra (TS_EDIT), it can also be started from the command line. However, to start Hydra outside of ADAPS, a DV or UV RDB file needs to be available to edit. The command is "hydra rdb_file_name." For a complete description of using Hydra, refer to ***Section 4.5.2 Edit Time-Series Data using Hydra (TS_EDIT).***

5.2 nwrt2rdb

This command is used to output rating information in RDB format. It writes RDB files with a table containing the rating equation parameters or the rating point pairs, with all other information contained in the RDB comments.

The following arguments can be used with this command:

```
nwrt2rdb         -ooutfile
                 -zdbnum
                 -aagency
                 -nstation
                 -dddid
                 -trating_type
                 -irating_id
                 -e (indicates to output ratings in expanded form; it is
                    ignored for equation ratings.)
                 -l loctzcd (time zone code or local time code "LOC")
                 -m (indicates multiple output files.)
                 -r (rounding suppression)
```

Rules

- If -o is omitted, it writes to stdout; AND arguments -n, -d, -t, and -i must be present.
- If -o is present, no other arguments are required, and the program will use ADAPS routines to prompt for them.

- If -m is present, -o must be present; -i OR -i and -t OR -i, -t, and -d can be omitted. A file will be output for each rating found in the database for the supplied keys.
- If -e is present, point-pair ratings will be output in expanded form.
- If -l is omitted, it will default to local time code "LOC."
- If -a is omitted, it will default to agency "USGS."
- If -z is omitted, it will default to database 1.
- If -r is present, rounding is suppressed, otherwise rounded values are output.

The nwrt2rdb command may also be executed using a control file (-f argument). The contents of the control file are described below after the usage rules. When a control file is used only the following arguments are applicable:

```
nwrt2rdb       -fctlfile
                -ooutfile
                -zdbnum
                -e (indicates to output ratings in expanded form. It is
                    ignored for equation ratings.)
                -l loctzcd (time zone code or local time code "LOC")
```

Rules

- The –o argument is mandatory when a control file is used. A separate output file is written for each rating in the control file. Outfile is used as the prefix for the output files.
- If -z is omitted, it will default to database 1.
- If -e is present, point-pair ratings will be output in expanded form.
- If -l is omitted, it will default to local time code "LOC."

The control file (-f argument) is an RDB file containing the columns "AGENCY," "STATION," "DDID," "RATING_TYPE," and "RATING_ID," corresponding to the -a, -n, -d, -t, and -i arguments for the usage when no control file is used. All columns must be present and populated. It does not matter in what order the columns appear in the control file. Valid rating types are:

Type	Description
MEAS	**Input conversion rating**
PARM	**General parameter rating**
STGQ	**Stage/discharge rating**
FALL	**Fall/factor adjusted fall rating**
FLFC	**Fall/factor discharge rating**
STAR	**Stage-area rating**

Type	Description
VELO	**Index velocity/mean velocity rating**
STCO	**Stage-coefficient rating**

5.3 nwts2rdb

The nwts2rdb command is used to output time-series information (daily-values, unit-values, discharge measurements, peak-flow, data corrections, and shifts) in RDB format. It writes RDB files with a table containing the time-series data with all other information contained in the RDB comments.

The following arguments can be used with this command:

```
nwts2rdb -ooutfile
         -zdbnum
         -tdatatype (dv, uv, ms, pk, dc, or sv)
         -aagency
         -nstation
         -dddid OR -pparm (not used with datatypes ms and pk)
         -sstatistic (dv) OR uvtype (M)easured, (E)dited,
                        (R)corrections, (S)hifts,(C)computed, or(N)Raw
                        Measured(no conversion of input ratings) OR
                        mstype (C)sg, (M)eas, (G)age insp. or (B)oth OR
                        pktype (F)ull,(P)artial or (B)oth (not used
                        with datatypes dc and sv)
         -bbegdate (yyyymmdd) (dv, dc, sv, ms, pk) OR
                        begdtm (yyyymmddhhmmss) (uv)
                        A value of all zeros indicates beginning of
                        period of record.
         -eenddate (yyyymmdd) (dv, dc, sv, ms, pk) OR
                        enddtm (yyyymmddhhmmss) (uv)
                        A value of all nines indicates end of period
                        Of record.
         -l loctzcd (time zone code or local time code "LOC")
         -r (rounding suppression)
         -w (water year flag)
         -c (Output COMPUTED daily values only (DV))
                        (combine date and time in a single column (UV))
         -y transport_cd (Measured Unit-Values only)
                        A (ADR), E (EDL), S (DCP), O (OBS), or U (UNS)
                        If omitted, it defaults to preferred input.
         -i title_line (Alternate title line if S_STRT is run)
```

Rules

- If -o is omitted, it writes to stdout; AND arguments -t, -n, -s, -b, -e, and -d or -p must be present. (-d or -p is not required when datatype is “ms” or “pk,” -s is not required when datatype is “c,” or “sv.”)

- If -o is present, no other arguments are required, and the program will use ADAPS routines to prompt for them.
- If -p is present, -d cannot be present. The parameter code is used to find the PRIMARY DD for that parameter.
- If -a is omitted, it defaults to agency "USGS."
- If -l is omitted, it will default to local time code "LOC."
- If -r is present, rounding is suppressed, otherwise rounded values are output.
- If -w is present, -b and -e will be water years instead of dates or datetimes or the user will be prompted for water years instead of dates or datetimes.
- If -c is present and daily-values are being output, only computed daily-values will be retrieved. If unit-values are being output, date and time are combined into a single datetime column. This option is ignored if the datatype is not "dv" or "uv."
- If -z is omitted, it defaults to database 1.
- If -y is present, it is ignored unless Measured Unit-Values are specified as arguments or selected in the prompting. If omitted, it defaults to preferred input.
- If -m is present, it is ignored.
- If -i is omitted, the standard S_STRT title line is used.

The nwts2rdb command may also be executed using a control file (-f argument). The contents of the control file are described below after the usage rules. When a control file is used only the following arguments are applicable.

```
nwts2rdb -fctlfile
         -ooutfile
         -m (write multiple files)
         -zdbnum
         -l loctzcd (time zone code or local time code "LOC")
         -r (rounding suppression)
         -c (Output COMPUTED daily values only (DV))
                  (combine date and time in a single column (UV))
         -y transport_cd (Measured Unit-Values only)
```

Rules

- If -o is omitted, it writes to stdout, and -m cannot be used.
- If -m is present, outfile is used as the output file name prefix. If omitted, all rows in the control file must be the same datatype.
- If -l is omitted, it will default to local time code "LOC."
- If -r is present, rounding is suppressed, otherwise rounded values are output.
- If -c is present and daily-values are being output, only computed daily-values will be retrieved.
- If unit-values are being output, date and time are combined into a single datetime column. This option is ignored if the datatype is not "dv" or "uv."

- If -z is omitted, it defaults to database 1.
- If -y is present, it is ignored except for rows in the control file specifying Measured Unit-Values. If omitted, it defaults to preferred input.
- If -t, -a, -n, -d, -p, -s, -b, -e, or -i are present, they are ignored.

The control file (-f argument) is an RDB file containing the columns “DATATYPE,” “AGENCY,” “STATION,” “DDID,” “SUBTYPE,” “BEGDATE,” and “ENDDATE,” corresponding to the -t, -a, -n, -d, -s, -b, and -e arguments for the usage when no control file is used. If the first character of the DDID is a “P,” then it is treated as a parameter code and used to locate the PRIMARY DD for that parameter. All columns must be present, and all columns must also be populated (not blank and not null), except that DDID is not used (may be blank or null) when DATATYPE is “ms” or “pk” and SUBTYPE is not used when DATATYPE is “dc” or “sv.” It does not matter in what order the columns appear in the control file.

5.4 pick_dd

The pick_dd command displays a menu of available ADAPS Data Descriptors (DDs) for a command-line supplied station to stderr, reads the user's choice on stdin, and writes the selected DD id to stdout. It is intended for shell-script use as in the following example:

```
ddid=`pick_dd -n 12345678`
  nwts2rdb -t dv -n 12345678 -d $ddid -s 3 -b 19900101 -e 19900131
```

Usage for this command: pick_dd [-z dbnum] [-a agency] -n station

The dbnum defaults to one, agency defaults to "USGS" if omitted.

5.5 pick_rating

The pick_rating command displays a menu of available ADAPS ratings for a command-line supplied station and data descriptor (DD) to stderr, reads the user's choice on stdin, and writes the selected rating type and id to stdout in a format suitable for input to the nwrt2rdb command. It is intended for shell-script use as in the following example:

```
ratingid=`pick_rating -n 12345678 -d 1`
  nwrt2rdb -n 12345678 -d 1 $ratingid
```

Usage for this command: pick_rating [-z dbnum] [-a agency] -n station -d ddid

Rules

- The dbnum defaults to one, agency defaults to “USGS” if omitted.
- If I_card_file does not exist, it is assumed to be a station number and will be used to construct a temporary I-card file.
- If -o is omitted, the output file prefix will be the I_card_file argument. The output files will have a “.prt” and “.ps” suffix.

5.6 pkrtfq

The command pkrtfq is provided to automate the process of retrieving peak-flow data from the NWIS ADAPS sub-system and to perform flood frequency analysis with the HASS PEAKFQ program. It takes either a station number or a file of I-cards (see the ADAPS peak flow program documentation) as input. Output is a text file containing the flood frequency analysis report and a postscript file containing the flood frequency plots.

Usage for this command: pkrtfq I_card_file [-o output_file_prefix]

Rules

- If I_card_file does not exist, it is assumed to be a station number and will be used to construct a temporary I-card file.
- If -o is omitted, the output file prefix will be the I_card_file argument. The output files will have a “.prt” and “.ps” suffix.

5.7 rtlist

The command “rtlist,” used in NWIS Version 4_1 and earlier to display DCP status and transmission information, has been discontinued. The functions of the rtlist program may be found in the program “lrgs,” documented in the DECODES area at ***http://wwwnwis.er.usgs.gov/datarelay/lrgs/lrgs_admin.html*.**

5.8 rtmakemaster

The command rtmakemaster extracts DCP sensor information from the DECODES database and creates in the current working directory master.dcp.list.dbnn files, where “nn” is a two-digit database number for each database that contains stations from DECODES. The DBA then edits these files and places the final versions in /usr/opt/nwis/data/auxdata for the rtsoft programs to use as the default input files.

5.9 sentrystatus

The sentrystatus command displays the status of the ADAPS SENTRY processes. It looks at the ADAPS global variables, displays the process ID of the two sentry processes, and the names of the last files processed. In addition, it shows the file currently being processed, the date/time and DCP ID of the last transmission processed, and the transmission currently being processed. If -no_verify is specified, the sentrystatus command skips the step of verifying that the processes are still running.

The sentrystatus command can be run by any valid ADAPS user. Status information also can be found in the log files in the directory /usr/opt/nwis/data/systat. Look for files named sentry.dbnn.yymmdd.hhmmss.log and sen_unl_arch.dbnn.yymmdd.como.

Symbolic links that point to the most recent sentry.dbnn.yymmdd.hhmmss.log or .como file are SENTRY.DBnn.CURRENT.LOG and SENTRY.DBnn.CURRENT.COMO.

Usage for this command: sentrystatus nn [-no_verify]

where: nn is the database number of the SENTRY processes to check.

5.10 std_store

This command is used to store STD format data in the ADAPS database. The **std_store** command is a command line interface to the ADAPS STD_STOR program. The data contained in the supplied STD formatted file is loaded into the database and status information is displayed to stdout. No user interaction is normally required. If any existing data is found in the database, the default action is to **not** store the data from the input file. If the user needs to overwrite existing data, he must provide the "-ov" switch on the command line as shown below. The default action of this command is to **not** perform a recomputation from the freshly loaded unit-values. If the recomputation is desired, the "-co" switch will force it to be run.

Usage for this command: std_store std_file_path [-ov -co]

where:	-ov	allows existing data to be overwritten without user prompting
	-co	forces a recomputation using the newly loaded UV data

5.11 startsentry

The SENTRY program is actually one or more copies of the sentry process, one running for each ADAPS numbered database that receives DCP or telemetered EDL data. Each sentry process initially processes data for its database only. A sentry process can handle multiple databases, but because the process of switching from one database to another is time-consuming and can cause the sentry process to lag behind real-time, the use of this feature should be avoided.

The startsentry command is used by user satin to start the ADAPS SENTRY processes sentry and sencmp.

Usage for this command: startsentry nn [-no_query|-nq]

where: nn is the integer database number (from 1 to 98) to run.
and -no_query or -nq means to attempt to start even if the flags indicate sentry is already running (for boot scripts).

5.12 stopsentry

The STOPSENTRY command is used by user satin to stop the ADAPS SENTRY processes sentry and sencmp.

Usage for this command: stopsentry nn [-kill] [-no_query|-nq]

where: nn is the integer database number (from 1 to 98) to run.

Rules

- -kill means to find the sentry processes and kill them, and
- -no_query or -nq means to kill processes without asking any questions.

The stopsentry nn command can be run by any user with access to the stopsentry command. The stopsentry nn -kill command can be run only by the user who started sentry or as root (otherwise the kill command will not work).

5.13 approve_all_primary

by James F. Cornwall

The approve_all_primary script is for use by the System Administrator (user type “SYST”) to set the data aging codes for all Primary DDs in the specified database to “Approved.” The processing will be for every DD flagged as “Primary” in the specified database, as well as all related DDs as specified in the processing instruction sets for the Primary DDs.

Usage for this command:
approve_all_primary nn StartWY EndWY output_file_path &

where: nn is the integer database number (from 1 to 98) to run against.
StartWY is the starting Water Year for processing.

EndWY is the ending Water Year for processing.
output_file_path is the complete file name, including path, for the output report, and the "&" tells the system to run the script in the background.

Rules

- All four arguments are mandatory (must be present).
- StartWY must be within the range 1801 – 2020.
- EndWY must be greater than StartWY.
- EndWY must be within the range 1801 – 2021.
- The path and file name supplied for the output report will be validated to ensure the data can be written under the user's file permissions.

The approve_all_primary script, once it has been started by the user, will run until it has completed its task. Depending upon the contents of the database (number of stations and DDs, etc.), and the number of water years specified in the argument list, the script may run for several hours or even overnight. For this reason, caution is urged in the use of this script to avoid database locks and degraded performance while running. To run the script in the background and avoid locking up the user's terminal window, the "&" should always be used with this command as well.

5.14 list_data_aging_status

by James F. Cornwall

The script list_data_aging_status is intended for use by any system users to report on the current status of the data aging codes for all DDs in the specified database for the specified water year. To use this script, the user must be a member of the UNIX group "nwis_select." The script generates a formatted report into a user-specified output file.

Usage for this command: list_data_aging_status *nn WY output_file_path*
where:
nn is the integer database number (from 1 to 98) to run against.
WY is the Water Year for processing.
output_file_path is the complete file name, including path, for the output report.

Rules

- All three arguments are mandatory (must be present).
- WY must be within the range 1801 – 2020.
- The path and file name supplied for the output report will be validated to ensure the data can be written under the user's file permissions.

The list_data_aging_status script uses an SQL query to scan the database and extract the desired information. The output report is written to a user-specified file with information on each DD found in the database, as shown in the sample report below:

```
  =============================================
  ===    Data Aging Status Listing         ===
  ===                                      ===
  ===    Water Year:  1998                 ===
  ===    Database Number:  01              ===
  =============================================

  =========================================================
  ===    Data, Ratings, & Processor Tables Listing    ===
  =========================================================

AGENCY  STATION_ID       DD_NUMBER  PRIMARY_DD      RATINGS     PROCESSOR   DV
------  ---------------  ---------  -------------   ----------  ----------  ----
USGS    01010000         6          Y               A           A           W
USGS    01010500         5          Y               A           A           A
USGS    05014500         2          Y               A           A           A
USGS    05016000         1          Y               A           A           A
USGS    05018500         1          N               A           A           W
USGS    05018500         4          Y               A           A           A
USGS    12389000         2          Y               A           A           A
USGS    450937112393701  1          Y               A           A           W
USGS    451746106301101  1          N               A           A           W
USGS    453107106110601  1          N               A           A           W
```

The report generated by the script is in two parts. The first part lists the status of ratings, processors, and data broken down by Data Descriptor (DD).

- Data in the column "PRIMARY_DD" tells if the DD is considered a Work DD or a Primary DD, a "Y" indicating a Primary DD.
- The "RATINGS" column shows the status of any Ratings found for each DD.
- The "PROCESSOR" column shows the status of the Processor instruction set for each DD.
- The "DV" column shows the status of the Daily-Values for the DD. Since the data aging status for Unit-Values, Daily-Values, Rating Dates, Shifts, and Corrections are updated as a single agglomeration of data, the single DV status is shown and may be taken as an indicator of the other types' status as well.
- The data aging codes listed may be "W" for "Working," "R" for "in-Review," or "A" for "Approved" records.

5.15 dcp_performance_rpt

by James F. Cornwall

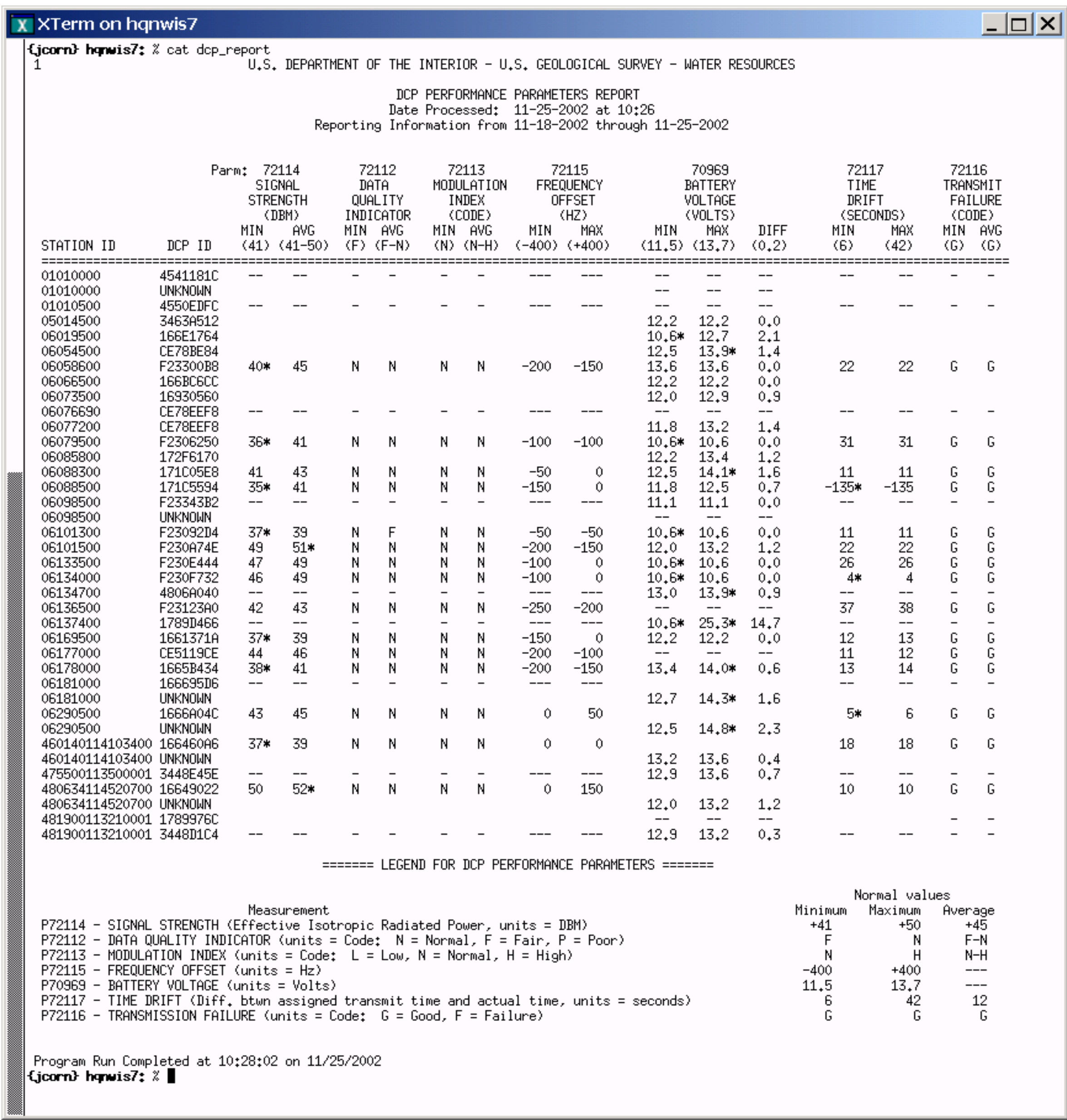
The program dcp_performance_rpt is a utility program, intended to run as a daily cron job, which will produce a listing of DCP Performance Parameters for System or Database Administrators to use for monitoring their equipment. The program may also be run manually from the UNIX command line as shown here:

Usage (command line): **nwis dcp_performance_rpt dbNN Ndays > output.file**
where:
NN is the integer database number (from 1 to 98) to run against.

NDays is the number of days to report on (backwards from current day), and **output.file** is the complete file name, including path, for the output report.

A run of the program will produce a report which lists all Data Descriptors in the specified database with a DCP Performance Parameter Code (72112, 72113, 72114, 72115, 72116, 72117, or 70969). Any Unit-Values stored in the database for the specified date range (present time backwards N days) are read out and scanned to determine the maximum, minimum, and average values as appropriate, and certain parameters are converted from numeric values (stored by the satin/sentry programs) into alphabetic status codes for display.

A sample report is shown below:



```
XTerm on hqnwis7
{jcorn} hqnwis7: % cat dcp_report
 1                             U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

                                                DCP PERFORMANCE PARAMETERS REPORT
                                               Date Processed:  11-25-2002 at 10:26
                                          Reporting Information from 11-18-2002 through 11-25-2002


                           Parm:  72114        72112      72113      72115            70969                 72117       72116
                                  SIGNAL        DATA    MODULATION  FREQUENCY        BATTERY                TIME      TRANSMIT
                                 STRENGTH     QUALITY     INDEX      OFFSET          VOLTAGE                DRIFT      FAILURE
                                  (DBM)      INDICATOR    (CODE)      (HZ)           (VOLTS)              (SECONDS)     (CODE)
                                 MIN   AVG    MIN  AVG   MIN  AVG    MIN   MAX     MIN    MAX   DIFF     MIN    MAX    MIN  AVG
STATION ID        DCP ID        (41) (41-50)  (F) (F-N)  (N) (N-H) (-400) (+400) (11.5) (13.7) (0.2)     (6)   (42)    (G)  (G)
=================================================================================================================================
01010000        4541181C         --    --      -    -     -    -    ---    ---     --     --    --       --     --     -    -
01010000        UNKNOWN                                                            --     --    --
01010500        4550EDFC         --    --      -    -     -    -    ---    ---     --     --    --       --     --     -    -
05014500        3463A512                                                          12.2   12.2   0.0
06019500        166E1764                                                          10.6*  12.7   2.1
06054500        CE78BE84                                                          12.5   13.9*  1.4
06058600        F23300B8         40*   45      N    N     N    N   -200   -150    13.6   13.6   0.0      22     22     G    G
06066500        166BC6CC                                                          12.2   12.2   0.0
06073500        16930560                                                          12.0   12.9   0.9
06076690        CE78EEF8         --    --      -    -     -    -    ---    ---     --     --    --       --     --     -    -
06077200        CE78EEF8                                                          11.8   13.2   1.4
06079500        F2306250         36*   41      N    N     N    N   -100   -100    10.6*  10.6   0.0      31     31     G    G
06085800        172F6170                                                          12.2   13.4   1.2
06088300        171C05E8         41    43      N    N     N    N    -50      0    12.5   14.1*  1.6      11     11     G    G
06088500        171C5594         35*   41      N    N     N    N   -150      0    11.8   12.5   0.7    -135*  -135     G    G
06098500        F23343B2         --    --      -    -     -    -    ---    ---    11.1   11.1   0.0      --     --     -    -
06098500        UNKNOWN                                                            --     --    --
06101300        F23092D4         37*   39      N    F     N    N    -50    -50    10.6*  10.6   0.0      11     11     G    G
06101500        F230A74E         49    51*     N    N     N    N   -200   -150    12.0   13.2   1.2      22     22     G    G
06133500        F230E444         47    49      N    N     N    N   -100      0    10.6*  10.6   0.0      26     26     G    G
06134000        F230F732         46    49      N    N     N    N   -100      0    10.6*  10.6   0.0       4*     4     G    G
06134700        4806A040         --    --      -    -     -    -    ---    ---    13.0   13.9*  0.9      --     --     -    -
06136500        F23123A0         42    43      N    N     N    N   -250   -200     --     --    --       37     38     G    G
06137400        1789D466         --    --      -    -     -    -    ---    ---    10.6*  25.3* 14.7      --     --     -    -
06169500        1661371A         37*   39      N    N     N    N   -150      0    12.2   12.2   0.0      12     13     G    G
06177000        CE5119CE         44    46      N    N     N    N   -200   -100     --     --    --       11     12     G    G
06178000        1665B434         38*   41      N    N     N    N   -200   -150    13.4   14.0*  0.6      13     14     G    G
06181000        166695D6         --    --      -    -     -    -    ---    ---                           --     --     -    -
06181000        UNKNOWN                                                           12.7   14.3*  1.6
06290500        1666A04C         43    45      N    N     N    N      0     50                            5*     6     G    G
06290500        UNKNOWN                                                           12.5   14.8*  2.3
460140114103400 166460A6         37*   39      N    N     N    N      0      0                           18     18     G    G
460140114103400 UNKNOWN                                                           13.2   13.6   0.4
475500113500001 3448E45E         --    --      -    -     -    -    ---    ---    12.9   13.6   0.7      --     --     -    -
480634114520700 16649022         50    52*     N    N     N    N      0    150                           10     10     G    G
480634114520700 UNKNOWN                                                           12.0   13.2   1.2
481900113210001 1789976C                                                           --     --    --                     -    -
481900113210001 3448D1C4         --    --      -    -     -    -    ---    ---    12.9   13.2   0.3      --     --     -    -

                                      ======= LEGEND FOR DCP PERFORMANCE PARAMETERS =======

                                                                                                      Normal values
                                 Measurement                                                  Minimum   Maximum   Average
P72114 - SIGNAL STRENGTH (Effective Isotropic Radiated Power, units = DBM)                      +41       +50       +45
P72112 - DATA QUALITY INDICATOR (units = Code:  N = Normal, F = Fair, P = Poor)                  F         N        F-N
P72113 - MODULATION INDEX (units = Code:  L = Low, N = Normal, H = High)                         N         H        N-H
P72115 - FREQUENCY OFFSET (units = Hz)                                                         -400      +400       ---
P70969 - BATTERY VOLTAGE (units = Volts)                                                       11.5      13.7       ---
P72117 - TIME DRIFT (Diff. btwn assigned transmit time and actual time, units = seconds)          6        42        12
P72116 - TRANSMISSION FAILURE (units = Code:  G = Good, F = Failure)                              G         G         G


 Program Run Completed at 10:28:02 on 11/25/2002
{jcorn} hqnwis7: %
```

Since each Data Descriptor is assigned a unique identifier within the database, the program must attempt to group the various performance parameters for a DCP by means of the DCP ID code. When a DD is located with a Performance Parameter code, e.g. 70969 Battery Voltage, but there is no 8-character DCP ID found with it, the record will be printed on its own line as shown. If some of the performance parameters are not defined for a station/DCP ID, that column will be left blank in the report. If a performance parameter is defined, but there are no Unit-Values found within the specified dates, the column will show dashes instead.

Sample crontab entry for **dcp_performance_rpt:**

00 1 * * * /usr/opt/nwis/bin/nwis dcp_performance_rpt db01 30 > /usr/opt/nwis/data/systat/dcp_performance_rpt.db01.`date +\%Y\%m\%d`.`date +\%H\%M\%S`.log 2>&1

This entry will run the program against database 01, at 01:00 every day, for a period of 30 days, and store its output in date/time stamped files in the NWIS systat directory (files will be named as "**dcp_performance_rpt.db01.YYYYmmdd.hhmmss.log**").

> **NOTE**: If the crontab entry for the program uses "...`date +\%**y**..." instead of an uppercase "+\%**Y**", the file date/time stamping will use only the last 2 digits of the year rather than the full 4 digit years.

5.16 del_perf_uvs

by James F. Cornwall

The program del_perf_uvs is a utility program, intended to run as a daily cron job, which will delete from the database any Unit-Values data with specific DCP Performance Parameters older than the number of days specified for the run. The program may also be run manually from the UNIX command line as shown here:

Usage (command line): **nwis del_perf_uvs dbNN Ndays > output.file**
where:
NN is the integer database number (from 1 to 98) to run against.
NDays is the number of days to report on (backwards from current day), and
output.file is the complete file name, including path, for the output report.

A run of the program will determine the deletion date (Ndays backwards from the current date), and will process all the UV sub-files for the specified database dbNN. Any Unit-Values with a DCP Performance Parameter Code (72112, 72113, 72114, 72115, 72116, 72117, or 70969) stored in the database which are older than the deletion date, are deleted from the database. The total number of records deleted is printed out as well. Output is normally directed into an output file for logging the deletions.

A sample crontab entry to run the program is shown below:

00 1 * * * /usr/opt/nwis/bin/nwis del_perf_uvs db01 30 > /usr/opt/nwis/data/systat/del_perf_uvs.db01.`date +\%Y\%m\%d`.`date +\%H\%M\%S`.log 2>&1

This entry will run the program against database 01, at 01:00 every day, for a period of 30 days, and store its output in date/time stamped files in the NWIS systat directory (files will be named as "del**_perf_uvs.db01.YYYYmmdd.hhmmss.log**").

6 ATTACHMENTS

6.1 Steps for Processing Station Records

This chapter presents the steps involved in processing hydrologic data (station records) from each of the different types of data-collection stations. The steps for each type of station are presented in logical order to allow for correct processing of time-series data in ADAPS.

6.1.1 Introduction

by Glenn B. Engel

Time-series water-data record processing at different stations can involve different computational methods depending on the type of hydrologic data being collected, the different instruments that are used to record and transmit the data, and the desired final product resulting from the data processing. Each computation method involves a series of steps for processing the data collected at the station to produce final products of publication quality Unit or Daily-Values. Succeeding sections of this chapter present the basic steps involved in processing station records for nine types of data-collection stations. They are: stage-discharge, stage-only, stage-fall (slope-discharge), velocity-index/deflection-meter, reservoir, tidal, water-quality monitor, ground-water observation well and precipitation station.

To process records the user should be familiar with ADAPS functions and terminology as discussed in ***Chapter 3*** of this ADAPS User's Manual, Overview Of Data Processing. Chapter 3 includes descriptions of data storage formats, ratings, correction values, and other items used in the processing of records. Also included are schematic diagrams in Figures 5 through 9 indicating the path of data processing which should be particularly useful. The ADAPS programs used to process station records are presented in detail in ***Chapter 4*** of this ADAPS User's Manual.

The user should also have a basic understanding of the interrelation of the Site record, Location record, Data Descriptor record, Processor record, and the DECODES program as described in ***Chapter 3.2*** and which are referred to in the following sections as necessary parts in the processing of data. These records can be created and updated only by a person with high level (SYST or ADBA) user access and are presented in detail in the ADAPS Administrator's Manual.

6.1.2 Stage-Discharge Station

by James M. Caldwell

To process time-series stage-discharge data using NWIS-ADAPS, the site is first established in the GWSI Site File, and then all support files in ADAPS necessary to define the data being stored in ADAPS are defined. The following steps are an overview of the navigation-path through the stage-discharge time-series data processing functionality of ADAPS:

1. Establish the Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the stage-discharge site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this site in the database. If the site already exists in the Site File, verify that the Site File information has been updated to document the existence of stage equipment at the site.

2. Create the Sensor Locations for the Site (Optional)

This step is not necessary if one sensor location is used at the site.
(Locations other than the "default location" are needed only if there are sensors at multiple locations, e.g. sensors at different depths or at multiple points in the cross-section.)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the site. Data collected for one parameter from multiple locations using the same data descriptor (DD) can be stored. With one data-descriptor (DD) for each measured parameter at a site, use of the location description will further differentiate the data collected by each sensor.

The sensor locations have to be established prior to setting up the data descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

3. Create or Update the Data Descriptors

Data descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish a data descriptor (DD) for each parameter by selecting "Update Data Descriptor" (DD_EDIT) in the SU sub-menu. Define the parameters for each DD, assign a location to the DD based on the locations, create the processor record for the DD, and define the screening thresholds for the DD. The input DD, gage height, has to be established first so that the computed DD, discharge, can be established from it, when the processor record is created. If only one location is used, the location will automatically be set to "default."

4. Create Decodes Site-Device Files (Optional—Needed for Edls)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level.
See the NWIS Site or ADAPS database administrator (ADBA) to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument that is recording Unit-Values electronically and is storing and/or transmitting the values from the site for entry into ADAPS. Please refer to the DECODES manual for instructions on writing an SDF to process the data.

5. Create or Update the Instrument File (Optional)

Instrument file editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update**.**

The Instrument File is only needed for ADR instruments. In this step, the user may establish or update an ADR instrument at the site. In the SU sub-menu, select the menu option, “Update ADR Instrument Information” (IN_EDIT) to create or update the instrument for the Stage-Discharge station.

6. Select the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), a “preferred input” transport code is assigned using the SU sub-menu option “Managing Preferred Input” (PFIN_EDIT). There may be multiple instruments collecting stage data at a site, or one instrument collecting, storing and transmitting data from the site into ADAPS using multiple transport methods, for example, a GOES data-collection platform (DCP) and an electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code “e.”**

ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the “preferred input.” To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport code “s”(GOES DCP), or the transport code “e” (telemetered EDL data). NWISWeb retrieves data from the edited Unit-Values file for display on the Web. The edited Unit-Values file is automatically populated during the data-conversion process with the measured Unit-Values from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled.

****Important note**: The real-time data coming into ADAPS are displayed to the public via NWISWeb. Real-time data should be reviewed on a regular basis.

7. Data Input

This step is not necessary for real-time transmitted data. Real-time data are transmitted and stored automatically as measured Unit-Values and edited Unit-Values. Data collected in any other manner will need to be processed by the user. Electronic data collected on laptop from an EDL or DCP should be converted to standard input files using DECODES (see DECODES). In ADAPS, choose the IN sub-menu and option “Process WRD standard input data” (STD_STOR). The input program will ask for the file name for processing. These data will be stored as measured Unit-Values and tagged with a transport code (listed in step 6 above). If real-time data does not exist at the site this transport method should be assigned as the preferred input (step 6). Then the data also will be stored as edited Unit-Values and will be tagged with a transport code (listed in step 6 above).

For data entry from the ADRs, use the sub-menu IN, “Read ADR Tape Data (TP_READ),” and store with the option “Edit And Store ADR Tape Data (TP_EDIT)” in this same sub-menu. These programs require a paper tape-reader.

For data entry from charts or from observations, entry is initiated in the sub-menu IN, “Enter Unit-Values from Digitizer/Keyboard (UV_ENTER).” The Digitizer option requires a digitizer interfaced to the system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

8. Review and Edit Time-Series Unit-Values

Review the edited Unit-Values of gage height record in HYDRA. Choose sub-menu PR and “Edit Time Series Data using HYDRA –” (TS_EDIT). Any missing record can be pulled in as a reference curve from the backup measured Unit-Values (see HYDRA section). If changes are made to the data in this program, answering yes to “Compute the record?” when closing will compute the entire record and update the database and

NWISWeb. Answering no will save the changes but will not compute the record or update the database or Web.

HYDRA is used to verify that quality data are being broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting “save and exit,” the user will be setting the Web-flag on that data to “checked” and it will be displayed as such on NWISWeb. If the data have been viewed using NWISWeb and edits do not need to be made to the data, the user may set the Web-display status flag on the data to “checked” using the UT menu-option “Set the Edited UV ‘checked’ Status,” (SET_CHECKFLAG).

9. Data Corrections

Apply any data corrections using the PR sub-menu, “Update/Display Data corrections” (DC_EDIT), see figure below. Up to three separate corrections can be made and each of the corrections can be prorated over time. The three data corrections are:

- Gage Height corrections
- Datum corrections from levels
- Other

Gage height corrections are entered to account for instrument errors, instrument drift, or instrument calibration. Datum Corrections are entered to correct for changes to the base datum at the station, documented when running levels. Other corrections can be, for example, a correction applied to the datum of the gage to avoid negative gage heights. Up to three separate correction diagrams can be entered and each of the correction diagrams can have one, two, or three points and will be prorated over time.
Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis.

Answering “yes” to “Compute the record?” when closing this program will compute the entire record and update the database and Web if any changes are made that will affect the data. Answering “no” will save the changes but will not compute the record or update the database or Web.

```
******************************************************************************
|   US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM ADAPS)      |
|         REVISION NWIS 4.2+20020205          Feb 13, 2002 14:51:24 Wednesday |
|            (PR) SUB-MENU : Primary Data Processing             |
******************************************************************************

 1 -- Update Data Descriptor Thresholds      9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra     10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections       11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables          12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars         13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)       14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)        15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary           16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation     PGM -- Display program_names
    QU -- Exit to previous menu               EX -- Exit to Unix
```

10. Measurements

All measurements for the Water Year should be stored using the sub-menu IN, “Enter/Update/Display Measurements” (MS_EDIT). Review all measurements and note deviation from the rating. Displaying the measurements in this same sub-menu is a useful tool.

11. Ratings

Review the rating. To display the expanded rating table choose the sub-menu DI, “Display Ratings (RT_DISPLAY).” After choosing the station, choose DISCHARGE as the data descriptor (DD). In the rating display window enter the options desired, then carriage return [CR] to produce output.

If necessary, update the rating or enter a new rating using the sub-menu PR “Update/Display Rating Tables.” Choose Type 1 rating, Standard discharge rating (gage height versus discharge). It may be necessary to use a Type 0 rating (Conversion of Input) using the gage-height DD if an ADR is in use, to convert dial readings to gage height in feet.

The data descriptor (DD) entry is based on the DISCHARGE. Ratings are stored in the rating tables either as equations or as tables. The active rating is designated (*). Options to enter new ratings are:

- Linear
- Log
- Equation

If entering a new rating for a stage-discharge station, choose the Log option. After entering the rating choose the effective dates for that rating. Choices are:

- “AP” to append a new rating date
- “ED” to edit a rating date
- “RM” to remove a rating date
- “SA” to save modifications and return to rating menu
- “RE” to return to rating menu without saving modifications

Comments can be added to explain development of ratings and rating dates. Use of this function is strongly recommended as these comments can be used to draft a station analysis.

12. Shifts

Shifts are applied to ratings to compensate for changes in the stage-discharge relation caused by changes in the river environment. Shifts to the rating are entered in sub-menu PR, “Update/Display Shifts” (SV_EDIT). The data descriptor (DD) used is DISCHARGE. The entry input points are gage heights, see shift-correction menu below.

```
     EDIT SHIFTS FOR RATING # 5.0     TYPE: stage-discharge
  USGS 01010000        St. John River at Ninemile Bridge, Maine
  DISCHARGE, in CFS                              WATER YEAR: 2000
        DATES VALID FROM: 10/01/1999 00:00 TO 09/30/2000 23:59
 LAST POSSIBLE CORRECTION FOR WATER YEAR ADDED - ADD MODE EXITED.
******************************************************************************
  START DATE TIME  ZONE   INPUT    SHIFT    INPUT    SHIFT    INPUT    SHIFT
  END   DATE TIME  ZONE  COMMENT
PRV:1992/10/01 0000 EDT      0.00    -0.11     0.80    -0.11     4.00     0.00
     /__/__ ____ ______ ____________________________________________________

 1:1999/10/01 0100 EDT      0.00    -0.11     0.80    -0.11     4.00     0.00
   1999/10/15 1600 EDT      0.00    -0.11     0.80    -0.11     4.00     0.00
 2:1999/10/15 2100 EDT      0.00    -0.20     0.80    -0.20     4.00     0.00
   2000/09/30 2359 EDT      0.00    -0.20     0.80    -0.20     4.00     0.00
 3:   /__/__ ____ ______ ________ ________ ________ ________ ________ ________

 "Q"= quit (no save)   "E"= exit (no save)   "A"= add to end of list
 "F"= forward 1 page   "M"= down 1 line   "D"= delete line  "C"= change line
 "B"= backward 1 page  "U"= up 1 line     "I"= insert line  "S"= save and quit
```

```
                SHIFT CORRECTION MENU
               ========================
          "AD"  -   ADD correction values
          "CH"  -   CHANGE/update correction values
          "DL"  -   DELETE entire selected record
          "VI"  -   VIEW correction values
          "LI"  -  LIST selection on screen/printer
          "ID"  -   Return to set ID screen
          "US"  -  Return to USer information screen
```

Shifts are linked to specific ratings and are in effect only within the time frame of the ratings. Shifts can be carried forward across one water-year boundary without re-entering the correction. The option to compute the record is available after shifts are entered. Comments can be added to explain use or distribution of shifts. Use of this function is strongly recommended as these comments can be used to draft a station analysis.

13. Primary Computations

Final values are computed in the sub-menu PR, "Primary computation" (PRIMARY), although values may have been computed prior depending on how re-compute options were chosen. The primary program calculates the discharge based on the gage-height Unit-Values, the rating and applicable corrections and shifts and stores the Unit and Daily-Values for each day. A primary report is generated with all the computed values, statistics, mean, and maximum and minimum Daily-Values. An optional diagnostic report can be produced also to help in the review of the computations.

14. Review Daily-Values

Review the Daily-Values of discharge record in HYDRA. Choose sub-menu PR and "Edit Time-Series Data using HYDRA" (TS_EDIT). Reference curves of the Unit-Values from the same station and Daily-Values from other stations can be used to help estimate any periods of missing, ice-affected, or erroneous record.

15. Daily-Values Tables

Prepare Daily Value tables using sub-menu DI, "Daily-Values Tables (DVTABLE)." Choose table type (TY option) #1.

16. Manage Record Data Aging Status

A record can be set to "In Review" after the data editing process. In the sub-menu PR choose "Manage Record Data Aging Status" (SETSTATUS). After the change to "in-review," all changes to the data will be prohibited. DBA access is required to change data aging back to "working." If this is necessary see the NWIS administrator. The ADBA should set the data to "Approved" after the review is completed and the record is acceptable.

Hydrographs

Hydrographs are valuable tools for reviewing either edited or computed data. Select PR or DI sub-menu, "Plot Time-Series Data" (PLOTWAT) to view Unit or Daily-Values. Select DI sub-menu, "Plot Hydrographs," (HYDROGRAPH) to plot a hydrograph of Daily-Values to screen or printer.

6.1.3 Records Processing in ADAPS for a Stage-Only Station

To process time-series stage data using NWIS-ADAPS, the site is first established in the GWSI Site File, and then all support files in ADAPS necessary to define the data being stored in ADAPS are defined. The following steps are an overview of the navigation-path through the stage time-series data processing functionality of ADAPS:

1. Establish the Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the stage-only site in the NWIS Site File using GWSI. ***Refer to the NWIS-GWSI User's Manual*** to obtain the information required to establish this site in the database. If the site already exists in the Site File, verify that the Site File information has been updated to document the existence of stage equipment at the site.

2. Create the Sensor Locations for the Site (Optional)

This step is not necessary if one sensor location is used at the site. (Locations other than the "default location" are needed only if there are sensors at multiple locations, e.g. sensors at different depths or at multiple points in the cross-section.)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the site. Data collected for one parameter from multiple locations using the same data descriptor (DD) can be stored. With one data descriptor (DD) for each measured parameter at a site, using the location description will further differentiate the data collected by each sensor.

The sensor locations have to be established prior to setting up the data descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

3. Create or Update the Data Descriptors

Data descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish a data descriptor (DD) for each parameter by selecting "Update Data Descriptor" (DD_EDIT) in the SU sub-menu. Define the parameters for each DD, assign a location to the DD based on the locations, create the processor record for the DD, and define the screening thresholds for the DD. If only one location is used, the location will automatically be set to "default."

4. Create Decodes Site-Device Files (Optional—Needed for EDLS)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level.
See the NWIS Site or ADAPS database administrator (ADBA) to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument that is recording Unit-Values electronically and is storing and/or transmitting the values from the site for entry into ADAPS. Please refer to the DECODES manual for instructions on writing an SDF to process the data.

5. Create or Update the Instrument File (Optional)

Instrument file editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

The Instrument File is only needed for ADR instruments. In this step, the user may establish or update an ADR instrument at the site. In the SU sub-menu, select the menu option, "Update ADR Instrument Information" (IN_EDIT) to create or update the instrument for the Stage-Discharge station.

6. Select the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), a "preferred input" transport code is assigned using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). There may be multiple instruments collecting stage data at a site, or one instrument collecting, storing and transmitting data from the site into ADAPS using multiple transport methods, for example, a GOES data-collection platform (DCP) and an electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input. To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport code "s"(GOES DCP), or the transport code "e" (telemetered EDL data). NWISWeb retrieves data from the edited Unit-Values file for display on the Web. The edited Unit-Values file is automatically populated during the data-conversion process with the measured Unit-Values from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled.

**Important note: The real-time data coming into ADAPS are displayed to the public via NWISWeb. Real-time data should be reviewed on a regular basis.

7. Data Input

This step is not necessary for real-time transmitted data. Real-time data are transmitted and stored automatically as measured Unit-Values and edited Unit-Values. Data collected in any other manner will need to be processed by the user. Electronic data collected on laptop from an EDL or DCP should be converted to standard input files using DECODES (see DECODES). In ADAPS, choose the IN sub-menu and option "Process WRD standard input data" (STD_STOR). The input program will ask for the file name for processing. These data will be stored as measured Unit-Values and tagged with a transport code (listed in step 6 above). If real-time data does not exist at the site this transport method should be assigned as the preferred input (step 6). The data will be stored as edited Unit-Values and will be tagged with a transport code (listed in step 6 above).

For data entry from the ADRs, use the sub menu IN, option “Read ADR Tape Data (TP_READ),” and store with the option “Edit And Store ADR Tape Data (TP_EDIT)” in this same sub-menu. These programs require a paper tape-reader.

For data entry from charts or from observations, entry is initiated in the sub-menu IN with option “Enter Unit-Values from Digitizer/Keyboard (UV_ENTER).” The Digitizer option requires a digitizer interfaced with the data system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

8. Review and Edit Time-Series Unit-Values

Review the edited Unit-Values of gage-height record in HYDRA. Choose sub-menu PR and option “Edit Time-Series Data using HYDRA” (TS_EDIT). Any missing record can be pulled in as a reference curve from the backup measured Unit-Values (see HYDRA section). If changes are made to the data in this program, answering “yes” to “Compute the record?” when closing will compute the entire record and update the database and NWISWeb. Answering “no” will save the changes but will not compute the record or update the database or Web.

HYDRA is used to verify that quality data are broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting “save and exit,” the user will be setting the Web-flag on that data to “checked” and it will be displayed as such on NWISWeb. If the data have been viewed using NWISWeb and no edits are made to the data, the Web-display status flag on the data may be set to “checked” using the UT menu-option “Set the Edited UV ‘checked’ Status,” (SET_CHECKFLAG).

9. Data Corrections

Apply any data corrections using the PR sub-menu option, “Update/Display Data Corrections” (DC_EDIT), see figure below. Three separate types of corrections can be made and each of the corrections can be prorated over time. The three data corrections are:

- Gage Height corrections
- Datum corrections from levels
- Other

Gage height corrections are entered to account for instrument errors, instrument drift, or instrument calibration. Datum Corrections are entered to correct for changes to the base datum at the station, documented when running levels. Other corrections can be, for example, a correction applied to the datum of a gage to avoid negative gage heights. Up to three separate correction diagrams can be entered and each of the correction diagrams can have one, two, or three points and will be prorated over time. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis.

Answering “yes” to “Compute the record?” when closing this program will compute the entire record and update the database and Web if any changes are made that will affect the data. Answering “no” will save the changes but will not compute the record or update the database or Web.

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******************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)      |
| REVISION NWIS 4.2+20020205            Feb 13, 2002 14:51:24 Wednesday |
|             (PR) SUB-MENU : Primary Data Processing              |
******************************************************************************

 1 -- Update Data Descriptor Thresholds       9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra      10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections        11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables           12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars          13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)        14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)         15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary            16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation     PGM -- Display program_names
    QU -- Exit to previous menu               EX -- Exit to Unix
```

10. Primary Computations

Final values are computed in the sub-menu PR option “Primary computations” (PRIMARY). The primary program generates computed gage-height Unit-Values and gage-height Daily-Values, even though they may have been computed prior, depending on responses to “compute” options in HYDRA and DC_EDIT. A primary report also is generated with the hourly computed values, mean, maximum and minimum Daily-Values. An optional diagnostic report can be produced also to help in the review of the computations.

11. Review Daily-Values

Review the Daily-Values of the gage-height record in HYDRA. Choose sub-menu PR option “Edit Time-Series Data using HYDRA” (TS_EDIT).

12. Daily-Values Tables

Prepare Daily-Value tables using sub-menu DI, option “Daily-Values Tables (DVTABLE).” Choose table type (TY option) #1.

13. Manage Record Data Aging Status

A record can be set to "In Review" after the data editing process. In the sub-menu PR choose "Manage Record Data Aging Status" (SETSTATUS). After the change to "in-review," all changes to the data will be prohibited. DBA access is required to change data aging back to "working." If this is necessary, see the NWIS site or database administrator. The ADBA should set the data to "Approved" after the review is completed and the record is acceptable.

6.1.4 Records Processing in ADAPS for a Stage-Fall (Slope) Station

by Timothy C. Stamey

To process time-series Stage-Fall (Slope) Station data using NWIS-ADAPS, the site needs to be established in the GWSI Site File, and then the necessary support files created in ADAPS to define the data that are being stored in ADAPS. Once these support files are established, the user will be able to process the time-series data collected and to produce the final publication output Unit and Daily-Values of stage and discharge data. The following steps are an overview of the navigation-path through the Stage-Fall (Slope) Station time-series data processing functionality of ADAPS.

1. Create or Update the Site File

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS-ADAPS Site or database administrator to make this entry or update.

Establish the Stage-Fall (Slope) Station site(s) in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this type of site in the database. If the site already exists in the Site File, verify that the Site File information has been updated. Site Files will be needed for both the Base Gage and Auxiliary Gage if data are to be entered under different station numbers. (See note below in step 3.)

2. Create or Update the Sensor Locations for the Site (Optional)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

This step may be skipped if there is only one sensor-location at the site (this is the default sensor location setup). Locations other than the "default location" are needed only if there are sensors at multiple locations at the site, e.g. sensors at different depths or at multiple points in the cross-section.

If there are multiple sensor locations, it is imperative that the sensor locations are established in ADAPS prior to setting up the data-descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the Stage-Fall (Slope) Station site. In the 4.2 version of ADAPS, data collected for one parameter from multiple locations can be stored using the same data-descriptor (DD). Since there is only one data-descriptor (DD) for each measured parameter at a site, the use of the location description will further differentiate the data collected by each sensor.

3. Create or Update the Data Descriptors

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In this step, a data-descriptor (DD) is entered or updated for each parameter that is measured at the site. In the SU sub-menu, select the menu option, "Update Data Descriptor" (DD_EDIT) to create or update the data-descriptors for the Stage-Fall (Slope) Station. In this step, define the parameters for each DD and assign a location to the DD based on multiple locations – (if they were created in the previous step). Next create the processor record for the DD and define the screening thresholds for the DD. If only one location is used, the location will automatically be set to "default" in this step.

Note: If the Auxiliary Gage is to be entered as a different station number, it is necessary to **first** create the DD and Processor entries for the Auxiliary Gage so that the proper responses to the setup prompts during the Base Gage entries for stage and discharge will be possible. The entries needed for the Auxiliary Gage are the DD/Processor records for the gage-height parameter code (00065). When setting up the Auxiliary GH DD use option 2 (stage only computation) to create the processor and review and change as needed the options in the succeeding menu displays (the starting date is critical). No other processing is required for the Auxiliary Gage.

The entries needed for the Base Gage are the DD/Processor records for the gage-height parameter code (00065) and the DD/Processor records for the discharge parameter code (00060). While creating the gage-height DD, the creation of the GH Processor is optional for the Base Gage. Daily-Value tables of GH can be defined as part of the creation of the output DD, if desired. If the user creates a GH DD processor, option 2 should be used (stage only computation) for the processor. The input DD, gage height, has to be established first so that the computed DD, discharge, can be established from it, when the processor record is created. When creating the discharge processor file, be sure to select the computation method option "Slope-discharge Computation," and answer the subsequent self-explanatory options to complete the Discharge Processor record setup or update.

4. Create DECODES Site-Device Files (Optional - Needed for EDLS)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level. See the NWIS site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the values for entry into ADAPS. Please refer to the DECODES manual for instructions on creating an SDF to process the data.

5. Create or Update the Instrument File (Optional)

Instrument file editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

The Instrument file is only needed for ADR instruments. In this step, the user may establish or update an ADR instrument at the site. In the SU sub-menu, select the menu option, "Update ADR Instrument Information" (IN_EDIT) to create or update the instrument for the Stage-Fall (Slope) Station.

6. Manage the Preferred Input Transport Code

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), a "preferred input" transport code needs to be assigned using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). At a site, there may be multiple instruments collecting gage-height data for use in Slope computations, or one instrument may be collecting, storing and transmitting data from the site into ADAPS with multiple transport methods used; for example - a GOES data-collection platform (DCP) and an electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options are currently not implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

The data from each transport method for each data-descriptor are stored as measured Unit-Values. ADAPS stores measured Unit-Values from each transport method for a

DD, identifying the transport method and identifying which method is the "preferred input." To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport-code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the computed Unit-Values tables for display on the Web. The computed Unit-Values table is automatically populated during the SATIN/SENTRY data-conversion process and ADAPS correction processes using the measured Unit-Values from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled. EDL data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web, or if separate data processing streams with separate data-descriptors (DD) are established.

****Important note:** The real-time data coming into ADAPS are displayed to the public via NWISWeb. It is imperative that the real-time data be checked and corrected each day using HYDRA to verify that erroneous data are not being broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting "save and exit," the user will be setting the Web-flag on that data to "checked" and it will be displayed as such on NWISWeb. If the data have been viewed using NWISWeb and no edits need to be made to the data, the Web-display status flag may be set to "checked" on the data using the UT menu option "Set the Edited UV 'checked' Status," (SET_CHECKFLAG). The data also could be edited using the UT menu-option uv_edit "Edit Unit-Values."

7. Methods for Translating, Entering, and Storing Measured Unit Value Gage-Height Data

If data are being transmitted to ADAPS via a GOES DCP, it will be the preferred input method and the data will be automatically processed through the SATIN/SENTRY programs and no further input is required.

Translation and data entry into ADAPS from a Stage-Fall (Slope) Station can be accomplished from at least three other possible pathways or procedures:

a. ADR Paper-tape

Translate the Base and Auxiliary gage ADR paper tapes for the desired period(s) using the TP_READ program or by selecting the ADAPS IN menu option "Read ADR Tape Data." The translations are done based on the setup of each station. (**Note**: If this option is used there must be a conversion of input rating in ADAPS before this step can be successfully completed. See Step 9 below for Type 0 and Type 20 ratings).

Edit and store the translated Base and Auxiliary gage-height data using the TP_EDIT program or by selecting the ADAPS IN menu option “Edit And Store ADR Tape Data.”

The data are stored as two input files based on the Base and Auxiliary Site ID and DDs. The data must be time corrected and verified before it is stored. If the Historic Type Primary is selected, the Historic Time Correction Method should be used. If the Standard Type Primary is selected, the Standard Time Correction Method should be used.

b. Electronic Data Logger (EDL)

A DECODES site-device file (SDF) will need to be created for each instrument transmitting or recording Unit-Values from the site for entry into ADAPS. Please refer to the DECODES manual for instructions on writing an SDF to do this. Translate the Base and Auxiliary gage data using DECODES Site-Device Files (SDF) for data from and EDL using the STD_STOR program, or from the IN menu in ADAPS select, “Process WRD Standard Input Data.” Data entry into ADAPS from an EDL can be done through automatic processing setups using **SATIN/SENTRY** programs but for the most part these programs are for data being transmitted via GOES DCP.

c. Other common methods of inputting data into ADAPS

Process ADR card-image data by using the CD_READ program or by selecting the ADAPS IN sub-menu option “Process ADR Card-Image Data.” These data are equivalent to measured Unit Value data as if obtained from a digital tape or equal time-step data from a strip chart.

Direct entry of Unit Value data by using the UV_EDIT program or by selecting the ADAPS UT sub-menu option “Edit Unit-Values.”

Process Unit Value card image data by using the UV_STORE program or by selecting the ADAPS IN sub-menu option “Process UV Card-Image Data.” These data are in usually in B-Card format.

Process digitized data by using the UV_ENTER program or by selecting the ADAPS IN sub-menu option “Enter Unit-Values from Digitizer/Keyboard.”

As the data are entered into ADAPS as measured Unit-Values, they are tagged with their appropriate transport code. For the preferred input transport code, the data also are automatically entered into the edited Unit-Values table. The other measured Unit-Value data can be used in HYDRA as backup data, if needed.

8. Screen and Edit Input Gage-Height Data

The input Unit-Value data from the Base and Auxiliary Gages will need to be screened for any obvious erroneous values such as spikes or other inconsistent data. This screening and editing process is done using HYDRA (TS_EDIT) or from the PR menu in ADAPS, select the option “Edit Time-Series Data Using HYDRA.” If the data are transmitted as real-time, they can be viewed on NWISWeb. HYDRA allows the user to make immediate corrections to the edited Unit-Value data, including the pasting or substituting of data from backup sources, if they exist. The use of HYDRA will also allow the user to flag the data as “checked” for properly displaying data on NWISWeb. If the real-time data are screened from NWISWeb, those data can be flagged as “checked” by using SET_CHECKFLAG or from the UT menu in ADAPS by selecting, “Set Edited UV ‘checked’ Status Flag.”

9. Process Base and Auxiliary Data for Time-Series Computation of Discharge

Enter or update Rating(s), if necessary, using RT_EDIT program or in the PR menu of ADAPS, select menu option “Update/Display Rating Tables.” **Note:** Rating entries for Slope stations are entered based on the Base and Auxiliary Gage site ID and DDs. Applicable rating types that may be entered into ADAPS for the Base and Auxiliary gage-height DD are given below:

- MEAS: Conversion of input – only used for conversion of gage-height data (parameter code 00065) from ADR (dial readings) to gage-height in feet. This used to be Type 0 rating in previous versions of ADAPS.

  Note: All other rating entries for the Slope stations should be entered under the Base Gage discharge ID and DD (parameter code 00060).

Applicable rating types that may be entered into ADAPS for the Base Gage Discharge DD are given below:

- STGQ: Standard discharge rating (gage-height versus discharge); this used to be Type 1 rating in previous versions of ADAPS.
- FALL: Stage-Fall rating; (If this rating does not exist, the processing assumes that the rating fall is equal to 1); this used to be Type 2 rating in previous versions of ADAPS.
- FLFC: Fall/discharge ratio rating (fall-factor); (If this rating does not exist, the processing assumes that the discharge ratio is equal to the square root of the fall ratio). This used to be Type 3 rating in previous versions of ADAPS.
- MEAS: Conversion of Auxiliary gage-height data (only used for conversion of gage-height data (parameter code 00065) from ADR (dial readings) to gage-height in feet). This used to be Type 20 rating in previous versions of ADAPS.

Use of some of these ratings is optional, and the user must select the appropriate rating types for use with the station being processed. Comments can be added to explain development of ratings and rating dates. Use of this function is strongly recommended as these comments can be used to draft a station analysis.

Enter Data Corrections for the Base and/or Auxiliary Gage-height DDs, if needed, using DC_EDIT or in the PR menu of ADAPS, select menu option “Update/Display Datum Corrections.” Data correction entries are based on the Site ID and gage-height DDs for the Base and Auxiliary Gages. Data corrections can be labeled to distinguish between instrument, datum, and other types of data corrections and can be applied separately over time. Data corrections are applied by prorating over time. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis. The option is available to compute the record at this point.

Enter shifts for the Base Gage under the Discharge DD, if any, to be applied by using stage-variation diagrams using the SV_EDIT program or in the PR menu of ADAPS, select menu option “Update/Display Shifts.” The shifts are entries based in the discharge DD for the Base Gage. Comments can be added to explain the use or distribution of shifts. Use of this option is strongly recommended as these comments can be used to draft a station analysis. The option is available to compute the record at this point.

Perform Primary Slope Computations interactively or in batch mode by using the primary program or in the PR menu of ADAPS, select menu option “Primary Computations.” The Primary Computations for Slope Station should be run using the processors in the Base Gage Discharge ID/DD. A primary report can be generated with all the computed values and with statistics indicated in the processor record. An optional diagnostic report can be produced also, to help in the review of the complex computations.

10. Review the Primary Computations

To eliminate errors in the data, use the following ADAPS programs to assist in finding and resolving the errors:

- Display and edit Unit-Value data using the TS_EDIT program (**HYDRA**) or from the ADAPS PR menu, select “Edit Time-Series Data Using HYDRA;”

- Display and edit Unit-Values data using the UV_EDIT program or from the ADAPS UT menu “Edit Unit-Values;”

- Display edited and computed Unit-Values using the UV_TABLE program or from the ADAPS PR menu, select “Print/Display Unit-Values Tables;”

- Display and edit the Daily-Values using the TS_EDIT program (**HYDRA**) or from the ADAPS PR menu, select “Edit Time-Series Data Using HYDRA;”

- Estimate missing or erroneous Daily-Values using the TS_EDIT program (HYDRA and MISTE) or from the ADAPS PR menu, select “Edit Time-Series Data Using HYDRA;”

- Display and edit the Daily-Values using the DV_EDIT program or from the ADAPS UT menu, select "Edit Daily-Values;"

- Display the Daily-Values for a selected period of interest using the DVTABLE program or from the ADAPS PR menu, select "Daily-Values Tables."

Other programs in ADAPS that are helpful in further or final review and processing of Slope Station data are:

- Review/Delete Digital Tape Temporary Files using the program drfiles or from the ADAPS IN menu, select "Review/Delete Digital Tape Temporary Files;"

- Copy a Rating using the program RT_COPY or from the ADAPS PR menu, select "Update Display Rating Table;"

- Display Rating Table Dates using the program RT_DATES or from the ADAPS PR menu, select "Display Rating Table Dates;"

- Plot Rating(s) using the RATPLOT program or from the ADAPS DI menu, select "Plot Ratings;"

- Plot Time Series Data using PLOTWAT or from ADAPS PR menu, select "Plot Time-Series Data;"

- Compute Shift Analysis and Plot Shift Bars using the SHIFT_ANLY program or from ADAPS PR menu, select "Shift Analysis and Error Bars;"

- Display Expanded Shifts and Data Corrections using SHFT_TABLES or from the ADAPS PR menu, select "Display Expanded Shifts/Corrections;" and

- End-of-Year Summary using the program EOYSUMM or from the ADAPS PR menu, select "End-of-Year Summary."

11. District QA/QC

Follow District quality-assurance procedures when using the Data Aging programs in ADAPS for final review and approval of the Unit-Value and Daily-Value records. After the Stage-Fall (Slope) station data have been analyzed and are ready for publication, the user should use the SETSTATUS program or from the ADAPS menu, select "Manage Record Data Aging Status." At this point, set the status from "Working" to "In Review." This will not allow any further changes to the data and indicates that the records are ready for review prior to final approval. If any further editing is needed after the data has been set to "In Review," see the District ADBA to reset the status to "Working" (see Chapter 3 for additional data aging details). Once the data are reviewed and are acceptable for publication, the ADBA should set the record flags to "Approved" for transmittal to the NWISWeb database.

6.1.5 Records Processing in ADAPS for a Velocity-Index or Deflection Meter Station

To process time-series Velocity-Index or Deflection Meter Station data using NWIS-ADAPS, the user should establish the site in the GWSI Site File, and then create the support files in ADAPS necessary to define the data being stored in ADAPS. Once these support files are established, the user will be able to process the time-series data that is collected and produce the final publication output Unit and Daily-Values of stage and discharge data. The following steps are an overview of the navigation-path through the Velocity-Index or Deflection Meter Station time-series data processing functionality of ADAPS. These steps are also used for a point velocity or an acoustic velocity-meter station.

1. Create or Update the Site File

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See your NWIS-ADAPS Site administrator to make this entry or update.

Establish the Velocity-Index or Deflection Meter Station site(s) in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this type of site in the database. If the site already exists in the Site File, verify that the Site File information has been updated.

2. Create or Update the Sensor Locations for the Site (Optional)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

This step may be skipped if there is only one sensor-location at the site (this is the default sensor location setup). Locations other than the "default location" are needed only if there are sensors at multiple locations at the site, e.g. sensors at different depths or at multiple points in the cross-section.

If the user has more than one sensor location, it is imperative that he or she establish the sensor locations prior to setting up the data-descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the Velocity-Index or Deflection Meter Station site. In the 4.2 version of ADAPS, the user can store data collected for one parameter from multiple locations using the same data-descriptor (DD). Since the user has only one data-descriptor (DD) for each measured parameter at a site, using the location description will further differentiate the data collected by each sensor.

3. Create or Update the Data Descriptors

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the ADAPS Site administrator to make this entry or update.

In this step, the user is entering or updating a data-descriptor (DD) for each parameter measured at the site. In the SU sub-menu, select the menu option, "Update Data Descriptor" (DD_EDIT) to create or update the data-descriptors for the Velocity-Index or Deflection Meter Station. In this step, the user defines the parameters for each DD and assigns a location to the DD based on multiple LOCATIONS – (if these were created in the previous step). Next create the processor record for the DD, and define the screening thresholds for the DD. If only one location is used, it will automatically be set to "default" in this step.

NOTE: It is necessary to first create the DD/Processor entries for the velocity data so that the proper response to the setup prompts during the entries for stage and discharge DDs will be possible. The files needed for the velocity input data are the DD/Processor records for the velocity parameter code (00055). No other processing is required for the velocity.

The files needed for the input values of stage are the DD/Processor records for the gage-height parameter code (00065) and the DD/Processor Records for the discharge parameter code (00060). While creating the gage-height DD, the creation of the GH Processor is optional. Daily-Value tables of GH can be defined as part of the creation of the output DD, if desired. If the user creates a GH DD processor, use option 2 (stage only computation) for the processor. The input DDs, velocity and gage height, have to be established first so that the computed DD, discharge, can be established from it, when the processor record is created. When creating the discharge processor record be sure to select the computation method option "Velocity/Deflection Discharge Computation," and answer the subsequent self-explanatory options to complete the Discharge Processor Record setup or update.

4. Create DECODES Site-Device Files (Optional—Needed for EDLS)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level. See the NWIS Site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the values for entry into ADAPS. Please refer to the DECODES manual for instructions on creating an SDF to process the data.

5. Create or Update the Instrument File (Optional)

Instrument file editing is only authorized at the ADAPS database administrator (ADBA) level. See the ADAPS Site administrator to make this entry or update.

The Instrument File is only needed for ADR instruments. In this step, the user may establish or update an instrument (IN) at the site. In the SU sub-menu, select the menu option, "Update Instrument File" (IN_EDIT) to create or update the instrument for the Velocity-Index or Deflection Meter Station.

6. Manage the Preferred Input Transport Code

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the ADAPS Site administrator to make this entry or update.

For each input data-descriptor (DD), the user needs to assign a "preferred input" transport code using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). At a site, the user may have multiple instruments collecting gage-height data for use in Velocity-Index computations, or one instrument may be collecting, storing and transmitting data from the site into ADAPS using multiple transport methods; for example - a GOES data-collection platform (DCP) and electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options are currently not implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

The data from each transport method for each data-descriptor are stored as measured Unit-Values. ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input." To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport-code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the computed Unit-Values file for display on the Web. The computed Unit-Values file is automatically populated during the data-conversion process with the measured Unit-Values from the preferred-input sensor and the SATIN/SENTRY programs. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled. EDL data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web, or if separate data processing streams with separate data-descriptors (DD) are established.

****Important note**: The real-time data coming into ADAPS are displayed to the public via NWISWeb. It is imperative that the user checks and corrects the real-time data each day using HYDRA to verify that erroneous data is not broadcasted to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting “save and exit,” the user will be setting the Web-flag on that data to “checked” and it will be displayed as such on NWISWeb. If the data is viewed using NWISWeb and no edits to the data are needed, the user may set the Web-display status flag on the data to “checked” using the UT menu-option “Set the Edited UV ‘checked’ Status,” (SET_CHECKFLAG).

7. Methods for Translating, Entering, and Storing Measured Unit Value Gage-Height and Velocity Data

Translation and data entry into ADAPS from a Velocity-Index or Deflection Meter Station can be accomplished from at least three possible pathways.

> **a. Translate the gage-height and velocity ADR paper tapes for the desired period(s) using the TP_READ program or by selecting in the IN ADAPS menu option “Read ADR Tape Data.”** The translations are done based on the setup of each station. (**Note:** If this option is used there must be a conversion of input rating in ADAPS before this step can be successfully completed. See Step 9 below for MEAS ratings).
>
> Edit and store the translated gage-height and velocity data using the TP_EDIT program or by selecting in the IN ADAPS menu option “Edit And Store ADR Tape Data.”
>
> The data are stored based on the Site ID and DDs. The data must be time-corrected and verified before it is stored. If the Historic Type Primary is selected, the Historic Time Correction Method should be used. If the Standard Type Primary is selected, the Standard Time Correction Method should be used.
>
> **b. The user will need to create a DECODES site-device file (SDF) for each instrument transmitting Unit-Values from the site into ADAPS.** Please refer to the DECODES manual for instructions on writing an SDF to do this. Translate the gage-height and velocity data using DECODES Site-Device Files (SDF) for data from and EDL involves using the STD_STOR program, or from the IN menu in ADAPS select, “Process WRD Standard Input Data.” Data entry into ADAPS from an EDL can be done through automatic processing setups using SATIN/SENTRY programs but for the most part are for data being transmitted via GOES DCP.

A DECODES SDF can only be created at the administrator level. See the NWIS Site administrator to make this entry or update.

c. Other common methods of inputting data into ADAPS include:

i. ADR card-image data from CD_READ program or selecting in the ADAPS IN menu "Process ADR Card-Image Data." These data are equivalent to measured Unit-Value data as if obtained from a digital tape or choosing equal time step data from a strip chart.

ii. Direct entry of Unit-Value data using the UV_EDIT program or selecting in the ADAPS UT menu "Edit Unit-Values."

iii. Unit-Value card image data using UV_STORE program or selecting in the ADAPS IN menu "Process UV Card-Image Data." These data are in usually in B-Card format.

iv. Digitized data using the UV_ENTRY program or selecting in the ADAPS IN menu "Enter Unit-Values from Digitizer/Keyboard."

As the data are entered into ADAPS as measured Unit-Values, they are tagged with their appropriate transport code. For the preferred input transport code the data are automatically entered into the edited Unit-Values table. The other measured Unit-Value data can be used in HYDRA as backup data, if needed.

8. Screen and Edit Input Gage-height and Velocity Data

The gage-height and velocity input Unit-Value data will need to be screened for any obvious erroneous values such as spikes or other inconsistent data. This screening and editing process is done using HYDRA (TS_EDIT) or from the PR menu in ADAPS, select the option "Edit Time-Series Data Using HYDRA." If the data are transmitted as real-time, they can be viewed on NWISWeb. HYDRA allows the user to make immediate corrections to the edited Unit-Value data, including the pasting or substituting of data from backup sources, if they exist. The use of HYDRA will also allow the user to flag the data as "checked" for properly displaying data on NWISWeb. If the real-time data are screened from NWISWeb, those data can be flagged as "checked" by using SET_CHECKFLAG or from the UT menu in ADAPS by selecting, "Set Edited UV 'checked' Status Flag."

9. Steps for Processing Gage-height and Velocity data for Time-Series Computation of Discharge

a. Enter or update Rating(s), if necessary, using RT_EDIT program or in the PR menu of ADAPS, select menu option "Update/Display Rating Tables."

Note: All rating entries for Velocity-Index or Deflection Meter stations entered are based on the site ID and DDs. Applicable rating types that may be entered into ADAPS for the gage-height DD are given below:

- MEAS: Conversion of input – only used for conversion of gage-height and velocity data (parameter codes 00065 and 00055) from ADR (dial readings) to real numbers. This used to be Type 0 rating in previous versions of ADAPS.

Note: All other rating entries for the Velocity-Index or Deflection Meter stations should be entered under the Discharge DD (parameter code 00060).

Applicable rating types that may be entered into ADAPS for the Discharge DD are given below:

- STAR: Stage-area rating is a **MANDANTORY** rating for standard cross-section. (Cross-sectional area is not stored or used in ADAPS with an assigned parameter code); this used to be Type 4 rating in previous versions of ADAPS.
- STCO: Stage-Velocity correction factor rating. This rating is used to correct the output from the rating VELO, if needed. (If this rating does not exist, the processing assumes that the velocity from the deflection-velocity rating VELO is the mean cross-sectional velocity); this used to be Type 5 rating in previous versions of ADAPS.
- VELO: 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 station to convert an instantaneous horizontal line velocity to a cross-sectional mean velocity. (This is a **MANDANTORY** rating unless regression equation is used). This used to be Type 6 rating in previous versions of ADAPS.

Note: The output computed velocity stored in ADAPS is the velocity resulting from using rating VELO and then multiplying by the velocity factor determined from rating STCO.

- MEAS: Conversion of Velocity data. Can be used for conversion of gage-height data (parameter code 00065) from ADR (dial readings) to gage-height in feet, or velocity data (parameter code 00055) from ADR (dial readings) to feet per second or other intermediate value. This used to be Type 20 rating in previous versions of ADAPS.

Use of these ratings is optional, except for rating STAR and VELO, and the user must select the appropriate rating types for use with the station being processed.

(**<u>Note</u>**: If the regression equation method is approved for use by OSW, the equation will take the place of ratings STCO and VELO). The form of the regression equation is:

Vmean = X*Vindex + Y*Vindex*STAGE + C
where:
Vmean = mean velocity in cross section
Vindex = shifted index velocity
STAGE = Gage height

X, Y, and C are coefficients derived by regression analysis.

Comments can be added to explain development of ratings and rating dates. Use of this function is strongly recommended as these comments can be used to draft a station analysis.

2. Enter Data Corrections for either or both the gage-height and velocity data, if needed, using DC_EDIT or in the PR menu of ADAPS, select menu option "Update/Display Datum Corrections". Data corrections entries are based on the Site ID and gage-height DDs. Data corrections can be labeled to distinguish between instrument, datum, and other types of data corrections and can be applied separately over time. Data corrections are applied to the GH DD or velocity DD by prorating over time. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis. **The option is available to compute the record at this point.**

3. Enter shifts for Velocity under the Discharge DD, if any, to be applied by using stage-variation diagrams using SV_EDIT program or in the PR menu of ADAPS, select menu option "Update/Display Shifts". The shifts are based on entries in the Discharge DD (Shifts can only be applied to velocity). Comments can be added to explain the use or distribution of shifts. Use of this option is strongly recommended as these comments can be used to draft a station analysis. The option is available to compute the record at this point.

4. Perform Primary Velocity-Index or Deflection Meter Computations interactively or in batch mode by using the primary program or in the PR menu of ADAPS, select menu option "Primary Computations". The Primary Computations for Velocity-Index or Deflection Meter Station should be run using the processors in the Discharge DD. A primary report can be generated with all the computed values and with statistics indicated in the processor record. An optional diagnostic report can be produced also to help in the review of the complex computations.

10. Review the Primary Computations

If any errors are evident, use the following ADAPS programs to assist in finding and resolving the errors:

- Display and edit Unit-Value data using the TS_EDIT program (**HYDRA**) or from the ADAPS PR menu, select "Edit Time-Series Data Using HYDRA."

- Display and edit Unit-Values data using the UV_EDIT program or from the ADAPS UT menu "Edit Unit-Values."

- Display edited and computed Unit-Values using the UV_TABLE program or from the ADAPS PR menu, select "Print/Display Unit-Values Tables."

- Display and edit the Daily-Values using the TS_EDIT program (**HYDRA**) or from the ADAPS PR menu, select "Edit Time-Series Data Using HYDRA."

- Estimate missing or erroneous Daily-Values using the TS_EDIT program (**HYDRA and MISTE**) or from the ADAPS PR menu, select "Edit Time-Series Data Using HYDRA."

- Display and edit the Daily-Values using the DV_EDIT program or from the ADAPS UT menu, select "Edit Daily-Values."

- Display the Daily-Values for a selected period of interest using the DVTABLE program or from the ADAPS PR menu, select "Daily-Values Tables."

- Other programs in ADAPS that are helpful in further or final review and processing of Velocity-Index or Deflection Meter Station data are:

- Review/Delete Digital Tape Temporary Files using the program DRFILES or from the ADAPS IN menu, select "Review/Delete Digital Tape Temporary Files."

- Copy a Rating using the program RT_COPY or from the ADAPS PR menu, select "Update Display Rating Table."

- Display Rating Table Dates using the program RT_DATES or from the ADAPS PR menu, select "Display Rating Table Dates."

- Plot Rating(s) using the RATPLOT program or from the ADAPS DI menu, select "Plot Ratings."

- Plot Time-Series Data using PLOTWAT or from ADAPS PR menu, select "Plot Time-Series Data."

- Display Expanded Shifts and Data Corrections using SHFT_TABLES or from the ADAPS PR menu, select "Display Expanded Shifts/Corrections."

- End-of-Year Summary using the program EOYSUMM or from the ADAPS PR menu, select "End-of-Year Summary."

11. District QA/QC

Follow District quality-assurance procedures when using the Data Aging programs in ADAPS for final review and approval of the Unit-Value and Daily-Value records. After the Velocity-index station data have been analyzed and are ready for publication, the user should use the SETSTATUS program or from the ADAPS menu, select "Manage Record Data Aging Status." At this point, set the status from "Working" to "In Review." This will not allow any further changes to the data and indicates that the records are ready for review prior to final approval. If any further editing is needed after the data has been set to "In Review," see the District ADBA to reset the status to "Working" (***see Chapter 3*** for additional data aging details). Once the data are reviewed and are acceptable for publication, the ADBA should set the record flags to "Approved" for transmittal to the NWISWeb database.

6.1.6 Records Processing in ADAPS for a Reservoir Station

by Glenn B. Engel

To process time-series reservoir data using NWIS-ADAPS, the user needs to establish the site in the GWSI Site File, then create the support files in ADAPS necessary to define the data being stored in ADAPS. Once these support files are established, the user will be able to process the time-series data that is collected to produce the final products of publication-quality Unit and Daily-Values of reservoir data. The following steps are an overview of the navigation-path through the reservoir station time-series data processing functionality of ADAPS:

1. Establish the Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the reservoir station site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this site in the database. If the site already exists in the Site File, verify that the Site File information such as gage-height sensing equipment is up-to-date.

2. Create the Sensor Locations for the Site (Optional)

Skip this step if there is only one sensor-location at the site. (Locations other than the "default location" are needed only if there are sensors at multiple locations at the site, e.g. sensors at different depths or at multiple points in the cross-section.)

If there are multiple sensor locations, it is imperative that the sensor locations are established in ADAPS prior to setting up the data-descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update**.**

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the reservoir site. In the 4.2 version of ADAPS, the user can store data collected for one parameter from multiple locations using the same data-descriptor (DD). Since there is only one data-descriptor (DD) for each measured parameter at a site, using the location description will further differentiate the data collected by each sensor.

3. CREATE OR UPDATE THE DATA DESCRIPTORS

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In this step, a data-descriptor (DD) is established for each parameter measured at the site. In the SU sub-menu, select the menu option, "Update Data Descriptor" (DD_EDIT) to create or update the data-descriptors for each parameter measured at the reservoir site. In this step, the user defines the parameters for each DD; assigns a location to the DD based on the LOCATIONS created in the previous step, if necessary; creates the processor record for the DD, and defines the screening thresholds for the DD. If only one location is used, the location will automatically be set to "default" in this step. The input DD, gage height, has to be established first so that the computed DD, generally reservoir contents, can be established from it, when the processor record is created.

4. Create DECODES Site-Device Files (Optional—Needed for EDLS)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level. See the NWIS Site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the values for entry into ADAPS. Please refer to the DECODES manual for instructions on creating an SDF to process the data.

5. Create the Instrument File (Optional - Only Needed for ADRS)

Instrument editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the "SU" sub-menu of ADAPS, select the menu option "Update ADR Instrument Information" (IN_EDIT). This program is used to enter information about reservoir stations that have recorded readings using an Analog Digital Recorder (ADR) and binary paper-tape media.

6. Manage the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), the user needs to assign a "preferred input" transport code using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). At a site, multiple instruments may be collecting elevation data, or one instrument may be collecting, storing and transmitting data from the site into ADAPS using multiple transport methods, for example, a GOES data-collection platform (DCP) and electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

The data from each transport method for each data-descriptor are stored as measured Unit-Values. ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input." To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport-code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the computed Unit-Values tables for display on the Web. The edited Unit-Values tables are automatically populated during the SATIN/SENTRY data-conversion process with the measured Unit-Values from the preferred-input sensor, then the computed Unit-Values tables are created/updated automatically during the data correction/computation processes in ADAPS. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled. EDL data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web, or if a separate data-processing stream with separate data-descriptors (DD) is established.

**Important note: The real-time data after being processed through ADAPS are displayed to the public via NWISWeb. It is imperative that the real-time data be checked and corrected each day using HYDRA to verify that erroneous data are not being broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting "save and exit," the user sets the Web-flag on that data to "checked" and it will be displayed as such on NWISWeb. If the user has viewed the data using NWISWeb and does not need to make any edits to the data, the Web-display status flag on the data may be set to "checked" using the UT menu-option "Set the Edited UV 'checked' Status", (SET_CHECKFLAG).

7. Input Data

Data entry into ADAPS from a reservoir station will be from three general pathways:

- A GOES DCP
- An EDL
- Other (ADR, chart, or observer)

GOES DCP: Data from the GOES data-collection platform (DCP) typically are tagged as the preferred-input transport method. These data are transmitted to ADAPS and are entered automatically into the measured unit-values table and the edited unit-values table. The data also are processed through the ADAPS correction and computation processes and entered automatically into the computed Unit-Values tables, which are displayed on NWISWeb. There is no need to enter additional data from a DCP so proceed to Step 8, "SCREEN AND EDIT DATA."

Electronic Data Logger (EDL): Data from an EDL must first be converted to standard-input format using the DECODES program which is run outside of the ADAPS menu (see DECODES manual for detailed instructions of this process). Once these data have been converted, they are entered into ADAPS using the "Process WRD standard input data" program (STD_STOR) from the "IN" sub-menu, are entered into the measured unit-values table, and are available as back-up record. An EDL may be a preferred input if no DCP is used at the site. If the EDL data are the preferred input, these data will be written to both the measured and edited unit-values tables in this step.

Other Methods (ADR, Chart, Observer): Data from ADRs are entered into ADAPS using the IN (Input) sub-menu option "Read ADR Tape Data" (TP_READ). This program requires a paper tape-reader interfaced to the data system. Once these data are read, they are stored in the measured Unit-Values table using the program "Edit and

Store ADR Tape Data" (TP_EDIT). If the ADR is the preferred-input transport method the data also will be stored in the edited Unit-Values tables.

For data from charts or observations, entry is through the ADAPS IN sub-menu option "Enter Unit-Values from Digitizer/Keyboard" (UV_ENTER). The Digitizer option requires a digitizer interfaced to the data system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

ADR card-image data can be entered using the ADAPS IN sub-menu option "Process ADR Card Image Data" (CD_READ). Unit-Values card image data can be processed using ADAPS IN sub-menu option "Process Unit-Values Card Image Data" (UV_STORE) and direct entry of Unit-Values can be made using the ADAPS IN sub-menu option "Edit Unit-Values" (UV_EDIT).

The data are entered into ADAPS as measured Unit-Values and tagged with a transport method code. For the preferred input, the data are also automatically entered into the edited Unit-Value table.

8. Screen and Edit Data

After input, the data need to be screened for obvious erroneous values such as spikes or stuck instruments. Select PR (Primary Data Processing) sub-menu option "Edit Time Series Data using HYDRA" (TS_EDIT). HYDRA allows the user to make immediate corrections to the data including pasting in data from backup data sources, and also marks the data as "checked." HYDRA works on edited Unit-Values. Real-time data can also be viewed on NWISWeb. If real-time data is screened on the Web, which are computed Unit-Values, the data can be flagged as checked using the sub-menu UT (Miscellaneous Utility Functions), option "Set edited UV "checked" Status Flag" (SET_CHECKFLAG). The Unit-Values also may be edited by using the ADAPS UT sub-menu option "Edit Unit-Values" (UV_EDIT).

9. Apply Data Corrections

Select ADAPS sub-menu PR (Primary Data Processing), option "Update/Display Data Corrections (DC_EDIT)" to apply data corrections to the reservoir gage heights/water levels. Three different types of corrections can be entered into this program:

- Gage height/Elevation Corrections
- Datum Corrections from Levels
- Other

Gage height/Elevation corrections are instrument errors caused by drift, mis-calibration or malfunction, etc. Datum Corrections from Levels are due to changes in the station reference gages or orifice, documented by levels run at the station. Other corrections can be, for example, a correction applied to the datum of the gage to avoid recording negative gage heights/elevations.

The DC_EDIT program creates data correction curves, which generate correction Unit-Values, which are then applied to the edited Unit-Values to generate computed Unit-Values of gage height/elevation. There can be three separate data correction curves applied to one time segment of Unit-Values and ADAPS will add the corrections together for one total data correction. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis. The user has a choice of running (yes) or not running (no) computations at this point to produce computed Daily-Values of reservoir gage height/elevation.

10. Enter Ratings

In the PR (Primary Data Processing) sub-menu of ADAPS, select menu option "Update/Display Rating Tables" (RT_EDIT) to enter rating input points or to review previously entered ratings. Because ratings are tied to the output DD, a number of ratings are possible to compute different outputs from the same input DD (gage height/elevation); for example, reservoir contents from gage height or surface area from gage height, etc.

It is also possible to enter an input conversion rating in RT_EDIT tied to the input DD if input data needs to be converted prior to storage. If the reservoir water level is recorded as gage height, it should be converted to elevation by an input rating, especially if data is going to the Web. The transport code is chosen and then a choice of linear table, log table, or equation can be entered. Comments can be added to explain development of ratings and rating dates. Use of this function is strongly recommended as these comments can be used to draft a station analysis.

11. Compute Time Series Data

In the PR sub-menu of ADAPS, select menu option "Primary Computations" (PRIMARY). The PRIMARY program calculates and stores computed Unit-Values of gage height/elevation, computed Unit-Values of output (usually reservoir contents), and computed Daily-Values of both input (gage height/elevation) and output (usually reservoir contents) and generates a report. Usually computed Unit-Values and also computed Daily-Values of both the input and output parameters have been produced during earlier processes such as HYDRA and DC_EDIT if the user had picked "yes" to compute. The PRIMARY needs to be run, if computations have not been run earlier, in order that any changes made to the data are reflected in the computed values. The output DD, such as contents, is used to run PRIMARY. Options are available to choose Historical or Standard output, or report with no computation, if computations had already been done earlier. The PRIMARY program produces a report showing daily mean elevation and daily mean contents as well as daily maximum and minimum values of reservoir elevation and reservoir contents with times of occurrence. If the daily maximum and minimum values are to be stored, the processor record would have to be set up to do that.

An optional diagnostic report can be produced also to help in the review of the computations.

12. Review Computations

Computed Daily-Values can be viewed on the PRIMARY report or by requesting a Daily-Values table by selecting ADAPS PR sub-menu option “Daily-Values Tables” (DVTABLE). Select ADAPS PR sub-menu, option HYDRA (TS_EDIT) to edit computed Daily-Values of elevation and computed Daily-Values of contents to produce final Daily-Values. Daily-Values also may be edited by selecting ADAPS UT sub-menu option “Edit Daily-Values” (DV_EDIT). Other programs may be helpful in analyzing the Daily-Values such as “Plot Time Series Data” (PLOTWAT) and “Plot Hydrographs” (HYDROGRAPH).

13. Process End-Of-Year Summary

Select ADAPS PR sub-menu option “End-of-Year Summary” (EOYSUMM) to print out maximum and minimum elevation and contents for the water year.

14. Perform Quality-Assurance Procedures

Perform required District quality-assurance procedures such as checking of record, printing of required tables and plots from ADAPS (data corrections, Daily-Values tables, hydrographs, etc.,) and writing the station analysis.

15. Manage Data Aging

Once the data have been edited and checked, the user can select ADAPS PR sub-menu option “Manage Record Data Aging Status” (SETSTATUS) to set record from “Working” to “In Review.” No changes can be made to the record at this point and it is indicated that the record is ready for review prior to approval. If edits need to be made to the record after it has been set to “In Review,” the ADBA can set the status back to “Working.” Once the data are reviewed and are acceptable for publication, the ADBA should set the status to “Approved.”

6.1.7 Records Processing in ADAPS for a Tidal Monitoring Station

by James R. Kolva

To process time-series tidal monitoring data using NWIS-ADAPS, the user needs to establish the site in the GWSI Site File, then create the support files in ADAPS necessary to define the data that will be stored in ADAPS. Once these support files are established, the user will be able to process the time-series data that is collected in order to create the final products of publication-quality Unit and Daily-Values for a tidal monitoring station. The following steps are an overview of the navigation-path through the tidal monitoring time-series data processing functionality of ADAPS:

1. Establish the Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the tidal monitoring site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this site in the database. If the site already exists in the Site File, verify that the Site File information has been updated to document the existence of tidal monitoring equipment at the site.

2. Create the Sensor Locations for the Site (Optional)

This Step May Be Skipped If There Is Only One Sensor-Location At The Site.

(Locations other than the "default location" are needed only if there are sensors at multiple locations at the site, e.g. sensors at different depths or at multiple points in the cross-section.)

It is imperative that the sensor locations are established in ADAPS prior to setting up the data-descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the tidal monitoring site. In the 4.2 version of ADAPS, the user can store data collected for one parameter from multiple locations using the same data-descriptor (DD). Since there is only one data-descriptor (DD) for each measured parameter at a site, use of the location description will further differentiate the data collected by each sensor.

3. Create or Update the Data Descriptors

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In this step, a data-descriptor (DD) is established for each parameter measured at the site. In the SU sub-menu, select the menu option, "Update Data Descriptor" (DD_EDIT) to create or update the data-descriptors for the tidal monitoring site. In this step, the user defines the parameters for each DD; assigns a location to the DD based on the LOCATIONS created in the previous step, if necessary; creates the processor record for the DD; and defines the screening thresholds for the DD. If only one location is used, the location will automatically be set to "default" in this step.

"Tidal Stage Computation" should be selected as the processing method for the parameter "Gage Height." This automatically selects computation and storing of the four tidal statistics (00021,00022,00023 and 00024) tidal high, tidal high-low, tidal low-high, and tidal low for each day as well as a mean Daily-Value for the day.

4. Create DECODES Site-Device Files (Optional—Needed for EDLs)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level. See the NWIS Site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the values for entry into ADAPS. Please refer to the DECODES manual for instructions on creating an SDF to process the data.

5. Create the Instrument File (Optional—Only Needed For ADRS)

Instrument editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the "SU" sub-menu of ADAPS, select the menu option "Update ADR Instrument Information" (IN_EDIT). This program is used to enter information about tidal monitoring sites where data is recorded using an Analog Digital Recorder (ADR) and binary paper-tape media.

6. Manage the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), the user needs to assign a "preferred input" transport code using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). At a site, the user may have multiple instruments collecting tidal data, or one instrument may be collecting, storing and transmitting data from the site into ADAPS using multiple transport methods, for example, a GOES data-collection platform (DCP) and electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data

r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

The data from each transport method for each data-descriptor are stored as measured Unit-Values. ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input." To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport-code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the computed Unit-Values table for display on the Web. The computed Unit-Values table is automatically populated during the SATIN/SENTRY data-conversion process and the correction/computation processes in ADAPS using the measured Unit-Values from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled. EDL data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web, or if a separate data-processing stream with separate data-descriptors (DD) is established.

7. Enter Data

Tidal monitoring data is entered into ADAPS by using one or more of the options in the IN sub-menu. Data entry into ADAPS from a tidal monitoring station will be from three possible pathways:

- A GOES DCP
- An EDL
- Other (ADR, Chart, or Observer)

For data from the GOES DCP, entry is automatic through the SATIN/SENTRY programs. The user can go directly to the Data Screening step.

For data from the EDL, entry is through the IN (Input) sub-menu option "Process WRD standard input data" (STD_STOR), after the data is processed through DECODES to create a standard format file. The input program asks for the file name for processing.

For other data from ADRs, entry is through the IN (Input) sub-menu option "Read ADR Tape Data" (TP_READ) and then stored with the option "Edit and Store ADR Tape Data" (TP_EDIT). These programs require a paper tape-reader interfaced to the data system.

For other data from charts or observations, entry is through the IN (input) sub-menu option “Enter Unit-Values from Digitizer/Keyboard” (UV_ENTER). The Digitizer option requires a digitizer interfaced to the data system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

The data are entered into the measured Unit-Values table and tagged with a transport code. For the preferred input, the data also are entered automatically into the edited Unit-Value table.

8. Screen and Edit Data

After input, the data need to be screened for obvious erroneous values such as spikes or stuck instruments. This screening can be done using the HYDRA program (PR sub-menu option “Edit Time-Series Data using HYDRA” (TS_EDIT)) or by viewing real-time data on NWISWeb. HYDRA allows the user to make immediate corrections to the data including pasting in data from backup data sources, and also marks the data as “checked.” HYDRA works on the edited Unit-Values. The option is available to compute the record at this point. If real-time data is screened on the Web, the data can be flagged as checked using the UT (utility) sub-menu “Set Edited UV ‘checked’ Status Flag” (SET_CHECKFLAG).

**Important note: The real-time data coming into ADAPS are displayed to the public via NWISWeb. It is imperative that the real-time data be checked and corrected each day to verify that erroneous data are not being broadcast to the public.

9. Apply Data Corrections

Data corrections to the gage height data are applied next by the PR (Primary Data Processing) sub-menu option “Update/Display Data Corrections” (DC_EDIT). Three different types of corrections can be entered into this program:

- Gage Height Corrections
- Datum Corrections from Levels
- Other

Gage Height Corrections are instrument errors caused by drift, mis-calibration, or malfunction, etc. Datum Corrections from Levels are due to changes in the station or orifice, documented by levels run at the station. Other corrections can be, for example, a correction applied to the datum of the gage to avoid recording negative gage heights.

The DC_EDIT program creates data correction curves, which can include three points each, that produce correction Unit-Values, which are then applied to the edited Unit-Values to generate computed Unit-Values of gage height. There can be three separate data correction curves applied to one time segment of Unit-Values and ADAPS will add the corrections together for one total data correction. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis. Correction entry and editing are also done in the DC_EDIT program. Screening thresholds flags are also applied and stored with the computed Unit-Values. The option is available to compute the record at this point.

10. Compute Time-Series Data

The tidal statistics are computed by the PR sub-menu option “Primary Computations” (PRIMARY). The Primary program calculates the High-high, High-low, Low-high and Low-low tide extremes for each day. It also calculates and stores the maximum, minimum, and mean daily gage height values for each day if so instructed in the DD processor information. A tidal primary report is generated listing each of the statistics along with the associated time, the mean tide level for the day, the maximum and minimum gage height data corrections used for each day, and the computed Unit-Values for each hour of the day. Any threshold screening flags are also displayed.
An optional diagnostic report can be produced also to help in the review of the computations.

11. Analyze, Edit, and Display Data

The tidal data can now be analyzed or used in a variety of program options such as “Daily-Values Manipulation” (DV_MANIP), “End-of-year Summary” (EOYSUMM), “Plot Time-Series Data” (PLOTWAT), “Plot Hydrographs” (HYDROGRAPH), “Daily-Values Monthly and Annual Statistics” (DVMAS) or “Daily Duration and N-Day Low/High Value Analysis” (DVSTAT). The data can be displayed using “Print/Display Unit-Values” (UV_TABLE) or “Daily-Values Tables” (DVTABLE). The use of these program options is discussed elsewhere in this manual.

Computed Daily-Values can be edited using the option “Edit Time-Series Data using HYDRA” (TS_EDIT). HYDRA can edit the Daily-Values either graphically or through a table. All Daily-Values changed in HYDRA are flagged as estimated in the computed Daily-Values table.

12. Managing Data Aging

After the tidal data have been analyzed and are ready for publication, the user should enter the PR sub-menu option “Manage Record Data Aging Status” (SETSTATUS) and change the status from “Working” to “In Review.” This will lock any changes to the data and indicate that the record is ready for review prior to approval. The ADBA should set the status to “Approved” when data is acceptable for publishing.

6.1.8 Records Processing in ADAPS for a Water Quality Monitor Station

by Susan C. Grams

To process time-series water-quality data using NWIS-ADAPS, the user needs to establish the site in the GWSI Site File then create the support files in ADAPS necessary to define the data being stored in ADAPS. Once these support files are established, the user will be able to process the time-series data that is collected to produce the final products of publication-quality Unit and Daily-Values of water-quality data. The following steps are an overview of the navigation-path through the water-quality (QW) time-series data processing functionality of ADAPS:

1. Establish the Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the continuous water-quality monitoring site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this QW site in the database. If the site already exists in the Site File, verify that the Site File information has been updated to document the existence of QW monitoring equipment at the site.

2. Create the Sensor Locations for the Site (Optional)

Skip this step if there is only one sensor-location at the site. (Locations other than the "default location" are needed only if there are sensors at multiple locations at the site, e.g. sensors at different depths or at multiple points in the cross-section.)

If there are multiple sensor locations, it is imperative that the sensor locations are established in ADAPS prior to setting up the data-descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the "SU" sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the water-quality (QW) monitoring site. In the 4.2 version of ADAPS, the user can store data collected for one parameter from multiple locations using the same data-descriptor (DD). Since there is only one data-descriptor (DD) for each measured parameter at a site, using the location description will further differentiate the data collected by each sensor.

```
*******************************************************************
  US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
 REVISION NWIS 4.2+20020205
      (SU) SUB-MENU : Update Support Files/Record Flags
*********************************************************************
 1 -- Update Location File
 2 -- Update Data Descriptor File
 3 -- Update Instrument File
 4 -- Manage preferred input
 5 -- Edit public access flags
 6 -- Manage Record Data Aging Status

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

   DOC menu_opt -- Display documentation     PGM -- Display program_names
   QU -- Exit to previous menu              EX -- Exit to Unix

Select desired menu option or program_name ([CR] for menu):
```

ADAPS "SU" Sub-Menu

3. Create or Update the Data Descriptors

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In this step, a data-descriptor (DD) is established for each parameter measured at the site. In the SU sub-menu, select the menu option, "Update Data Descriptor" (DD_EDIT) to create or update the data-descriptors for each water-quality (QW) parameter measured at the site. In this step, the user defines the parameters for each DD; assigns a location to the DD based on the LOCATIONS that were created in the previous step, if necessary; creates the processor record for the DD, and defines the screening thresholds for the DD. If only one location is used, the location will be set automatically to "default" in this step.

4. Create Decodes Site-Device Files (Optional—Needed for EDLS)

DECODES SDFs can only be created at the ADAPS administrator level. See the NWIS site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and storing and/or transmitting the values for entry into ADAPS. Please refer to the DECODES manual for instructions on creating an SDF to process the data.

5. Create The Instrument File (Optional—Only Needed for ADRS)

Instrument editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS site or ADAPS database administrator to make this entry or update.

In the "SU" sub-menu of ADAPS, select the menu option "Update ADR Instrument Information" (IN_EDIT). This program is used to enter information about QW monitors that record their readings using an Analog Digital Recorder (ADR) and binary paper-tape media.

6. Manage the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), the user needs to assign a "preferred input" transport code using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). At a site, there may be multiple instruments collecting water-quality (QW) data, or one instrument may be collecting, storing and transmitting data from the site into ADAPS using multiple transport methods; for example, a GOES data-collection platform (DCP) and electronic data-logger (EDL).

The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a File
c -Digitized analog Chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

The data from each transport method for each data-descriptor are stored as measured Unit-Values. ADAPS stores measured Unit-Values (UVs) from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input". To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport-code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the computed Unit-Values table for display on the Web. The edited and computed Unit-Values tables are automatically produced during the SATIN/SENTRY data-conversion process and the data correction/computation processes in ADAPS using the measured Unit-Values (UVs) from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be assigned to the real-time transport method, even if the instrument is not USGS-owned or USGS-controlled.

EDL data that are retrieved manually can only be used as the preferred input if no real-time data are to be served on the Web, or if a separate data-processing stream with separate data-descriptors (DD) is established.

**Important note: The real-time data, after being processed through ADAPS, are displayed to the public via NWISWeb. It is imperative that the real-time data be checked and corrected each day using HYDRA to verify that erroneous data are not being broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting “save and exit,” the user sets the Web-flag on that data to “checked” and it will be displayed as such on NWISWeb. If the user has viewed the data using NWISWeb and does not need to make any edits to the data, the Web-display status flag on the data may be set to “checked” using the UT menu option “Set the Edited UV ‘checked’ Status”, (SET_CHECKFLAG).

Now that the site has been established in GWSI and ADAPS, transmissions of the water-quality (QW) data can be received, data can be stored in ADAPS, corrections can be applied to the data based upon the calibration information and site-visit notes, and the Unit and Daily-Value record can be computed that will be published for that site. Further information on the field operation of water-quality monitors may be found in “Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Site Selection, Field Operation, Calibration, Record Computation and Reporting”; Wagner, et al; U.S. Geological Survey, Water-Resources Investigations Report 00-4252: 2000, 53p.

One typical USGS water-quality monitor configuration collects data for the four parameters: water temperature, specific conductance, pH, and dissolved oxygen. When data enter ADAPS from the QW monitor from the preferred-input sensors for each of these parameters, the data are written to both the Measured Unit-Values table and the Edited Unit-Values table for each of the specified data-descriptors (DDs). If these data are recorded on a backup recording device, the backup recorder becomes an alternate transport method for the data. These Unit-Values from the other transport methods used at the site are written to measured Unit-Values tables for their respective data-descriptors/transport methods and can be called up in the time-series edit program (TS_EDIT, “HYDRA”) as reference-curves and may be used to fill in gaps or to correct erroneous UVs that are stored in the edited Unit-Values table from the preferred-input sensors. In ADAPS 4.2, only one data-descriptor exists for each parameter at a specified location for which the monitor is collecting data; the data recorded on different recording devices for each data-descriptor (DD) are distinguished in the measured Unit-Values table by the transport method that had been specified in the section on “Manage The Preferred Input.”

7. Enter QW Time-Series Data

a. GOES DCP: Data from the GOES data-collection platform (DCP) typically are tagged as the preferred-input transport method. These data are transmitted to ADAPS and are entered automatically into the measured Unit-Values table and the edited Unit-Values table. If data from the DCP are the only data to be transported to ADAPS from the QW monitor, there is no need to enter data, so proceed to Step 8, "Screening Time-Series QW Data."

b. Electronic Data Logger (EDL): Data from an EDL must first be converted to standard-input format using the DECODES program which is run outside of the ADAPS menu (see DECODES manual for detailed instructions of this process). Once these data have been converted, they are entered into ADAPS using the "Process WRD standard input data" program (STD_STOR) from the "IN" sub-menu, are entered into the measured Unit-Values table, and are available as backup record. An EDL may be a preferred input if no DCP is used at the site. If the EDL data are the preferred input, these data will be written to both the measured and edited Unit-Values tables in this step.

c. ADR Paper-tape:** Should there be QW monitor data recorded on binary paper-tape using an ADR, these data are entered into ADAPS via a tape-reader using the program "Read ADR Tape Data" (TP_READ), in the ADAPS "IN" sub-menu. Once these data are read, they are stored in the measured Unit-Values table using the program "Edit And Store ADR Tape Data" (TP_EDIT). If the binary paper-tape data are the preferred input, these data will be written to both the measured and edited Unit-Values tables in this step. An instrument record is required in addition to data descriptors to process this type of data. <u>Creating an instrument record in ADAPS 4.2 is only authorized at the database administrator (DBA) level.</u>

d. Other Data Input:** Data from observations or charts are entered into ADAPS using the program UV_ENTER in the "IN" sub-menu. Unit-Values may be entered into ADAPS from the "IN" sub-menu using UV card images input via the program UV_STORE.

**Data input from the GOES DCP or EDL typically are transmitted in the engineering units of the parameter, or in "real values". Should the data be collected in some format <u>requiring conversion to engineering units, a conversion-of-input rating must exist in ADAPS prior to transporting the data</u>. Conversion-of-input ratings are discussed in Chapter 4.

```
****************************************************************************
 US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
                  REVISION NWIS 4.2+20020205
                   (IN) SUB-MENU : Data Input                  |
****************************************************************************

   1 -- Read ADR Tape Data (TP_READ)
   2 -- Process ADR Card-Image Data (CD_READ)
   3 -- Edit And Store ADR Tape Data (TP_EDIT)
   4 -- Review/Del. Dig. Tape Temp. Files (DRFILES)
   5 -- Process UV Card-Image Data (UV_STORE)
   6 -- Enter Unit-Values from Digitizer/Keyboard (UV_ENTER)
   7 -- Process Daily-Values Card-Image Data (DV_STORE)
   8 -- Process WRD standard input data (STD_STOR)
   9 -- Enter/Update/Display Measurements (MS_EDIT)

   FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

     DOC menu_opt -- Display documentation     PGM -- Display program_names
     QU -- Exit to previous menu               EX -- Exit to Unix

   Select desired menu option or program_name ([CR] for menu):
```

ADAPS "IN" Sub-Menu

8. SCREEN THE TIME-SERIES QW DATA

TS_EDIT, or "HYDRA", found in the ADAPS "PR" sub-menu (below) is the tool of choice to screen the Unit-Value data. The Unit-Value data seen when HYDRA is invoked for a station/data-descriptor are the edited Unit-Values from the preferred-input sensor. HYDRA allows the user to:

- View these edited Unit-Values
- Edit these edited Unit-Values
- Set the Web-flag to "checked" for these edited Unit-Values

In this step, delete erroneous preferred-input Unit-Values or replace erroneous preferred-input Unit-Values with the measured Unit-Values from an alternate transport method for the same data-descriptor which can be brought into HYDRA as a reference curve. HYDRA allows the user to "cut and paste" Unit-Values from the reference curve onto the preferred-input curve and then save the Unit-Values from the modified preferred-input curve to the edited Unit-Values table.

Data synchronization in ADAPS is key to maintaining the integrity of the data and of the data displayed on NWISWeb. After editing the Unit-Values in HYDRA, the user has the option of computing the record. It is recommended that the answer "yes" be chosen to compute the record so that the computed Unit-Values table and the computed Daily-Values table reflect the changes made in the edited Unit-Values table in this step.

If the data are screened using NWISWeb *and no editing is required*, set the status flag for the data to "checked" for Web display using the "Set Edited UV 'checked' Status Flag" (SET_CHECKFLAG) program in the "UT" sub-menu. Unit-Values also may be edited at this point using the uv_edit program in ADAPS UT menu "Edit Unit-Values".

```
******************************************************************************
|   US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)     |
| REVISION NWIS 4.2+20020205
|           (PR) SUB-MENU : Primary Data Processing             |
******************************************************************************

 1 -- Update Data Descriptor Thresholds      9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra     10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections       11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables          12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars         13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)       14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)        15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary           16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

   DOC menu_opt -- Display documentation    PGM -- Display program_names
   QU -- Exit to previous menu              EX -- Exit to Unix

     Select desired menu option or program_name ([CR] for menu):
```

ADAPS "PR" Sub-Menu

9. Apply Data Corrections

Once the Unit-Values have been viewed and edited in HYDRA, data corrections can be applied to the Unit-Values based on calibration notes and other site-inspection information.

Shifts are no longer used to correct water-quality data in ADAPS 4.2. Shifts are tied to ratings and are exclusive to the stage-discharge computation. Use data corrections (DC_EDIT) to correct time-series water-quality data. The old functionalities of "datum correction," "shift-by-time" and "variable shift" of QW data are not lost; these functionalities are now present in the form of the three (3) data-correction curves that can coincide for one time-period and one data-descriptor (DD).

Apply data corrections to correct the edited Unit-Values for problems associated with sensor-fouling, calibration-drift, or instrument-error, by using the DC_EDIT program in the "PR" sub-menu. In ADAPS 4.2, there can be up to three (3) data-correction curves applied to one time-segment of edited Unit-Values data, and each of these data-correction curves can be a one-, two-, or three-point curve. It is strongly recommended, beginning with the 4.2 version of ADAPS, that data correction set 1 be used to correct for sensor fouling, data correction set 2 be used for calibration drift, and data correction set 3 be used for "other" types of corrections.

Once the data corrections have been entered, ADAPS will compute the corrections prorated over the specified time period and apply them to the edited Unit-Values. If multiple data-correction curves exist that are coincident in time, ADAPS computes the combined correction for the time period and applies that combined correction to the data. View the actual Unit-Values of correction by running the “Print/Display Unit-Values Tables” (UV_TABLE) program and selecting the option, “Correction Unit-Values” to specify that type of UV output. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. This is strongly recommended as these comments can be used in a draft of the station analysis.

Data synchronization in ADAPS is key to maintaining the integrity of the data and of the data displayed on NWISWeb. After the data-correction curves are entered or edited in DC_EDIT, the user has the option of computing the record. It is recommended that the answer “yes” be picked to compute the record so that the computed Unit-Values table and the computed Daily-Values table reflect the corrections applied to the edited Unit-Values table in this step.

10. Time-Series QW Data Computations

If the record was not computed in Steps 8 and/or 9, this step is MANDATORY to maintain data synchronization and to obtain a report of the record computations.

PRIMARY

After reviewing and editing the edited Unit-Values and entering the data corrections based on the site inspections, time-series QW monitor data are computed using the Primary Computations” (PRIMARY) program in the “PR” sub-menu. If the QW time-series data was processed upon exiting HYDRA and/or DC_EDIT, the data are consistent in the database, however a primary report of the data will not be available to review. Running PRIMARY is the only way to generate a PRIMARY report. If data synchronization has been maintained in previous steps and only a PRIMARY report is needed, this program can be run to only generate the PRIMARY report without recomputing the record.

If the record has NOT been recomputed in previous steps, running the PRIMARY program is required to update the computed Unit and Daily-Values of the QW monitor data to reflect any changes made to the edited Unit-Values table or to the data correction curves. An optional diagnostic report can be produced also to help in the review of the computations.

11. Review and Edit Data

As the PRIMARY program is run, the selected Daily-Value statistics of the time-series QW data are computed and stored. These computed Daily-Values can be viewed either on the PRIMARY report, or by requesting a Daily-Values table by running the “Daily-Values Tables” (DVTABLE) program in the “PR” sub-menu. If the Daily-Values require editing, use the program “Edit Time-Series Data using HYDRA” (TS_EDIT) to make these corrections. The Daily-Values that result from this editing process are the final Daily-Values of the record.

While **not recommended** as the main editing procedures, Unit Value editing and Daily Value editing can still be accomplished by using the UV_EDIT programs and the DV_EDIT programs in the "UT" sub-menu of ADAPS 4.2.

12. Manage Data Aging

Follow the District quality-assurance processes for final review and approval of the Unit and Daily-Value records. Once the data have been edited and reviewed, the user can set the status of the data from "Working" to "In Review" using the "Manage Record Data Aging Status" (SETSTATUS) program in the "PR" sub-menu. When this is done, the data are marked ready for the review process and no changes may be made to the Unit-Values, Daily-Values or corrections in ADAPS. If edits to the data need to be made after it is set to "In Review," please see the ADBA to reset the status to "Working." Once the data are reviewed and are acceptable for publication, the ADBA should set the status of the data from "In Review" to "Approved."

6.1.9 Records Processing in ADAPS for a Ground-Water Observation Well Site

by Sarah E. Giffen

To process time-series ground-water data using NWIS-ADAPS, first establish the site in the GWSI Site File and create the support files in ADAPS necessary to define the data. Next, process the time-series data in order to create the final products of publication-quality Unit and Daily-Values. The following steps outline these processes in more detail.

1. Establish Site

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the ground-water site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this ground-water site in the database. If the site already exists in the Site File, verify that the Site File information is correct and up to date.

2. Create Sensor Locations for the Site (Optional)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

To enter information about the physical locations of the sensor(s) at a site, select "Update Location File" (LOC_EDIT) from the SU sub-menu. If there is only one sensor location at the site, this step may be skipped and the location will automatically be set to "default

(0).” Locations other than the “default location” are needed only if there are multiple sensor locations at the site, e.g. at different depths or at multiple points in the cross-section. With one data-descriptor (DD) for each measured parameter at a site, using the location descriptor will differentiate the data collected by each sensor.

3. Create or Update Data Descriptors

Data-descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish a data-descriptor (DD) for each parameter by selecting “Update Data Descriptor” (DD_EDIT) in the SU sub-menu. Define the parameters for each DD; assign a location to the DD; create the processor record for the DD; and define the screening thresholds for the DD.

4. Create Decodes Site-Device Files (Optional—needed for EDLS)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level. See the NWIS Site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) must be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the Unit-Values to be stored in ADAPS. Please refer to the DECODES manual for instructions on writing an SDF to process the data.

5. Create the Instrument File (Optional—Only needed for ADRs)

Instrument editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS site or ADAPS database administrator to make this entry or update.

In the “SU” sub-menu of ADAPS, select the menu-option “Update ADR Instrument Information” (IN_EDIT). This program is used to enter information about ground-water monitors that record readings using an Analog Digital Recorder (ADR) and binary paper-tape media.

6. Select Preferred Input

Managing the preferred input is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

There may be multiple instruments collecting ground-water data at a site, or one instrument collecting more than one set of data. For example, a ground-water site with real-time data capabilities that transmits DCP data as well as stores EDL data that are retrieved manually in the field. The values resulting from these different collection methods or paths are all stored in ADAPS as measured Unit-Values under the same DD and are differentiated from one another by a transport code. The transport codes that ADAPS uses to identify the origin of measured Unit-Values are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file
c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

Note: * Indicates that these options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."

For each data-descriptor (DD), one transport method is identified as the preferred input path using the SU sub-menu option "Managing preferred input" which runs the program PFIN_EDIT. Measured Unit-Values from the preferred input path are also stored as the edited Unit-Values in ADAPS. If the site has real-time data capabilities, the preferred input path must be set to the real-time DCP data path.

7. Input Data

The data input step is not necessary for real-time transmitted data. Real-time transmitted data are identified as the preferred data input stream in step 6. "Manage the Preferred Input" and are automatically processed through ADAPS by means of the SATIN/SENTRY programs. These data are stored in tables as measured Unit-Values and as the edited Unit-Values. The computed Unit-Values produced by ADAPS from the edited Unit-Values are displayed on NWISWeb.

EDL data are loaded into ADAPS as standard input files (which are the output from DECODES). Standard input files are loaded into ADAPS by choosing "Process WRD Standard input data" (STD_STOR) from the IN sub-menu (shown in the figure below). These data are stored in ADAPS as measured Unit-Values and are distinguished from the other measured Unit-Values, under the same DD, by a transport code. If there is no real-time transmitted data, then these data are likely the preferred input and have been identified as such in step 6.

ADR data are read using the "Read ADR Tape Data (TP_READ)" from the IN sub-menu, and are stored with the option "Edit And Store ADR Tape Data (TP_EDIT)" in this same sub-menu. These programs require a paper tape recorder.

Data from charts or observations are loaded into ADAPS through, "Enter Unit-Value from Digitizer/Keyboard (UV_ENTER)" from the IN sub-menu. This process requires a digitizer interfaced with the data system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

```
******************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)     |
| REVISION NWIS 4.2+20020205            |
|                  (IN) SUB-MENU : Data Input
******************************************************************************

 -- Read ADR Tape Data (TP_READ)
 -- Process ADR Card-Image Data (CD_READ)
 -- Edit And Store ADR Tape Data (TP_EDIT)
 -- Review/Del. Dig. Tape Temp. Files (DRFILES)
 -- Process UV Card-Image Data (UV_STORE)
 -- Enter Unit-Values from Digitizer/Keyboard (UV_ENTER)
 -- Process Daily-Values Card-Image Data (DV_STORE)
 -- Process WRD standard input data (STD_STOR)
 -- Enter/Update/Display Measurements (MS_EDIT)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation     PGM -- Display program_names
    QU -- Exit to previous menu               EX -- Exit to Unix

  Select desired menu option or program_name ([CR] for menu):
```

Data Input Figure

8. Review Edited Unit-Values

Edited Unit-Values can be displayed by creating a Unit-Value inventory table (“Print/Display Unit-Values Tables” in the PR sub-menu) or by using PLOTWAT (“Plot Time-Series Data” in the PR sub-menu). Edited Unit-Values are modified and reviewed in “Edit Time-Series Data using HYDRA” in the PR sub-menu (shown below).

HYDRA allows the user to make immediate corrections to the edited Unit-Values by deleting erroneous values, pasting in data from backup data sources, etc. HYDRA is used to verify that quality data are being broadcast to the public. By using HYDRA to view or correct data and then selecting “save and exit,” the Web-flag on that data will be changed to and displayed on NWISWeb as “checked.” If the data is viewed using NWISWeb and does not need to be edited, the Web-display status flag can be set to “checked” using “Set the Edited UV ‘checked’ Status” (SET_CHECKFLAG) from the UT sub-menu.

```
****************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)    |
| REVISION NWIS 4.2+20020205            Feb 13, 2002 14:44:58 Wednesday |
|             (PR) SUB-MENU : Primary Data Processing              |
****************************************************************************

 1 -- Update Data Descriptor Thresholds        9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra       10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections         11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables            12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars           13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)         14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)          15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary             16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

   DOC menu_opt -- Display documentation     PGM -- Display program_names
   QU -- Exit to previous menu                EX -- Exit to Unix
```

Review Edited Unit Values Figure

Primary Data Processing Sub-Menu

When exiting HYDRA, answering "yes" to "compute (Y/N)," will compute the entire record and update the Web. Answering "no," will save the changes to the edited Unit-Values but will not compute the rest of the record and will not update the Web.

9. Apply Data Corrections

Data corrections are applied to edited Unit-Values by choosing "Update/Display Data Corrections (DC_EDIT)" from the PR sub-menu (see figure below). Three types of data corrections can be applied to edited Unit-Values: gage height corrections (instrument errors caused by drift, incorrect calibration, or malfunction), datum corrections (changes to the elevation of the measuring point, documented by levels run at the station), and other corrections. These three types of corrections are entered into the data corrections table separately and each of these three types can be a diagram consisting of one, two, or three points. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. Use of this feature is recommended as it will help in analysis and review of the record.

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*****************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
|         | REVISION NWIS 4.2+20020205            Feb 14, 2002 09:22:01 Thursday
|                    (PR) SUB-MENU : Primary Data Processing
*****************************************************************************

 1 -- Update Data Descriptor Thresholds     9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra    10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections      11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables         12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars        13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)      14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)       15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary          16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation     PGM -- Display program_names
    QU -- Exit to previous menu               EX -- Exit to Unix
```

Data Corrections Figure

When exiting DC_EDIT, answering “yes” to “compute (Y/N),” will apply the data corrections to the entire record and update the Web. Answering “no,” will save the changes to the data corrections table but will not apply them to the rest of the record and will not update the Web.

10. Primary Computations

Computed values are generated from the edited Unit-Values by running “Primary Computations (PRIMARY)” from the PR sub-menu (see figure below). Running “Primary Computations” applies any changes made in HYDRA and/or DC_EDIT to the edited Unit-Values in order to produce both the computed Unit-Values and the computed Daily-Values, although computed values may have been produced prior depending on the pick of “compute” options available. Running “Primary Computations” also produces a report of these computed values. An optional diagnostic report can be produced to help in the review of the computations.

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******************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
|         | REVISION NWIS 4.2+20020205             Feb 14, 2002 09:22:01 Thursday |
|                    (PR) SUB-MENU : Primary Data Processing                |
******************************************************************************

 1 -- Update Data Descriptor Thresholds    9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra   10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections     11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables        12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars       13 -- Peak Flow Entry and Retrieval (PE
 6 -- Update/Display Shifts (SV_EDIT)     14 -- Manage Record Data Aging Status (
 7 -- Primary Computations (PRIMARY)  15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary         16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation     PGM -- Display program_names
    QU -- Exit to previous menu               EX -- Exit to Unix
```

Primary Computations Figure

11. Review Computed Daily-Values

Review and make any changes to the computed Daily-Values with “Edit Time-Series Data using HYDRA” from the PR sub-menu. Other data can be brought into HYDRA as reference curves in order to evaluate and/or modify the computed Daily-Values. After computed Daily-Values have been reviewed and/or modified in HYDRA, they are referred to as final Daily-Values.

12. Review Final Daily-Values

To Review final Daily-Values select “Daily-Values Table” from the PR sub-menu (shown in the figure below) and review the table. It is customary to check the final Daily-Values table against the primary report for verification purposes.

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******************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM
          (ADAPS)   REVISION NWIS 4.2+20020205  Feb 14, 2002 09:22:01 Thursday |
|             (PR) SUB-MENU : Primary Data Processing                |
******************************************************************************

 1 -- Update Data Descriptor Thresholds    9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra   10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections     11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables        12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars       13 -- Peak Flow Entry and Retrieval (PE
 6 -- Update/Display Shifts (SV_EDIT)     14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)      15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary         16 -- Show Site Information (SHOWSITE)
```

Final Daily-Values Figure

13. Manage Record Data Aging Status

A record can be set to “Working,” “In Review,” or “Approved” at any point in the data editing process. The record status is set in “Manage Record Data Aging Status” in the PR sub-menu (shown in the figure below). Follow the District quality-assurance procedures for the final review and approval of the Unit and Daily-Value records. Once the data have been edited and are considered “final,” the user can set the data from “Working” to “In Review.” No changes can be made to the data at this point. After District formal review and data is acceptable for publication, the ADBA should set the status of the data to “Approved.”

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******************************************************************************
|    US. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
|        | REVISION NWIS 4.2+20020205            Feb 14, 2002 09:22:01 Thursday |
|             (PR) SUB-MENU : Primary Data Processing                |
******************************************************************************

 1 -- Update Data Descriptor Thresholds    9 -- Daily-Values Manipulation (DV_MANIP)
 2 -- Edit Time-Series Data using Hydra   10 -- Print/Display Unit-Values Tables
 3 -- Update/Display Data Corrections     11 -- Daily Values Tables (DVTABLE)
 4 -- Update/Display Rating Tables        12 -- End-of-Year Summary (EOYSUMM)
 5 -- Shift Analysis and Error Bars       13 -- Peak Flow Entry and Retrieval
 6 -- Update/Display Shifts (SV_EDIT)     14 -- Manage Record Data Aging Status
 7 -- Primary Computations (PRIMARY)      15 -- Plot Time-Series Data (PLOTWAT)
 8 -- Edit DV Statistical Summary         16 -- Show Site Information (SHOWSITE)

 FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

    DOC menu_opt -- Display documentation      PGM -- Display program_names
    QU -- Exit to previous menu                EX -- Exit to Unix
```

6.1.10 Records Processing in ADAPS for a Precipitation Station

by Joseph P. Nielsen

To process time-series precipitation data using NWIS-ADAPS, the site is first established in the GWSI Site File, and then all support files in ADAPS necessary to define the data being stored in ADAPS are defined.

Precipitation data processing can take one of three paths in ADAPS, depending on the form of the measured Unit-Values:

1. **Measured Unit-Values as the cumulative amount of precipitation since the last time the recorder was reset.** This type of Unit-Value can be recorded by weighing bucket, float, or tipping bucket precipitation systems. In this chapter this is referred to as *cumulative* Unit-Values.

2. **Measured Unit-Values as the incremental precipitation during the recording period (often 15 minutes or an hour, for example).** This type of Unit-Value is most often recorded using a tipping bucket precipitation system. In this chapter this is referred to as *incremental* Unit-Values.

3. **Measured Unit-Values of a constant volume (often 0.01 in.) at a variable time step.** In this chapter this is referred to as *event* Unit-Values.

In each of these three cases, the form of the *computed* Unit-Values will always be incremental precipitation over the recording period.

The following steps are an overview of the navigation-path through the precipitation time-series data-processing functionality of ADAPS:

1. ESTABLISH THE SITE

Site File editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish the precipitation site in the NWIS Site File using GWSI. Refer to the ***NWIS-GWSI User's Manual*** to obtain the information required to establish this site in the database. If the site already exists in the Site File, verify that the Site File information has been updated to document the existence of precipitation equipment at the site.

2. CREATE THE SENSOR LOCATIONS FOR THE SITE (OPTIONAL)

This step is not necessary if one sensor location is used at the site. (Locations other than the "default location" are needed only if there are sensors at multiple locations, e.g. sensors at different depths or at multiple points in the cross-section.)

Location editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

In the SU sub-menu of ADAPS, select the menu option "Update Location File" (LOC_EDIT). This program is used to enter information into the system about the physical location of the sensor, or sensors, at the site. Data collected for one parameter from multiple locations using the same data descriptor (DD) can be stored. With one data-descriptor (DD) for each measured parameter at a site, using the location description will further differentiate the data collected by each sensor.

The sensor locations have to be established prior to setting up the data descriptor for a parameter. The location for the DD will be set to "default (0)" if no location is specified in this step.

3. CREATE OR UPDATE THE DATA DESCRIPTORS

Data descriptor editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

Establish a data descriptor (DD) for each parameter by selecting "Update Data Descriptor" (DD_EDIT) in the SU sub-menu. Define the parameters for each DD; assign a location to the DD based on the locations; create the processor record for the DD; and define the screening thresholds for the DD. If only one location is used, the location will automatically be set to "default."

For precipitation data, the following should be in the setup of the DD:

Parameter Code: The use of parameter code 45 is highly recommended. The use of any other parameter code will not allow for the display of precipitation data on NWISWeb, and will support other primary processing options dealing with precipitation data.

Computed DV statistic: Sum (6).

Minimum threshold: (Only available for rainfall difference computations.) The minimum valid precipitation unit value. Computed Unit-Values below this threshold will be set to zero and marked with the "F" remark. This threshold is used where the edited Unit-Values record cumulative precipitation (rather than incremental or event) and small variations are often not caused by actual precipitation.

First-last threshold: (Only available for rainfall difference computations.) The minimum valid daily sum for precipitation, as computed by subtracting the last edited Unit-Value for the day from the first edited Unit-Value for the day. All Unit-Values during the day will be set to zero and marked with the "F" remark code during primary processing when this threshold is not met. This threshold is used where the edited Unit-Values record cumulative precipitation (rather than incremental or event) and small variations are often not caused by actual precipitation.

Two primary computation types are available in the processor setup for precipitation:

- Direct Daily-Values computation. This computation type should be used for incremental and event measured Unit-Values.
- Rainfall difference computation. This computation type should be used for cumulative measured Unit-Values.

4. Create Decodes Site-Device Files (Optional – needed for EDLs)

Note: Either a DECODES site device file or an instrument file needs to be established. See Instruction 5 below if an ADR is used for instrumentation.

DECODES SDFs can only be created at the administrator level.
See the NWIS Site or ADAPS database administrator to make this entry or update.

A DECODES site-device file (SDF) needs to be created for each instrument recording Unit-Values electronically and is storing and/or transmitting the Unit-Values at the site for entry into ADAPS. Please refer to the DECODES manual for instructions on writing an SDF to process the data.

5. Create or Update the Instrument File (Optional)

Instrument file editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS site or ADAPS database administrator to make this entry or update.

The Instrument File is only needed for ADR instruments. In this step, the user may establish or update an ADR instrument at the site. In the SU sub-menu, select the menu option, "Update ADR Instrument Information" (IN_EDIT) to create or update the instrument for the precipitation station.

6. Select the Preferred Input

Preferred-input editing is only authorized at the ADAPS database administrator (ADBA) level. See the NWIS Site or ADAPS database administrator to make this entry or update.

For each input data-descriptor (DD), a "preferred input" transport code is assigned using the SU sub-menu option "Managing Preferred Input" (PFIN_EDIT). There may be multiple instruments collecting precipitation data at a site, or one instrument collecting, storing and transmitting data from the site into ADAPS using multiple transport methods, for example, a GOES data-collection platform (DCP) and an electronic data-logger (EDL). The transport method codes are:

s -GOES DCP (data-collection platform)
e -EDL (electronic data-logger)
a -ADR binary digital paper tape
f* -Data input from a file

c -Digitized analog chart
p* -Telephone telemetry data
r* -Radio telemetry data
o -Observation data

*** These options cannot be implemented in ADAPS 4.2. EDL data telemetered by telephone or radio are flagged with the transport code "e."**

ADAPS stores measured Unit-Values from each transport method for a DD, identifying the transport method and identifying which method is the "preferred input." To serve real-time data on the Web, the preferred-input must be set to the real-time transport code.

Real-time data are the data from either the transport code "s"(GOES DCP), or the transport-code "e" (telemetered EDL data). NWISWeb retrieves data from the edited Unit-Values file for display on the Web. The edited Unit-Values file is automatically populated during the data-conversion process with the measured Unit-Values from the preferred-input sensor. If the District wishes to serve real-time data via NWISWeb, the preferred-input for a data-descriptor (DD) must be set to the real-time transport code, even if the instrument is not USGS-owned or USGS-controlled.

****Important note**: The real-time data coming into ADAPS are displayed to the public via NWISWeb. Real-time data should be reviewed on a regular basis.

7. DATA INPUT

This step is not necessary for real-time transmitted data. Real-time data are transmitted and stored automatically as measured Unit-Values and edited Unit-Values. Data collected in any other manner will need to be processed by the user. Electronic data collected on laptop from an EDL or DCP should be converted to standard input files using DECODES (see DECODES). In ADAPS, choose the IN sub-menu and option "Process WRD standard input data" (STD_STOR). The input program will ask for the file name for processing. These data will be stored as measured Unit-Values and tagged with a transport code (listed in step 6 above). If real-time data does not exist at the site this transport method should be assigned as the preferred input (step 6). The data will be stored as edited Unit-Values and will be tagged with a transport code (listed in step 6 above).

For data entry from the ADRs, use the sub-menu IN, option "Read ADR Tape Data (TP_READ)," and store with the option "Edit And Store ADR Tape Data (TP_EDIT)" in this same sub-menu. These programs require a paper tape-reader.

For data entry from charts or from observations, entry is initiated in the sub-menu IN with option "Enter Unit-Values from Digitizer/Keyboard (UV_ENTER)". The Digitizer option requires a digitizer interfaced with the data system. The keyboard option prompts the user for yyyymmdd.hhmmss of the observation and the value of the observation.

8. Review and Edit Time-Series Unit-Values

Review the edited Unit-Values of precipitation record in HYDRA. Choose sub-menu PR and option "Edit Time-Series Data using HYDRA" (TS_EDIT). Any missing record can be pulled in as a reference curve from the backup measured Unit-Values (see HYDRA section). If changes are made to the data in this program, answering "yes" to "Compute the record?" when closing will compute the entire record and update the database and NWISWeb. Answering "no" will save the changes but will not compute the record or update the database or Web.

HYDRA is used to verify that quality data are broadcast to the public. By invoking HYDRA on a segment of data, viewing the data, correcting the data if necessary, then selecting "save and exit," the user will be setting the Web-flag on that data to "checked" and it will be displayed as such on NWISWeb. If the data have been viewed using NWISWeb and no edits are made to the data, the Web-display status flag on the data may be set to "checked" using the UT menu option "Set the Edited UV 'checked' Status," (SET_CHECKFLAG).

While **not recommended** as the main editing procedures, Unit-Value editing can still be accomplished by using the UV_EDIT program in the "UT" sub-menu of ADAPS 4.2.

9. Data Corrections

Once the Unit-Values have been viewed and edited in HYDRA, data corrections can be applied to the Unit-Values based on calibration notes and site-inspection information. Shifts are not used to correct precipitation data in ADAPS 4.2.

Apply data corrections to correct the edited Unit-Values for problems associated with instrument-error or calibration by using the PR sub-menu option, "Update/Display Data Corrections" (DC_EDIT), see figure below. Although not likely to be needed for precipitation data, up to three separate corrections can be applied for any given time period. If multiple data-correction curves exist for the same period, ADAPS computes the combined correction for the time period and applies that combined correction to the data. Each of the corrections can have one, two, or three points and can be prorated over time. Also, comments can be added to explain how the data correction was determined or why it needs to be applied. Use of this feature is recommended, as it will help in analysis and review of the record.

Answering "yes" to "Compute the record?" when closing this program, will compute the entire record and update the database and Web if any changes are made that will affect the data. Answering "no" will save the changes but will not compute the record or update the database or Web.

Once the data corrections have been entered, ADAPS will compute the corrections prorated over the specified time period and apply them to the edited Unit-Values. View the actual Unit-Values of correction by running the "Print/Display Unit-Values Tables"

(UV_TABLE) program and selecting the option, "Correction Unit-Values" to specify that type of UV output.

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 ******************************************************************************
 U.S. GEOLOGICAL SURVEY AUTOMATED DATA PROCESSING SYSTEM (ADAPS)
    | REVISION NWIS 4.2+20020205          Feb 13, 2002 14:51:24 Wednesday |
    |            (PR) SUB-MENU : Primary Data Processing                  |
    ******************************************************************************

    1 -- Update Data Descriptor Thresholds     9 -- Daily-Values Manipulation (DV_MANIP)
    2 -- Edit Time-Series Data using Hydra    10 -- Print/Display Unit-Values Tables
    3 -- Update/Display Data Corrections      11 -- Daily Values Tables (DVTABLE)
    4 -- Update/Display Rating Tables         12 -- End-of-Year Summary (EOYSUMM)
    5 -- Shift Analysis and Error Bars        13 -- Peak Flow Entry and Retrieval (PE
    6 -- Update/Display Shifts (SV_EDIT)      14 -- Manage Record Data Aging Status (
    7 -- Primary Computations (PRIMARY)       15 -- Plot Time-Series Data (PLOTWAT)
    8 -- Edit DV Statistical Summary          16 -- Show Site Information (SHOWSITE)

    FROM THE PREVIOUS MENU -- IN, PR, AP, DI, RT, SU, MA, PD, UT, LA,

      DOC menu_opt -- Display documentation     PGM -- Display program_names
      QU -- Exit to previous menu               EX -- Exit to Unix
```

Primary Data Processing Sub-Menu

10. Primary Computations

Final values are computed in the sub-menu PR option "Primary computations" (PRIMARY). The primary program generates computed precipitation Unit-Values and daily sum values, even though they may have been computed prior depending on responses to "compute" options in HYDRA and DC_EDIT. A primary report also is generated with the hourly computed incremental values (if using the historic primary), the daily maximum and minimum incremental values, and the daily precipitation sum values.

There are several differences between precipitation primary processing and other data types, including:

- The hourly computed incremental values shown on the historic primary report for precipitation are for the times 0100 to 2400 for each day instead of the usual times shown on other primaries of 0000 to 2300 because the midnight value, which is a sum, belongs with the day preceding the value.
- A midnight value is **never** interpolated during precipitation primary processing. To do so would cause erroneous totals when processing incremental data.
- For cumulative primary processing there are two versions of the computed Unit-Values. The first are the cumulative values after any data corrections are applied. The second are the incremental Unit-Values after the difference

computation of the original computed Unit-Values. Only the second are saved as the final computed Unit-Values. The max and min of the corrected cumulative Unit-Values can be seen for every day on a standard primary report (as opposed to a historical primary report).

It should be noted that the instantaneous values on the historic primary computations report for precipitation are the on-hour incremental values only. Thus, unless the recorder is set for an hourly time interval, there will be precipitation that is not shown in the incremental values on the primary. The daily sum as shown in the primary will be correct, but it will often not match a hand-computed total of the incremental values shown. If there is a gap in the record, the primary program will compute the incremental difference across the gap between successive Unit-Values irrespective of the dv_abort limit set for the data descriptor, so that the precipitation total will be correct, although the exact timing will be unknown. **An optional diagnostic report can be produced also to help in the review of the computations.**

11. Review Daily-Values

Review the Daily-Values of the precipitation record in HYDRA. Choose sub-menu PR option "Edit Time-Series Data using HYDRA" (TS_EDIT). While **not recommended** as the main editing procedure, Daily-Value editing can still be accomplished by using the DV_EDIT program in the "UT" sub-menu of ADAPS 4.2.

12. Daily-Values Tables

Prepare Daily-Value tables using sub-menu DI, option "Daily-Values Tables (DVTABLE)." Choose table type (TY option) #1. Change the statistics code from 3 (mean) to 6 (sum).

13. MANAGE RECORD DATA AGING STATUS

A record can be set to "In Review" after the data editing process. In the sub-menu PR choose "Manage Record Data Aging Status" (SETSTATUS). After the change to "In-Review," all changes to the data will be prohibited. ADBA access is required to change data aging back to "Working." If this is necessary, see the NWIS Site or ADAPS database administrator. The data should be set to "Approved" by the ADBA when the record has been completely reviewed and is acceptable for publishing.

6.2 Postprocessor Programs Control Files

by Scott D. Bartholoma

This attachment presents the formats of the different kinds of control records created and used by ADAPS.

6.2.1 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 4.3 of this 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.

6.2.2 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.

Directory Pathname Record

Columns	Contents/Format	Description
1-5	/PATH	Record identification
6	Blank	
7-102	A*96	Directory name for placement of postprocessor program produced file

User Record

Columns	Contents/Format	Description
1-5	/USER	Record identification
6	Blank	
7-38	A*32	ID of user who created control file
39	Blank	
40-43	A*4	Database 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

Columns	Contents/Format	Description
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 (number 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

Columns	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 postprocessing. The site records may also contain site-specific data and statistic codes, depending upon the particular postprocessor program and the options specified for it.
The following fields are supplied by the Startup Routine:

Site Record

Columns	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)

Columns	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	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.

The date record is 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). Sub-setting to the actual dates specified is the responsibility of the individual batch postprocessor programs.

Date Record

```
Columns      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.
```

The year record is 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).

Year Record

```
Columns      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

Columns	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	Third through tenth statistic codes, as indicated

6.2.3 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.
The 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)
- 5 = only sediment concentration and load (no computation)

Type of Table Record

Columns	Contents/Format	Description
1-5	/TYPE	Record identification
6	Blank	
7-11	I5	Table type (NNNNN)

Remarks Record

Columns	Contents/Format	Description
1-5	/REMK	Record identification
6	Blank	
7-11	I5	Remark option flag (NNNNN): 0 = 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 of 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.

Summary Option Record (Type-1 daily-values table only)

Columns	Contents/Format	Description
1-5	/SOPT	Record identification
6	Blank	
7-86	A*80	Summary option string

Table Suppression Record (Type-1 only)

Columns	Contents/Format	Description
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.

The next record is used to tell the batch primary computation program the options to execute.

Record Type for Primary Computation

Columns	Contents/Format	Description
1-5	/PRIM	Record identification
6	Blank	
7-9	A*3	Standard Report Flag (YES = standard report, NO = Historical report)
10	Blank	
11-13	A*3	Save result flag (YES = save results to database, NO = do not save)
14	Blank	
15-17	A*3	Diagnostic Report flag (YES = produce diagnostic report, NO = do not produce diagnostic report)

6.3 Standard Format for Transferring and Entering Unit and Daily Values

by *James F. Cornwall*

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 databases. 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 data envelope (transfer) format, and for the recorded data within the envelope:

Record types defined for the transfer format:

Record Type	Content	Remarks
BE	Begin Envelope	Begins Data Envelope and defines type of envelope.
VE	Version	Optional record used to indicate NWIS 4_x formatting.
DB	Data Base	Contains the database 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 DCPs).
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
EF	End of File	Optional record used to indicate end of data, may be followed by messages or other information.

Record types 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.
DI	Dissemination	For DCP envelopes, contains transmission time and NESS DCP ID.
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.

Record types defined for the data format (continued):

Record Type	Content	Remarks
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 (VE, DE, MG, RE, and DB records) and one or more groups of station data. A data envelope structure is shown in the following example:

Data Envelope Structure

```
                -   BE
               |  VE  (OPTIONAL)
               |  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
                - EF  (OPTIONAL)
```

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:

Station Data Group Structure

```
               - 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:

Sensor Data Group Structure

```
                - 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. Times for data readings are processed differently according to the presence or absence of a “VE 4” record.
   (a) When the VE record is not present, all times will be considered as “local” times and will be converted to UTC according to the time zone code and daylight savings flag in the database for this station. ***WARNING*** - If daylight savings time is in effect for this station, times from 02:00:00 to 02:59:59 on a “spring-forward” day cannot be converted to UTC and will be discarded along with their corresponding values.
   (b) When the VE record is present, the user (or software) creating the data must also provide the UTC offset in the TM records within the envelope. This UTC offset (in the format “**+/- hh:mm**”) will be used to convert the supplied times to UTC for storage in the database.
3. An SD record must precede an SE record.
4. An SE record must precede a TM record.

5. If a VE record is present, there must be a UTC offset supplied for each TM record in the format specified in rule 2(b).
6. After an SE record has been encountered, the data records (UF, UV, UA, DF, or DV) must not change type before the next SE record is encountered (e.g. 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.
7. 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.

EDL Data, Fixed-Interval Unit Values

```
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
```

EDL Data, Standard Formatting, Variable-Interval Unit Values

```
BE STDEDL
DB  1
RE This is an example with Local time (no UTC Offsets in TM rec)
SD USGS 06090800
SE    7        000650001 64 V       M
TM 20000331001500
UV   4001500 12.37 003000 12.36 004500 12.35 010000 12.34
UV   4011500 12.34 013000 12.33 014500 12.32 020000 12.32
UV   4021500 12.31 023000 12.30 024500 12.29 030000 12.28
UV   4224500 11.58 230000 11.58 231500 11.56 233000 11.56
UV   4234500 11.55 240000 11.54
TM 20000401001500
UV   4001500 11.53 003000 11.52 004500 11.51 010000 11.50
UV   4011500 11.49 013000 11.48 014500 11.47 020000 11.46
UV   4021500 11.46 023000 11.45 024500 11.44 030000 11.43
EE
```

EDL Data, Version 4 Formatting, Variable-Interval Unit Values

```
BE STDEDL
VE 4
DB  1
RE This is an example with UTC offset supplied for the station
SD USGS 06090800
SE    7        000650001 64 V       M
TM 20000331001500 -07:00
UV   4001500 12.37 003000 12.36 004500 12.35 010000 12.34
UV   4011500 12.34 013000 12.33 014500 12.32 020000 12.32
UV   2234500 11.55 240000 11.54
TM 20000401001500 -07:00
UV   4001500 11.53 003000 11.52 004500 11.51 010000 11.50
UV   4011500 11.49 013000 11.48 014500 11.47 020000 11.46
UV   4021500 11.46 023000 11.45 024500 11.44 030000 11.43
EE
```

6.3.1 Record Types for the Transmission Envelope

Record Type BE: 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

 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
                       UNS  - Unspecified (valid for transferred data &
                              B-card data processed using UV_STORE)
```

Record Type VE: Version Number (optional)

```
Columns    Length      Description
---------------------------------------------------------
 1 - 2        2          Record Type = VE
 3            1          BLANK
 4            1          "4"
```

Record Type DB: Database Number (Must be supplied for DCP data; otherwise optional.)

```
Columns       Length  Description
---------------------------------------------------------
 1 - 2          2       Record Type = DB
 3              1       BLANK
 4 - 5          2       Database Number used by ADAPS for database
                        identification.
```

Record Type DE: 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: 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: 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 End of envelope

Columns	Length	Description
1 - 2	2	Record Type = EE

Record Type: EF End of File

Columns	Length	Description
1 - 2	2	Record Type = EF Anything following this record is ignored. May be used for informational or error messages.

6.3.2 Record Types for the Data Records

Record Type AL: 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.

Record Type SD: 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 DI: DIssemination (optional - DCP envelopes only)

Columns	Length	Description
1 - 2	2	Record Type = DI
3	1	BLANK
4 - 17	14	UTC Date/time of the DCP transmission in the format YYYYMMDDHHMMSS, where: YYYY – Year MM – Month DD – Day HH - Hour MM - Minutes SS - Seconds
18	1	BLANK
19 - 26	8	NESS DCP id

Record Type SE: Sensor

Columns	Length	Description
1 - 2	2	Record Type = SE
3	1	BLANK
4 - 7	4	Data Descriptor Number (right-justified) Connects this sensor with a data descriptor record in ADAPS.
8 - 15	8	Sensor Name (blank if coming from UV_ARCHIVE)
16 - 20	5	Parameter code
21 - 25	5	Statistic code
26 - 27	2	Length of data field
28 - 28	1	Precision of data (blank if coming from UV_ARCHIVE)
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.) Blank if coming from UV_ARCHIVE.
37	1	Unit-values type code ('M'=measured, 'E'=edited, 'R'=data corrections, 'S'=shifts, and 'C'=computed)
38	1	Transport type code (used if coming from UV_ARCHIVE)('U'=Unspecified historical data, 'A'=ADR, 'E'=EDL, and 'S'=DCP (Satellite data).
39 – 50	12	Sensor_type_id (right-justified integer, always 0 for NWIS 4_2)

Record Type UF: 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 one 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 TM: Date-Time Record

```
Columns    Length    Description
------------------------------------------------------------------------
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 data aging code, used only if coming
                      from UV_ARCHIVE ('W'=Working, 'R'=in-Review, and
                      'A'=Approved records).
19 – 24       6       UTC offset for station in the format +/-HH:MM
                      (e.g. "-07:00") where:
                          HH  - Hours
                          MM  - Minutes
```

Record Type UA: 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 HHMMSSD
                       DDD...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 screen codes
                          B  - Blank space indicating end of codes.
```

Record Type UV: 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 DF: Daily Values - Fixed Interval

```
Columns  Length  Description
------------------------------------------------------------------------
1 - 2       2      Record Type = DF
3           1      BLANK
4 - 6       3      Number of daily values in the 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 represents
                    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: 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  - Minute 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.
```

6.4 RDB Format

by Glenn B. Engel

There are man pages describing the RDB format and separate man pages that give information on each operator used in the RDB system that the user can access from the UNIX command line by typing “man rdb.” Each man page has detailed instructions for use, and examples are given for developing RDB tables.

This document will describe RDB in a general way and describe the data outputs from NWIS for the various data types including the NWIS comments at the top of the RDB table. RDB is a simple format for tabular data and a collection of data management programs using the format. RDB is a fast, portable, relational database management system without arbitrary limits, other than memory and processor speed that runs under and interacts with the UNIX Operating System.

6.4.1 General Data Tables

The data is contained in regular UNIX ASCII files, and can be manipulated by regular UNIX utilities such as ls, wc, mv, cp, cat, more, text editors, head, RCS, etc. Each file of data is in the form of a relation, or table, with rows and columns of information. The relation, or table structure, is achieved by separating the columns with ASCII TAB characters, and terminating the rows with an ASCII NEWLINE character. All rows in a file of data contain data separated by TAB characters and terminated with NEWLINE characters; therefore the data must not contain TAB characters.

Each data file consists of zero or more comment lines starting with a sharp character, “#,” followed by a header consisting of two lines containing structure definition information used by the operators, and zero or more lines of data which are referred to as the body. A file of data, structured as defined above, is said to be an RDB table.

6.4.2 NWIS Data Tables

Any comment that starts with “**# //,**” is an NWIS comment. Right after the “//” is a keyword that identifies what kind of NWIS data this line is. If it takes more than one line to hold all the data, then the keyword is repeated on the next line. Everything else on the line is a set of keyword=value pairs, separated by blanks. The values have to be double quoted if they contain embedded blanks, otherwise quoting is optional. The following is a sample comment block for DV data:

```
# //FILE TYPE="NWIS-I DAILY-VALUES" EDITABLE=NO
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS Data"
# //STATION AGENCY="USGS " NUMBER="88110553       " TIME_ZONE="MST"
    DST_FLAG=Y
# //STATION NAME="Scott Bartholoma Test Site at Magna, Utah"
# //DD DDID="   2" RNDARY="0222233332" DVABORT=120
# //DD LABEL="DISCHARGE, IN CFS"
# //PARAMETER CODE="00060" SNAME="DISCHARGE"
# //PARAMETER LNAME="DISCHARGE, CUBIC FEET PER SECOND"
# //STATISTIC CODE="00003" SNAME="MEAN"
# //STATISTIC LNAME="MEAN VALUES"
# //RANGE START="20001001" END="20010331"
```

Daily-Values RDB table

- The FILE record documents the RDB file.
- The DATABASE record documents the number and description of the database from which the data came.
- The STATION record contains information about the site the data came from and takes up two lines. The value pairs are for: agency, station number, time-zone code, daylight-savings time flag, and station name.
- The DD record contains DD information and also takes up two lines. The value pairs are for: data-descriptor ID, DD rounding array, Daily-Values abort limit, and DD label.
- The PARAMETER record contains the parameter information and also takes up two lines. The value pairs are for: parameter code, parameter short name, parameter long name.
- The STATISTIC record contains information about the statistics and also takes up two lines. The value pairs are for: statistic code, statistic short name, and statistic long name.
- The RANGE record documents the start and end dates (in YYYYMMDD format) requested for the retrieval. This date range may be larger than the actual period covered by the data lines.
- After the comments and NWIS "header" described above, the table has the RDB header lines and data as indicated in the example below:

```
DATE     TIME   VALUE  PRECISION   REMARK  FLAGS  TYPE  QA
8D     6S    16N    1S     1S     32S    1S    1S
20001001          5220   3              C     W
20001002          4870   3              C     W
20001003          4630   3              C     W
20001004          4370   3              C     W
```

The fields in the first row of the header contain the names of each column. The column names define the data in that column. The fields in the second row contain the data definitions and optional documentation for each column. The actual data starts in the third line.

The data definitions in the second line include column width, data type, and justification. The column width must be specified; the others are optional. The data definitions take the form of adjacent characters in a single word.

The width of each field is specified by a numeric count. The type of data is “string,” “numeric,” or “month.” The types are specified by an “S,” “N,” or “M,” respectively. Default is type string. If not specified, types string and month will be left justified and type numeric will be right justified. It is important to note that only actual data is stored in the data fields, with no leading or trailing space characters. This fact can have a major effect on the size of the resulting files.

In the example above, the first column in the data line contains the date, using eight character spaces and a specific type designation “D” for the date that is used so that graphics programs can recognize dates. The second column contains the time with six spaces in the string, but there is no time designated, as these are Daily-Values. The third column contains the discharge value, with up to 16 numerical characters. The fourth column contains the precision code of three-place rounding. The fifth column contains a remark code, if present. The sixth column contains a definition of a flag on the data, which can be a 32-character string. The seventh column contains the data type, which is “computed” in this case and is a single character string. The eighth column contains the quality-assurance flag, which shows that the data is in “Working” status.

6.4.3 Unit Values RDB Table

The following is an example of an RDB table retrieved for Unit-Values. Differences from the Daily-Values table are that there is an NWIS comment line “TYPE” with the CODE=C for computed Unit-Values. In the data lines, times are listed and a column headed TZCD, which indicates the time zone code, in this case EST (Eastern Standard Time).

```
# //FILE TYPE="NWIS-I UNIT-VALUES" EDITABLE=NO
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS Data"
# //STATION AGENCY="USGS " NUMBER="01010000       "
TIME_ZONE="EST" DST_FLAG=Y
# //STATION NAME="St. John River at Ninemile Bridge, Maine"
# //DD DDID="   1" RNDARY="0222233332" DVABORT=120
# //DD LABEL="DISCHARGE (well-DCP), in CFS"
# //PARAMETER CODE="00060" SNAME="DISCHARGE"
# //PARAMETER LNAME="DISCHARGE, CUBIC FEET PER SECOND"
# //TYPE CODE=C NAME=COMPUTED
# //RANGE START="20010101000000" END="20010110235959"
ZONE="LOC"
DATE    TIME    TZCD    VALUE   PRECISION     REMARK  FLAGS   QA
8D      6S      6S      16N     1S      1S      32S     1S
20010101        000000  EST     5390    3               W
20010101        001500  EST     5390    3               W
20010101        003000  EST     5390    3               W
20010101        004500  EST     5390    3               W
```

6.4.4 Measurement RDB Table

The following is an example of an RDB table retrieved for discharge measurements. The column names and data are the same as in the ADAPS measurement summary tables.

```
# //FILE TYPE="NWIS-I DISCHARGE MEASUREMENTS"
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS Data"
# //STATION AGENCY="USGS " NUMBER="01010000       "
TIME_ZONE="EST" DST_FLAG=Y
# //STATION NAME="St. John River at Ninemile Bridge, Maine"
# //RANGE START="20001001" END="99999999"
NUMBER  DATE    TIME    PARTY   WIDTH   AREA    VELOCITY    IGH
OGH     Q1      QCODE1  Q2      QCODE2  RATING  SHIFT   PCTDIF  NSE
CT      GHCHGF  GHCHGT  RATED   AIRT    WATERT  CONTROL MSTYPE
BASEFLOW        REMARKS
8S      8D      4S      8S      12N     12N     12N     12N     12N     12N     10S     12N
10S     12N     12N     12N     6N      12N
12N     2S      12N     12N     10S     10S     2S      100S
318     20010108        1710    TCS/JMC 385     670     1.63            1090
MEASURED                0.00
39      0.00    1.2     F       ICE COVER       ICE     100% ice cover on  control; GH = 3.75
319     20010319        1716    TCS/GRS 415     419     1.01    425     MEASURED        0.00
37      0.00    1.0     F       ICE COVER       ICE             100% ice cover; cfsm=.32
320     20010604        1150    TCS     422     1880    2.23    4.00    4.00    4190    MEASURED
5.0     0.00    0.0     32      0.00    1.8     G               CLEAR   CABLEWAY
```

6.4.5 Expanded Rating RDB Table

The following is an example of an RDB table retrieval of an expanded rating table. The NWIS comment lines unique to rating table retrievals are the RATING ID and TYPE and NAME, RATING REMARKS, RATING EXPANSION, both INDEPENDENT and DEPENDENT PARAMETER rounding arrays, and RATING_DATETIME with BEGIN and END times with corresponding time zone codes BZONE and EZONE.

```
# //FILE TYPE="NWIS RATING"
# //STATION AGENCY="USGS " NUMBER="01010000       "
 TIME_ZONE="EST"    DST_FLAG=Y
# //STATION NAME="St. John River at Ninemile Bridge, Maine"
# //DD NUMBER="   1" LABEL="DISCHARGE (well-DCP), in CFS"
# //PARAMETER CODE=""
# //RATING ID=" 5.0" TYPE="STGQ" NAME="stage-discharge"
# //RATING REMARKS="New low end and refinement of high end of rating 4"
# //RATING EXPANSION="logarithmic"
# //RATING_INDEP ROUNDING="0223456782" PARAMETER="GAGE
 HEIGHT in (FEET)"
# //RATING_DEP ROUNDING="0222233332" PARAMETER="DISCHARGE
 in CFS"
# //RATING_DATETIME BEGIN=19931001010000 BZONE=EDT
 END=23821230190000 EZONE=EST
INDEP   DEP    STOR
16N     16N    1S
0.50    80     *
0.51    82
0.52    85
0.53    87
0.54    90
0.55    92
0.56    95
0.57    97
0.58    100
0.59    102
0.60    105
0.61    107
0.62    110    *
```

The data lines consist of the independent parameter, gage height, and the dependent parameter, discharge, with the stored points indicated with an asterisk. An RDB table consisting of only the stored rating points can be retrieved from ADAPS also.

6.4.6 Peak-Flows RDB Table

The following is an example of an RDB table retrieved for peak flows. The values for RANGE start, 00000000, and end dates, 99999999, indicate that the entire period of the record was requested.

```
# //FILE TYPE="NWIS-I PEAK FLOWS"
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS
Data"
# //STATION AGENCY="USGS " NUMBER="01010000       "
TIME_ZONE="EST" DST_FLAG=Y
# //STATION NAME="St. John River at Ninemile Bridge, Maine"
# //RANGE START="00000000" END="99999999"
QDATE   QTIME   QVALUE  QQUALS  QGH    QGHQUALS
YEAR_LAST_PEAK  GHDATE  GHTIME  GHVALUE GHQUALS
8N     6N     8N     12S    8N     4S     4N     8N     6N     8N     4S
```

The column names for the data lines are: QDATE, peak discharge date; QTIME, peak discharge time, QVALUE, peak discharge; QQUALS, peak discharge qualification codes; QGH, gage height of peak discharge; QGHQUALS, gage height qualification codes; YEAR_LAST_PEAK, recorded peak is highest since listed year; GHDATE, date of maximum gage height if different than gage height of peak discharge, GHTIME; time of maximum gage height; GHVALUE, maximum gage height; GHQUALS, maximum gage height qualification codes.

6.4.7 Shift RDB table

The following is an example of an RDB table retrieval for shifts. The DD used for retrieval is the discharge DD because the rating is tied to the discharge but the parameter that the shifts are applied to is the gage height.

```
# //FILE TYPE="NWIS-I SHIFTS"
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS Data"
# //STATION AGENCY="USGS " NUMBER="01010500       "
TIME_ZONE="EST"   DST_FLAG=Y
# //STATION NAME="St. John River at Dickey, Maine"
# //DD DDID="   5" RNDARY="0223456782"
# //DD LABEL="DISCHARGE, IN CFS"
# //PARAMETER CODE="00065" SNAME="GAGE HEIGHT"
# //PARAMETER LNAME="GAGE HEIGHT, FEET"
# //RANGE START="19991001" END="20011030"
RATCD   RATNO   SEQ    BEGDATE BEGTIME BEGTZCD ENDDATE
ENDTIME ENDTZCD INDEP   SHIFT
      3N     5S     5S     8D     6S     6S     8D     6S     6S     16N    16N
      STGQ   14.0   1     20000426     234500  EDT                  0.00
0.00
      STGQ   14.0   2     20000426     234500  EDT                  4.00
0.00
      STGQ   14.0   3     20000426     234500  EDT                  5.00
0.00
      STGQ   14.0   1     20000427     000000  EDT                  0.00   -
0.06
      STGQ   14.0   2     20000427     000000  EDT                  4.00   -
0.06
      STGQ   14.0   3     20000427     000000  EDT                  5.00
0.00
```

The data lines are in sets of three for each variable shift entry indicating the three points of the shift diagram. The first entry is the rating code STGQ for stage-discharge and then the rating number. The variable shifts are in three consecutive lines with sequence numbers 1 through 3, begin date and time, time-zone code, end date and time with time-zone code (there are no entries for end dates in this example), independent variable, gage height, for the three diagram points, and the three shifts at the gage height points.

6.4.8 Data Corrections RDB table

The following is an example of an RDB table retrieved for data corrections. The NWIS comments have been explained in earlier examples. The data corrections are applied to the input DD such as the gage height in NWIS.

```
# //FILE TYPE="NWIS-I DATA CORRECTIONS"
# //DATABASE NUMBER=1 DESCRIPTION=" Montana District NWIS Data"
# //STATION AGENCY="USGS " NUMBER="01010500       "
TIME_ZONE="EST" DST_FLAG=Y
# //STATION NAME="St. John River at Dickey, Maine"
# //DD DDID="   2" RNDARY="0223456782"
# //DD LABEL="GAGE HEIGHT Cross-section:      590.0, in (FEET)"
# //PARAMETER CODE="00065" SNAME="GAGE HEIGHT"
# //PARAMETER LNAME="GAGE HEIGHT, FEET"
# //RANGE START="19991001" END="20011030"
SET     SEQ     BEGDATE BEGTIME BEGTZCD ENDDATE ENDTIME
ENDTZCD INDEP   CORR
3N      3N      8D      6S      6S      8D      6S      6S      16N     16N
1       1       20000320        130800  EST                             0.00    0.00
1       1       20000815        080500  EDT     20000815        080600  EDT     0.00
-0.01
1       1       20010416        120000  EDT                             0.00    -0.19
1       1       20010516        163000  EDT                             0.00    -0.19
        1       1       20010601        073000  EDT                             0.00    0.00
        1       2       20010601        073000  EDT                             2.00    -0.02
        1       3       20010601        073000  EDT                             5.00    -0.04
        2       1       20010601        073000  EDT                             0.00    0.00
        2       2       20010601        073000  EDT                             2.00    0.02
        2       3       20010601        073000  EDT                             5.00    0.10
        3       1       20010601        073000  EDT                             0.00    0.00
        3       2       20010601        073000  EDT                             2.00    0.00
        3       3       20010601        073000  EDT                             5.00    -0.15
```

The data lines include the set number, sequence number, begin date and time and time-zone code, end date and time and time-zone code (if available), and the stage and data correction pair. In the example, on June 1, 2001, there are three data correction diagrams of three points each, hence the three sets labeled 1 through 3 and the three data-correction pairs for each set with sequence numbers 1 through 3. In ADAPS, set 1 is designated Gage Height Corrections, set 2, Datum Corrections from Levels; and set 3, Other Corrections.