

Table of Contents

List of Figures	xv
List of Tables	xxiii
Foreword	xxv

Chapters

1 Introduction

1.1 Overview of the HEC Data Storage System	1-1
1.1.1 Background	1-1
1.1.2 HEC-DSS Contrasted with Other Database Systems	1-2
1.2 General Concepts for HEC-DSS	1-3
1.2.1 Pathnames	1-4
1.2.2 Catalogs	1-5
1.2.3 Data Conventions	1-5
1.3 Time Series Conventions	1-6
1.3.1 Default Pathname Parts.....	1-7
Part A - Group	1-7
Part B - Location.....	1-7
Part C - Parameters.....	1-7
Part D – Block Start Date.....	1-8
Part E – Time Interval or Block Length	1-8
Part F - Descriptor	1-9
1.3.2 Regular-Interval Time Series Conventions	1-9
Part D – Block Start Date.....	1-9
Part E – Time Interval.....	1-9
1.3.3 Irregular-Interval Time Series Conventions.....	1-10
Part D – Block Start Date.....	1-11
Part E – Time Interval.....	1-11
1.4 Paired Data (Curve Data) Conventions	1-11
Part A - Group	1-12
Part B - Location.....	1-12
Part C - Parameters.....	1-12
Part D – Optional Descriptor	1-12
Part E – Time Descriptor	1-12
Part F – General Descriptor	1-12
1.4 Text Data Conventions.....	1-13
1.6 General FILE Conventions.....	1-13
Part A - Group	1-13
Part B - Location.....	1-13
Part C – File Name	1-13
Part D – Meta Data Type	1-14
Part E – File Extension	1-14
Part F – General Descriptor	1-14

Table of Contents

Chapters

2 Using HEC-DSSVue: An Overview

2.1 HEC-DSSVue Main Window	2-1
2.1.1 Menu Bar	2-2
2.1.2 Tool Bar	2-3
2.1.3 File Tabs	2-4
2.1.4 Current File Name	2-4
2.1.5 Search Boxes	2-4
2.1.6 List of HEC-DSS Pathnames	2-5
2.1.7 Selected Pathnames	2-6
2.1.8 Selection Buttons	2-6
2.2 Message Bar	2-7
2.3 Drag and Drop	2-8
2.4 File Menu Operations	2-9
2.4.1 Creating a New HEC-DSS File	2-9
2.4.2 Opening an HEC-DSS File	2-10
2.4.3 Closing an HEC-DSS file	2-11
2.4.4 Printing the Catalog	2-11
2.4.5 Exiting HEC-DSSVue	2-12
2.5 View Catalog	2-13
2.5.1 Choosing a Display Mode for HEC-DSS Pathnames	2-13
2.5.2 Searching and Filtering HEC-DSS Pathnames	2-14
Searching Pathname Strings	2-14
Filtering HEC-DSS Pathnames by Parts	2-15
2.5.3 Refreshing the Catalog	2-13
2.6 Selecting Pathnames	2-15
2.7 De-Selecting Pathnames	2-16
2.8 Visualizing HEC-DSS Data with Plots and Tables	2-16
2.9 Groups	2-17
2.9.1 Creating and Saving Groups	2-18
2.9.2 Selecting Groups	2-19
2.9.3 Plotting Groups	2-19
2.9.4 Tabulate Groups	2-20
2.9.5 Math Groups	2-20
2.9.6 Manage Groups	2-21
2.10 Data Entry	2-21
2.11 Utilities	2-21
2.12 Custom and Scripting Menus	2-22
2.13 Plug-Ins	2-22

3 Displaying & Editing Data

3.1 Setting a Time Window	3-1
3.2 Display Data Options	3-3
3.3 Viewing Tabular Data	3-4
3.3.1 Accessing Tables	3-5
3.3.2 Customizing the Display of Tabular Data	3-5
3.3.3 Searching for Values	3-6

Table of Contents

Chapters

3 Displaying & Editing Data (continued)	
3.4 Editing Tabular Data	3-8
3.4.1 Selecting Table Cells.....	3-8
3.4.2 Cutting & Pasting Data	3-8
3.4.3 Copying & Pasting Data.....	3-9
3.4.4 Clearing Table Cells	3-9
3.4.5 Adding & Inserting Rows	3-10
3.4.6 Deleting Rows & Columns	3-12
3.5 Printing, Copying, & Exporting Tables.....	3-12
3.5.1 Printing Tables	3-12
3.5.2 Exporting Tables	3-14
3.5.3 Copying Tables to the Clipboard for Use in Other Applications	3-15
3.5.4 Tabulate & Editing Using MS Excel (Optional).....	3-15
3.6 Graphical Editing.....	3-17
3.6.1 Graphical Editor Tools & Buttons.....	3-19
3.6.2 Editing a Curve with the Line Draw Tool.....	3-20
3.6.3 Editing a Point with the Single-Point Edit Tool	3-20
3.6.4 Editing Data in the Table	3-21
3.6.5 Printing the Table & Graph	3-23
3.6.6 Graphical Editor View Options.....	3-25
3.7 Supplemental Information	3-25
4 Utilities	
4.1 Renaming HEC-DSS Data in HEC-DSSVue	4-1
4.2 Deleting Records	4-2
4.3 Undoing Deletions.....	4-2
4.4 Duplicating Records.....	4-3
4.5 Copying Records into Another HEC-DSS File.....	4-4
4.6 Merging HEC-DSS Files	4-5
4.7 Comparing Data Sets.....	4-6
4.8 Comparing HEC-DSS Files.....	4-9
4.9 Searching for a Value	4-12
4.10 Checking File Integrity	4-13
4.11 Squeezing an HEC-DSS File	4-15
4.12 Scripting.....	4-16
4.13 Catalogs	4-17
4.13.1 Condensed Disk Catalog.....	4-18
4.13.2 Abbreviated Disk Catalog	4-19
4.13.3 Full Disk Catalog	4-20
4.14 Viewing the Console Output.....	4-21
4.15 Viewing HEC-DSS File Output.....	4-22
4.15.1 Program Options	4-23

Table of Contents

Chapters

4 Utilities (continued)

4.16 Advanced Functions	4-24
4.16.1 Memory Monitor	4-24
4.16.2 Open List of HEC-DSS Files.....	4-24
4.16.3 Viewing the DSS Header List	4-25
4.16.4 HEC-DSS File Internals.....	4-25
Message Levels.....	4-26
DSS ZSET	4-26
DSS ZINQIR.....	4-26
Debug/Examine File	4-26

5 Data Entry, Import & Export

5.1 Entering Data Manually.....	5-1
5.1.1 Entering Time Series Data Manually	5-1
5.1.2 Entering Paired Data Manually	5-4
5.1.3 Manual Text Entry	5-5
5.2 Import/Export Files.....	5-7
5.2.1 Import Text Files.....	5-7
5.2.2 Exporting Text Files.....	5-8
5.2.3 Import Image & Generic Files	5-8
5.2.4 Exporting Image & Generic Files	5-11
5.3 Importing an Exporting SHEF Data	5-12
5.3.1 SHEF Table Files	5-12
SHEFPARM	5-13
Parameter File - shfdssp.....	5-13
Sensor File - shfdsss	5-14
5.3.2 Importing SHEF Data	5-14
5.3.3 Exporting SHEF.....	5-16
5.4 Importing & Exporting Microsoft Excel and ".csv" Data.....	5-16
5.4.1 Exporting Data to Microsoft Excel.....	5-17
5.4.2 Editing Data in Microsoft Excel	5-18
5.4.3 Importing Data from Microsoft Excel or ".csv" Files using Data Entry	5-18
5.4.4 Importing Data from Microsoft Excel or ".csv" Files using Time Series Wizard.....	5-21
5.5 Retrieving and Importing USGS (NWIS) Data	5-25
5.6 Importing NCDC Data	5-28
5.6.1 Obtaining NCDC Data	5-28
5.6.2 Recognized NCDC Formats	5-29
5.6.3 Importing	5-32
5.7 Retrieving and Importing CDEC Data.....	5-33
5.8 Importing and Importing DSSUTL Format	5-35
5.8.1 Importing DSSUTL Data.....	5-36
5.8.2 Exporting Data to DSSUTL.....	5-37
5.9 Importing North Carolina DWR CRONOS Data.....	5-37

Table of Contents

Chapters

6 Customizing Plots

6.1 Customizing Plots: Overview.....	6-2
6.2 Using Plot Editors	6-3
6.2.1 Setting Defaults vs. Customizing Individual Plots	6-3
6.2.2 Accessing Editors.....	6-4
6.3 Plot Editors and Tools.....	6-5
6.3.1 Plot Properties Editor.....	6-5
6.3.2 Individual Plot Property Editors.....	6-5
6.3.3 Configure Plot Editor	6-7
6.3.4 Default Line Styles Options Editor	6-8
6.3.5 Default Plot Properties Editor	6-8
6.4 Customizing Plot Titles.....	6-9
6.5 Customizing Curves.....	6-11
6.5.1 Customizing Curves in Individual Plots	6-11
6.5.2 Specifying Parameter-Based Default Curve Styles	6-12
6.5.3 Adding New Data Styles.....	6-13
6.5.4 Specifying Line and Point Styles of Curves.....	6-14
6.5.5 Customizing Curve Labels.....	6-16
6.5.6 Customizing Legend Items	6-17
6.5.7 Customizing Curve Quality Symbols.....	6-17
6.6 Customizing Viewport Properties	6-18
6.6.1 Customizing Viewport Borders & Background	6-18
6.6.2 Customizing Viewport Gridlines	6-19
6.7 Adding and Customizing Marker Lines.....	6-20
6.7.1 Adding Markers	6-21
6.7.2 Deleting Markers	6-21
6.7.3 Customizing Markers.....	6-21
6.7.4 Editing Callouts	6-23
6.8 Customizing Axes	6-24
6.8.1 Changing Axis Type	6-24
6.8.2 Specifying Axis Scale	6-25
6.8.3 Modifying Tic Marks.....	6-26
6.8.4 Customizing Axis Labels.....	6-28
6.9 Customizing Legends	6-30
6.9.1 Legend Title.....	6-31
6.9.2 Legend Blocks.....	6-32
6.9.3 Customizing Legend Items	6-34
6.10 Customizing Window Panels.....	6-35
6.10.1 Customizing the Panel Background Color	6-36
6.10.2 Customizing the Horizontal Spacer Size.....	6-36
6.10.3 Customizing the Window Size	6-37
6.11 Customizing Plot Layout	6-37
6.11.1 Adding and Removing Viewports.....	6-37
6.11.2 Setting Viewport Weights.....	6-38

Table of Contents

Chapters

6 Customizing Plots (continued)

6.11.3 Adding and Removing Axes	6-39
6.11.4 Arranging Viewports and Axes.....	6-39
6.11.5 Reversing Axes (Invert Data).....	6-40
6.12 Saving and Applying Templates.....	6-40
6.13 Additional Viewing options for Plots	6-41
6.13.1 Viewing Data in Tabular Form	6-41
6.13.2 Saving Plots	6-42
6.13.3 Copying Plots to the Clipboard	6-42
6.14 Printing Plots.....	6-42
6.15 Importing and Exporting Default Plot Properties.....	6-44
6.15.1 Exporting Default Plot Properties.....	6-44
6.15.2 Importing Default Plot Properties.....	6-45
6.16 Text substitution.....	6-46

7 Math Functions

7.1 Math Functions Screen	7-1
7.1.1 Menu Bar.....	7-1
7.1.2 Menu Bar Buttons.....	7-2
7.1.3 Other Math Feature of the Math Functions Screen	7-2
7.2 Managing Data	7-3
7.2.1 Selecting Paired Data curves for Functions Operations.....	7-3
7.3 Arithmetic Functions	7-5
7.3.1 Add.....	7-5
7.3.2 Subtract.....	7-7
7.3.3 Multiply.....	7-7
7.3.4 Divide	7-7
7.3.5 Exponentiation.....	7-8
7.3.6 Absolute Value	7-9
7.3.7 Square Root	7-9
7.3.8 Log.....	7-10
7.3.9 Log Base 10	7-10
7.3.10 Sine.....	7-11
7.3.11 Cosine	7-11
7.3.12 Tangent.....	7-12
7.3.13 Inverse	7-12
7.3.14 Accumulation.....	7-13
7.3.15 Successive Differences	7-13
7.3.16 Time Derivative	7-14
7.4 General Functions.....	7-14
7.4.1 Units Conversion	7-14
7.4.2 Set Units.....	7-15
7.4.3 Set Type.....	7-16
7.4.4 Round to Nearest Whole Number.....	7-16
7.4.5 Truncate to Whole Number.....	7-17

Table of Contents

Chapters

7 Math Functions (continued)

7.4.6 Round Off	7-18
7.4.7 Estimate Missing values	7-18
7.4.8 Replace Specific Values	7-19
7.4.9 Screen Using Minimum and Maximum	7-20
7.4.10 Screen with Forward Moving Average	7-21
7.4.11 Paired Data Operations	7-21
7.4.12 Merge Time Series	7-23
7.4.13 Merge Paired Data	7-23
7.4.14 Generate Data Pairs	7-24
7.5 Time Functions	7-25
7.5.1 Min/Max/Avg/... Over Period	7-25
7.5.2 Copy in Time	7-28
7.5.3 Shift in Time	7-29
7.5.4 Change Time Interval	7-30
7.5.5 Irregular to Regular	7-32
7.5.6 Regular to Irregular	7-35
7.5.7 To Irregular using Patter	7-36
7.5.8 Extract Time Series	7-38
7.6 Hydrologic Functions	7-40
7.6.1 Muskingum Routing	7-40
7.6.2 Straddle Stagger Routing	7-41
7.6.3 Modified Puls Routing	7-42
7.6.4 Rating Table	7-43
7.6.5 Reverse Rating Table	7-44
7.6.6 Two Variable Rating Table	7-45
7.6.7 Decaying Basin Wetness	7-47
7.6.8 Shift Adjustment	7-47
7.6.9 Period Constants	7-49
7.6.10 Multiple Linear Regression	7-50
7.6.11 Apply Multiple Linear Regression	7-51
7.6.12 Conic Interpolation	7-53
7.6.13 Polynomial	7-55
7.6.14 Polynomial with Integral	7-55
7.6.15 Flow Accumulator Gage Processor	7-56
7.7 Smoothing Functions	7-57
7.7.1 Centered Moving Average	7-58
7.7.2 Olympic Smoothing Average	7-60
7.7.3 Forward Moving Average	7-61
7.8 Statistics Functions	7-63
7.8.1 Basic	7-63
7.8.2 Linear Regression	7-64
7.8.3 Cyclic Analysis	7-66
7.8.4 Duration Analysis	7-68
7.8.5 Frequency Plot	7-73

Table of Contents

Chapters

8 Scripting

8.1 Executing Scripts	8-1
8.1.1 Script Menu	8-1
8.1.2 Main Toolbar	8-2
8.1.3 Script Selector	8-2
8.2 Script Editor	8-3
8.2.1 Menu Bar	8-4
File Menu Commands	8-4
Edit Menu Commands	8-4
Option Menu Commands	8-5
8.2.2 Editor Panel	8-5
Script Text Field Context Menu Commands	8-6
8.2.3 Tree Hierarchy	8-7
8.3 Scripting Basics	8-7
8.3.1 Outputting Text	8-7
8.3.2 Data Types	8-8
8.3.3 Operators	8-10
8.3.4 Comments	8-10
8.3.5 Program Lines	8-11
8.3.6 Conditional Expressions	8-11
8.3.7 Looping	8-12
Conditional Looping	8-13
Iterative Looping	8-13
8.3.8 Defining and Using Functions	8-14
8.3.9 Modules, Functions and Methods	8-14
8.3.10 Handling Exceptions	8-16
8.4 Displaying Messages	8-17
Displaying Message Dialogs	8-17
8.5 Headless and Batch Operation	8-18
8.5.1 Headless on Windows	8-18
8.5.2 Headless on UNIX	8-19
8.5.3 Running on Batch Mode	8-20
8.5.4 Modality with Scripts	8-21
8.6 Accessing the Main Program Window	8-22
8.6.1 ListSelection Class	8-23
8.6.2 DataReference Class	8-26
8.7 Reading and Writing to HEC-DSS Files	8-27
8.7.1 HecDss Class	8-27
8.7.2 HecDss Retrieve and Store Functions	8-28
Pattern Strings	8-28
Time Windows	8-35
8.8 DataContainer Class	8-37
8.8.1 TimeSeriesContainer Class	8-38
8.8.2 PairedDataContainer Class	8-41

Table of Contents

Chapters

8 Scripting (continued)

8.9	HECTime Class	8-42
8.10	Plotting Basics	8-46
8.10.1	Plot Class	8-47
8.10.2	Changing Plot Component Attributes	8-47
8.10.3	G2dDialog Class	8-47
8.10.4	PlotLayout Class	8-51
8.10.5	ViewportLayout Class	8-51
8.10.6	Viewport Class	8-54
8.10.7	AxisMarker Class	8-57
8.10.8	Axis Class	8-58
8.10.9	AxisTics Class	8-60
8.10.10	G2dLine Class	8-62
8.10.11	G2dLabel, G2dTitle, and AxisLabel Classes	8-64
8.10.12	Templates	8-66
8.11	Plot Component Properties	8-66
8.11.1	Colors	8-67
8.11.2	Alignment	8-67
8.11.3	Positions	8-67
8.11.4	Rotation	8-67
8.11.5	Fill Patterns	8-67
8.11.6	Fill Types	8-67
8.11.7	Line Styles	8-68
8.11.8	Step Style	8-68
8.11.9	Symbol Types	8-68
8.12	Tables	8-68
8.12.1	Tabulate Class	8-68
8.12.2	HecDataTableFrame Class	8-69
8.13	TableExportOptions Class	8-73
8.14	HecMath Class	8-74
8.15	Math Functions	8-80
8.15.1	Absolute Value	8-80
8.15.2	Accumulation (Running)	8-81
8.15.3	Arccosine Trigonometric Function	8-81
8.15.4	Add a Constant	8-81
8.15.5	Add a Data Set	8-82
8.15.6	Apply Multiple Linear Regression Equation	8-82
8.15.7	Arcsine Trigonometric Function	8-84
8.15.8	Arctangent Trigonometric Function	8-84
8.15.9	Ceiling Function	8-84
8.15.10	Centered Moving Average Smoothing	8-85
8.15.11	Conic Interpolation from Elevation/Area Table	8-86
8.15.12	Convert Values to English Units	8-87
8.15.13	Convert Values to Metric (SI) Units	8-87
8.15.14	Correlation Coefficients	8-88

Table of Contents

Chapters

8 Scripting (continued)

8.15.15 Cosine Trigonometric Function	8-89
8.15.16 Cyclic Analysis (Time Series)	8-89
8.15.17 Decaying Basin Wetness Parameters.....	8-90
8.15.18 Divide by a Constant	8-91
8.15.19 Divide by a Data Set.....	8-91
8.15.20 Estimate Values for Missing Precipitation Data.....	8-92
8.15.21 Estimate Values for Missing Data	8-92
8.15.22 Exponent	8-93
8.15.23 Exponentiation Function	8-93
8.15.24 Exponentiation Timeseries Function.....	8-94
8.15.25 Extract Time Series Data at Unique Time Specification	8-94
8.15.26 First Valid Date.....	8-97
8.15.27 First Valid Value	8-97
8.15.28 Floor Function	8-97
8.15.29 Flow Accumulator Gage (Compute Period Average Flows).....	8-97
8.15.30 Modulo Functions with both Arguments are Greater than Zero	8-98
8.15.31 Forward Moving Average Smoothing.....	8-99
8.15.32 Forward Moving Average Smoothing of Time Series	8-99
8.15.33 Generate Pairs from Two Time Series.....	8-100
8.15.34 Generate a Regular Interval Time Series.....	8-101
8.15.35 Get Data Container.....	8-102
8.15.36 Get Data Type for Time Series Data Set	8-102
8.15.37 Get Units Label for Data Set.....	8-102
8.15.38 Gmean	8-103
8.15.39 Hmean.....	8-103
8.15.40 Integer Division by a Constant.....	8-104
8.15.41 Integer Division by an Object.....	8-104
8.15.42 Interpolate Time Series Data at Regular Intervals.....	8-105
8.15.43 Inverse (1/X) Function	8-106
8.15.44 Determine if Data is in English Units.....	8-106
8.15.45 Determine if Data is in Metric Units.....	8-107
8.15.46 Determine if Computation Stable for Given Muskingum Routing Parameters.....	8-107
8.15.47 Last Valid Value's Data and Time	8-108
8.15.48 Last Valid Value in a Time Series	8-108
8.15.49 Natural Log, Base "e" Function.....	8-108
8.15.50 Log Base 10 Function.....	8-109
8.15.51 Maximum Value in a Time Series	8-109
8.15.52 Maximum Value in a Time Series (<i>tsMathArray</i>).....	8-110
8.15.53 Maximum Value's Data and Time	8-110
8.15.54 Mean Time Series Value	8-110

Table of Contents

Chapters

8 Scripting (continued)

8.15.55 Mean Time Series Value (<i>tsMathArray</i>)	8-111
8.15.56 Median Time Series Value.....	8-111
8.15.57 Merge Paired Data Sets	8-112
8.15.58 Merge Two Time Series Data Sets	8-112
8.15.59 Minimum Value in a Time Series	8-113
8.15.60 Minimum Value in a Time Series (<i>tsMathArray</i>)	8-113
8.15.61 Minimum Value's Data and Time	8-114
8.15.62 Modified Puls or Working R&D Routing Function.....	8-114
8.15.63 Modulo	8-115
8.15.64 Module (<i>tsMath</i>)	8-115
8.15.65 Multiple Linear Regression Coefficients.....	8-116
8.15.66 Multiple by a Constant	8-117
8.15.67 Multiply by a Data Set.....	8-117
8.15.68 Muskingum Hydrologic Routing Function.....	8-118
8.15.69 Negation Function	8-118
8.15.70 Number of Invalid Values in a Time Series	8-119
8.15.71 Number of Missing Values in a Time Series	8-119
8.15.72 Number of Questioned Values in a Time Series	8-119
8.15.73 Number of Rejected Values in a Time Series	8-119
8.15.74 Number of Valid Values in a Time Series	8-120
8.15.75 Olympic Smoothing	8-120
8.15.76 P1 Function	8-121
8.15.77 P2 Function	8-121
8.15.78 P5 Function	8-122
8.15.79 P10 Function	8-123
8.15.80 P20 Function	8-123
8.15.81 P25 Function	8-124
8.15.82 P75 Function	8-124
8.15.83 P80 Function	8-125
8.15.84 P89 Function	8-126
8.15.85 P90 Function	8-126
8.15.86 P95 Function	8-127
8.15.87 P99 Function	8-127
8.15.88 Period Constants Generation	8-128
8.15.89 Polynomial Transformation	8-129
8.15.90 Polynomial Transformation with Integral	8-129
8.15.91 Product Function	8-130
8.15.92 Rating Table Interpolation.....	8-130
8.15.93 Replace Specific Values	8-131
8.15.94 Reverse Rating Table Interpolation	8-131
8.15.95 RMS Function.....	8-132
8.15.96 Round to Nearest Whole Number.....	8-133
8.15.97 Round Off to Specified Precision	8-133
8.15.98 Screen for Erroneous Values Based on Constant Value....	8-134

Table of Contents

Chapters

8 Scripting (continued)

8.15.99 Screen for Erroneous Values Based on Duration Magnitude	8-135
8.15.100 Screen for Erroneous Values Based on Forward Moving Average.....	8-136
8.15.101 Screen for Erroneous Values Based on Forward Moving Average (Missing Values).....	8-137
8.15.102 Screen for Erroneous Values Based on Maximum/ Minimum Range (Missing Values)	8-138
8.15.103 Screen for Erroneous Values Based on Maximum/ Minimum Range	8-140
8.15.104 Screen for Erroneous Values Based on Maximum/ Minimum Range (Quality)	8-140
8.15.105 Screen for Erroneous Values Based on Maximum/ Minimum Range (Limits).....	8-141
8.15.106 Screen for Erroneous Values Based on Rate of Change.....	8-142
8.15.107 Select a Paired Data Curve by Curve Label.....	8-143
8.15.108 Select a Paired Data Curve by Curve Number.....	8-143
8.15.109 Set Data Container	8-144
8.15.110 Set Location Name for Data Set	8-144
8.15.111 Set Parameter for Data Set	8-144
8.15.112 Set Pathname for Data Set.....	8-145
8.15.113 Set Time Interval for Data Set.....	8-145
8.15.114 Set Data Type for Time Series Data Set.....	8-145
8.15.115 Set Units Label for Data Set	8-146
8.15.116 Set Version Name for Data Set.....	8-146
8.15.117 Set Watershed Name for Data Set	8-146
8.15.118 Shift Adjustment of Time Series Data	8-147
8.15.119 Shift Time Series in Time.....	8-147
8.15.120 Sign Function	8-148
8.15.121 Sine Trigonometric Function.....	8-148
8.15.122 Skew Coefficient.....	8-148
8.15.123 Snap Irregular Times to Nearest Regular Period	8-149
8.15.124 Square Root	8-150
8.15.125 Standard Deviation of Time Series	8-150
8.15.126 Standard Deviation of Time Series (<i>tsMathArray</i>).....	8-151
8.15.127 Straddle Stagger Hydrologic Routing.....	8-151
8.15.128 Subtract a Constant.....	8-152
8.15.129 Subtract a Data Set	8-152
8.15.130 Successive Differences for Time Series	8-153
8.15.131 Sum Values in Time Series	8-153
8.15.132 Sum Values in Time Series (<i>tsMathArray</i>)	8-153
8.15.133 Tangent Trigonometric Function	8-154
8.15.134 Time Derivative (Difference per Unit Time)	8-154
8.15.135 Transform Time Series to Regular Interval	8-155

Table of Contents

Chapters

8 Scripting (continued)

8.15.136 Transform Time Series to Irregular Interval.....	8-156
8.15.137 Truncate to Whole Numbers.....	8-158
8.15.138 Two Variable Rating Table Interpolation.....	8-158
8.15.139 Variable Function.....	8-160

Appendices

Appendix A Additional Plug-Ins

A.1 Introduction.....	A-1
A.2 Pie Charts.....	A-1
A.2.1 Creating a Pie Chart.....	A-2
A.2.2 Date/Time.....	A-2
A.2.3 Chart Dimension.....	A-3
A.2.4 Sort Type.....	A-4
A.2.5 Sort Order.....	A-4
A.2.6 Transparency.....	A-5
A.2.7 Section Colors.....	A-5
A.2.8 Printing and Saving.....	A-5
A.3 North Carolina DWR Duration Hydrograph.....	A-6
A.3.1 Introduction.....	A-6
A.3.2 Use.....	A-8

Appendix B Writing Plug-Ins

B.1 Introduction.....	B-1
B.2 Code Overview.....	B-2
B.3 Procedure.....	B-2
B.4 Generic DssVuePlugin Source.....	B-4
B.5 Primary Functions.....	B-5
B.5.1 ListSelection Functions.....	B-5
B.5.2 DSSPathname.....	B-6
B.5.3 TimeSeriesContainer.....	B-7
B.5.4 PairedDataContained.....	B-8
B.5.5 HecTime.....	B-9
B.5.6 HecDouble.....	B-10
B.5.7 HecDoubleArray.....	B-10
B.6 ToTextPlugin.....	B-11

Table of Contents

Appendices

Appendix C Example Scripts

C.1 Introduction	C-1
C.2 Sample Math Scripts	C-1
C.3 Sample Import and Export Scripts	C-3
C.3.1 Manually Entry Scripts	C-3
C.3.2 SHEF Import/Export Scripts	C-4
C.3.3 Exporting to Excel	C-5
C.3.4 Importing Other Functions	C-7
C.3.5 Sample Graphics Scripts	C-7
C.4 Sample Table Script	C-11
C.5 Complex Graphics Scripts	C-12
C.5.1 Coyote Valley Dam Reservoir Plot	C-12
C.5.2 Scripts with Arguments	C-15

List of Figures

Figure Number

2.1	HEC-DSSVue Main Window	2-1
2.2	HEC-DSSVue Menu Bar	2-2
2.3	File Tabs.....	2-4
2.4	File Name Box	2-4
2.5	View Menu.....	2-5
2.6	Search Pathnames by String	2-5
2.7	Search Pathname by Parts	2-5
2.8	List of HEC-DSS Pathnames by Parts	2-6
2.9	Selected Pathnames.....	2-6
2.10	Select, De-Select, Clear Selections, Restore Selections, and Set Time Window Buttons.....	2-7
2.11	Message Bar	2-7
2.12	Copying Data from One DSS File to Another Using Drag and Drop	2-8
2.13	Create New HEC-DSS File dialog Box.....	2-9
2.14	Open HEC-DSS File Browser	2-10
2.15	Properties Dialog Box	2-11
2.16	Print Preview Dialog Box	2-12
2.17	HEC-DSSVue – Data Selection List Window, Pathname List Displayed	2-13
2.18	HEC-DSSVue – Data Selection List Window, Pathname Parts Displayed.....	2-13
2.19	HEC-DSSVue – Data Selection List Window, Condensed Catalog Displayed.....	2-13
2.20	HEC-DSSVue – Data Selection List Window, Unsorted List Displayed	2-13
2.21	Search Pathname Box	2-15
2.22	Selecting Pathname Parts	2-15
2.23	Example Plot and Table.....	2-17
2.24	Input Dialog Box	2-18
2.25	Saved Group Message	2-18
2.26	Group Submenus.....	2-18
2.27	Group Plot	2-19
2.28	Individual Data Set Plot.....	2-20
2.29	Manage Groups Editor.....	2-21
3.1	Set Time Window Dialog Box.....	3-2
3.2	Calendar Tool	3-2
3.3	Normalized & Time Synched Precipitation Data for Years 1986 & 1995	3-4
3.4	Example Tabulation from HEC-DSSVue	3-4
3.5	HEC-DSSVue Tables have Several Options for Displaying Data	3-6
3.6	Tabulate Edit Menu.....	3-6
3.7	Find Dialog Box	3-6
3.8	Compare Data Sets	3-7
3.9	Display of the Number of Values that Vary.....	3-7
3.10	Comparison of Two Data Sets	3-7
3.11	Edit Menu – Allow Editing	3-8
3.12	Shortcut Menu	3-8
3.13	Extend Data Set Dialog Box for Regular Interval Data	3-10

List of Figures

Figure Number

3.14	Extend Data Set Dialog Box for Irregular Interval Data	3-11
3.15	Insert Rows Dialog Box.....	3-11
3.16	Delete Column Message Box.....	3-12
3.17	File Menu – Tabulate Dialog Box	3-12
3.18	Print Shortcut Menu	3-13
3.19	Properties Dialog Box - Printing	3-13
3.20	Print Preview dialog Box - Table	3-14
3.21	Table Export Options Dialog Box	3-14
3.22	Edit Menu – Table Dialog Box.....	3-15
3.23	Shortcut Menu - Copy.....	3-15
3.24	Tabular Data Exported to Excel	3-16
3.25	Graphical Editing	3-17
3.26	Shortcut Menu Table Fill.....	3-22
3.27	Properties Dialog Box – Printing Tables.....	3-23
3.28	Page Setup Dialog Box.....	3-24
3.29	Printer Margins Dialog Box	3-24
3.30	Location & Supplemental Information Dialog Box	3-25
4.1	Rename Records to: Dialog Box.....	4-1
4.2	Undelete Records Dialog Box.....	4-3
4.3	New Pathname Parts for Duplicate Records: Dialog Box.....	4-3
4.4	Copy Records into HEC-DSS File Browser.....	4-5
4.5	Message Box – Overwriting Existing Records.....	4-5
4.6	Merge (Copy All Records) into HEC-DSS File	4-5
4.7	Edit Menu	4-6
4.8	Number of Different Values.....	4-6
4.9	Highlight of Differences Between Two Data Sets.....	4-7
4.10	Compare Data Sets Message Box.....	4-7
4.11	Display Only the Differences in the Data Set	4-8
4.12	Compare Options Dialog Box.....	4-8
4.13	Compare Data Sets Message Box.....	4-9
4.14	File Comparison Result Message Box	4-10
4.15	Comparing Files – List of Records that are Different Between Files.....	4-10
4.16	Compare Record Dialog Box	4-10
4.17	Compare Options dialog Box	4-11
4.18	Comparison of Data Sets.....	4-11
4.19	Enter Value to Search for Dialog Box.....	4-12
4.20	Found Values Message Box	4-12
4.21	Found Values from Search	4-13
4.22	Database Integrity Check Dialog Box.....	4-14
4.23	Status Report Message Window	4-14
4.24	Error from Database Integrity Check.....	4-15
4.25	Status Report Message After Data Sets are Deleted	4-15

List of Figures

Figure Number

4.26	Squeeze Confirmation Window	4-16
4.27	Script Editor	4-16
4.28	Script Selector Dialog Box	4-17
4.29	Catalog File Update Message Box.....	4-18
4.30	Condensed Catalog Text Output.....	4-18
4.31	Print Dialog Box	4-19
4.32	Abbreviated Catalog Text Output.....	4-20
4.33	Full Disk Catalog Text Output	4-21
4.34	Console Output Dialog Box.....	4-22
4.35	DSS Output Dialog Box	4-22
4.36	Options Dialog Box – General Tab.....	4-23
4.37	Reset Program to Defaults Message Box	4-23
4.38	Reset Program to Default Confirmation Window	4-24
4.39	Memory Monitor.....	4-24
4.40	HecDSS File Manager Status	4-25
5.1	Time Series Data Entry Dialog Box.....	5-2
5.2	Manual Paired Data Entry Dialog Box.....	5-4
5.3	Dialog Box Used to Enter Text.....	5-6
5.4	File Menu.....	5-6
5.5	Save As Dialog Box	5-6
5.6	Open Browser.....	5-7
5.7	Dialog Box for Importing Text.....	5-8
5.8	Save Browser	5-9
5.9	Open Browser – Importing Images & Generic Files	5-10
5.10	Save Files Confirmed.....	5-10
5.11	Example of Data Selection for Drag & Drop	5-10
5.12	Imported Filenames Located in the C Part	5-11
5.13	Saving Files Confirmation	5-11
5.14	Options Dialog Box – SHEF Tab.....	5-12
5.15	SHEFPARM File Dialog Box.....	5-13
5.16	SHEF Parameter File Dialog Box.....	5-13
5.17	SHEF Sensor File Dialog Box	5-14
5.18	SHEF Import Status Message Window	5-15
5.19	Selection of <i>.shf</i> or <i>.shef</i> Files to Drag & Drop into DSSVue	5-15
5.20	Save Browser – SHEF Data.....	5-16
5.21	Tabulating Data in Excel.....	5-17
5.22	Excel Data Dialog Box	5-18
5.23	Importing Excel or <i>.csv</i> Files	5-19
5.24	Selection of an Excel or <i>.csv</i> File to Import into HEC-DSSVue.....	5-19
5.25	Editable Import Table of an Excel or <i>.csv</i> File	5-20
5.26	Selecting and Importing Data.....	5-20
5.27	Time Series Data Entry Dialog Box.....	5-21
5.28	Assigning Locations, Parameters, Units, Versions, etc. to Rows.....	5-22
5.29	Assigning Data and Time to Columns.....	5-23

List of Figures

Figure Number

5.30	Select all Data and Columns to Import.....	5-23
5.31	Window after Selecting Select All Data Columns	5-24
5.32	Import Data Window	5-24
5.33	Import Data Confirmation Window	5-24
5.34	USGS Download Window	5-25
5.35	Connection Settings Dialog Box.....	5-27
5.36	Open Browser - Import NCDC Files	5-32
5.37	Import NCDC File(s) Confirmation	5-33
5.38	CDEC Download Dialog Box.....	5-33
5.39	List of Stations Definitions.....	5-34
5.40	Selecting a DSSUTL Write Data File to Import.....	5-36
5.41	NC DWR CRONOS Download Dialog Box.....	5-38
5.42	Importing ND DWR CRONOS Data	5-38
5.43	Data Type Selection	5-38
5.44	Data Table Selection	5-39
5.45	Column Header Titles	5-39
5.45	Setting the Time Window for Data Retrieval.....	5-40
5.47	Select Parameters Dialog Box	5-40
6.1	Plot dialog Box.....	6-1
6.2	Configurable Features of Plots.....	6-2
6.3	Examples of Plot Properties Editors.....	6-3
6.4	Accessing the Plot Property Editors	6-4
6.5	Edit Properties	6-5
6.6	Plot Properties Editor	6-6
6.7	Viewport Shortcut Menu.....	6-6
6.8	Viewport Properties Editor	6-6
6.9	Configure Plot Editor.....	6-7
6.10	Default Line Styles Options Editor	6-8
6.11	Default Plot Properties Editor.....	6-9
6.12	Shortcut Menu - Title Properties	6-9
6.13	Edit Title Properties	6-10
6.14	Shortcut Menu - Curve Properties.....	6-11
6.15	Default Line Style options Editor: Detail of Line Styles Box.....	6-12
6.16	New Data Type Dialog Box.....	6-13
6.17	Curve Line and Point Style Editing Interface	6-14
6.18	Plot with Line Fill.....	6-15
6.19	Plot without Line Fill.....	6-15
6.20	Example Line and Fill Colors	6-15
6.21	Customizing Curve Labels	6-16
6.22	Curve Quality Symbols Editing Tab.....	6-17
6.23	Shortcut Menu - Viewport Properties	6-18
6.24	Viewport Properties Editor - Patterns Tab.....	6-19
6.25	Viewport Properties Editor - Gridlines Tab	6-20

List of Figures

Figure Number

6.26	Adding Marker Lines to Plots	6-20
6.27	Shortcut Menu - Add Marker	6-21
6.28	Shortcut Menu - Marker Line Properties	6-21
6.29	Marker Line Properties Editor - Style Tab	6-22
6.30	Marker Line with Fill Above	6-22
6.31	Calendar Tool	6-23
6.32	Callout	6-23
6.33	Shortcut Menu - Add Callout	6-23
6.34	Add Callout Dialog Box	6-24
6.35	Shortcut Menu - Set Axis Type	6-24
6.36	Shortcut Menu - Axis Tics	6-25
6.37	Plot Properties Editor - Scale Worksheet	6-25
6.38	Axis Properties Editor - Tics Tab	6-27
6.39	Shortcut Menu - Axis Label	6-28
6.40	Label Properties Editor	6-29
6.41	Customizing Legends	6-30
6.42	Shortcut Menu - Legend Panel	6-30
6.43	Legend Properties Editor	6-31
6.44	Viewport upper Left	6-33
6.45	Viewport Right of Panel	6-33
6.46	Legend Item Curve Properties Editor	6-34
6.47	Shortcut Menu - Legend Curves	6-34
6.48	Default Plot Properties Editor - Layout Tab	6-36
6.49	Configure Plot Editor	6-37
6.50	Shortcut Menu - Viewport	6-38
6.51	Set Plot Viewport Weights Dialog Box	6-38
6.52	Save Browser	6-40
6.53	Open Browser	6-41
6.54	File Menu	6-41
6.55	Data in Tabular Form	6-41
6.56	Save Browser - Plots	6-42
6.57	Page Setup Dialog Box	6-42
6.58	Printer Margins Dialog Box	6-43
6.59	Example Print Preview of a Plot	6-43
6.60	Print Multiple Dialog Box	6-43
6.61	Print Multiple Preview Dialog Box (Example)	6-44
6.62	Default Plot Properties Dialog Box	6-45
6.63	Save Browser - Exporting Plot Properties	6-45
6.64	Open Browser - Importing Plot Properties	6-46
7.1	Math Functions Screen	7-1
7.2	Save Changes Dialog Box	7-3
7.3	Plot of Time Series Data from the "Add" Function	7-4
7.4	Selection of Paired Data Curve	7-4
7.5	Math Functions - Arithmetic Tab	7-7

List of Figures

Figure Number

7.6	Adding a Constant to a Data Set.....	7-6
7.7	Add Data Sets Together	7-6
7.8	Math Functions - General Tab	7-15
7.9	Math Functions - Time Conversion Tab	7-25
7.10	Interpolation of "INST-VAL", "PER-AVER" and "PER-CUM" Data.....	7-26
7.11	Screen for Min/Max/Avg/... Over Period Function.....	7-27
7.12	Copy in Time	7-29
7.13	Screen for Shift in Time Function.....	7-30
7.14	Change Time Interval Function	7-31
7.15	Irregular Data to Regular Data Function	7-33
7.16	Regular Data to Irregular Data Function	7-35
7.17	Interpolation of "INST-VAL", "PER-AVER" and "PER-CUM" Data.....	7-36
7.18	Screen for Transforming to Irregular using Pattern Function.....	7-37
7.19	Screen for Extract Time Series Function.....	7-38
7.20	Math Functions - Hydrologic Tab	7-40
7.21	Straddle Stagger Routing Method.....	7-41
7.22	Modified Puls Routing Method	7-42
7.23	Rating Table Method	7-43
7.24	Reverse Rating Table Method	7-44
7.25	Example of two variable rating table paired data, reservoir release as a function of reservoir elevation and gate opening height (curve labels)	7-45
7.26	Screen for Two Variable Rating Table Function.....	7-46
7.27	Decaying Basin Wetness Method	7-48
7.28	Interpolation of Time Series Values using Shift Adjustment Function.....	7-48
7.29	Shift Adjustment Method.....	7-49
7.30	Interpolation of Time Series Values using Period Constants Function	7-50
7.31	Multiple Linear Regression Method.....	7-51
7.32	Multiple Linear Regression Method.....	7-53
7.33	Screen for Conic Interpolation Function	7-54
7.34	Flow Accumulator Gage Processor Method	7-57
7.35	Math Functions - Smoothing Tab	7-58
7.36	Centered Moving Average	7-59
7.37	Olympic Smoothing Average.....	7-61
7.38	Forward Moving Average.....	7-62
7.39	Math Functions - Statistics Tab.....	7-63
7.40	Linear Regression Statistics	7-65
7.41	Screen for Cyclic Analysis Function.....	7-67
7.42	Plot of Data Set Results from Cyclic Analysis	7-67
7.43	Duration Analysis Screen for Standard Method.....	7-69
7.44	Duration Analysis Screen for Bin Method.....	7-70
7.45	User Defined Bin Limits Table.....	7-71
7.46	Linear Vertical and Horizontal Axis	7-72
7.47	Linear Vertical and Log Horizontal Axis	7-72
7.48	Monthly Exceedances for Elevations	7-73

List of Figures

Figure Number

7.49	Computing a Frequency Curve	7-74
7.50	Frequency Plot and Computed Curve for Daily Flow Data	7-74
8.1	Running Scripts from the Script Menu.....	8-2
8.2	Show in Scripts Menu Checkbox in Script Editor.....	8-2
8.3	Script Menu Bar	8-2
8.4	Script Selector	8-3
8.5	Script Editor	8-3
8.6	Menu Bar	8-4
8.7	Editor Panel	8-5
8.8	Tree Hierarchy	8-7
8.9	Shortcut Properties Dialog Box	8-20
8.10	Example 16 Results	8-30
8.11	Example 17 Results	8-33
8.12	Plot Components	8-47
8.13	Interpolation of Time Series Values using Period Constants Function	8-128
8.14	Interpolation of Time Series Values using Shift Adjustment Function.....	8-147
8.15	Interpolation of "INST-VAL", "PER-AVER" and "PER-CUM" Data.....	8-156
8.16	Example of two variable rating table paired data, reservoir release as a function of reservoir elevation and gate opening height (curve labels)	8-159
A.1	Create New Pie Chart.....	A-2
A.2	Main Pie Chart Window	A-3
A.3	2D Pie Chart, Transparency Turned Off.....	A-3
A.4	3D Pie Chart, Transparency Set to Thirty-Five Percent.....	A-4
A.5	Color Chooser	A-5
A.6	Slice Color Changes (Pine Flats and Warm Springs).....	A-6
A.7	Create Duration Hydrograph for DSS File (NC DWR)	A-7
A.8	Create Duration Hydrograph for DSS File (NC DWR) - Plot.....	A-7
A.9	Open NC DWR Duration Hydrograph	A-8
A.10	Choose Pathnames to Create Duration Hydrograph	A-8
A.11	Select Units for Conversion	A-9
A.12	Select, Un-Select, Select All, and Clear buttons.....	A-9
A.13	Chart Title	A-9
A.14	Plot Content.....	A-9
A.15	Simple Plot	A-10
A.16	Detailed Plot	A-10
A.17	Drought Monitor Plot.....	A-10
A.18	Y-Axis	A-11
A.19	Image Orientation	A-11
A.20	Chart Intervals	A-11
A.21	Output Path	A-11
A.22	View Duration Hydrograph Image	A-12
A.23	Add Low Flow dQr	A-12

List of Figures

**Figure
Number**

A.24	Line Years	A-12
A.25	Reference Value	A-13
B.1	GenericPlugin.jar Directory	B-3
B.2	Manifest .mf File	B-3
B.3	Run Generic Plugin.....	B-3
B.4	Successful Run Confirmation.....	B-6
C.1	Time Series Data Entry Screen.....	C-4
C.2	Export to Excel	C-6
C.3	Oakville Output - Plot.....	C-8
C.4	Folsom Lake Plot.....	C-9
C.5	Folsom Lake Tabular Display.....	C-11
C.6	Mendocino Reservoir Data for March.....	C-12
C.7	Glenfir Plot.....	C-16

List of Tables

Table Number

1.1	Summary of Contents of User's Manual.....	1-3
8.1	MessageBox and MessageDialog Functions	8-18
8.2	Window Types with <i>stayOpen()</i> Method.....	8-21
8.3	ListSelection Static Functions	8-22
8.4	ListSelection Methods.....	8-23
8.5	DataRefernce Methods.....	8-26
8.6	HecDss Retrieval and Storage Methods	8-29
8.7	HecDss Additional Primary Methods.....	8-29
8.8	HecDss Secondary Methods.....	8-30
8.9	Time Series Data Storage Methods (Regular and Irregular)	8-35
8.10	DataContainer Data Fields.....	8-37
8.11	TimeSeriesContainer Data Fields	8-38
8.12	Data Quality Bits	8-39
8.13	PairedContainer Data Fields	8-41
8.14	HecTime Methods.....	8-42
8.15	HecTime Date Formats.....	8-46
8.16	G2dDialog Methods	8-48
8.17	PlotLayout Methods	8-52
8.18	ViewportLayout Methods	8-52
8.19	Viewport Methods	8-54
8.20	AxisMarker Fields	8-57
8.21	Axis Methods	8-58
8.22	AxisTics Methods.....	8-60
8.23	G2dLine Methods	8-62
8.24	Label Methods	8-64
8.25	Standard Colors.....	8-67
8.26	Fill Patterns.....	8-67
8.27	Line Styles	8-68
8.28	Symbol Types.....	8-68
8.29	HecDataTableFrame Methods	8-69
8.30	TableExportOptions Fileds.....	8-73
8.31	HecMath Methods.....	8-75
8.32	Valid timeLevelString and rangeString Values	8-95
B.1	DSSPathname	B-6
B.2	TimeSeriesContainter	B-7
B.3	PairedDataContainter	B-8
B.4	HecTime	B-9
B.5	HecDouble.....	B-10
B.6	HecDoubleArray	B-11

Foreword

The U.S. Army Corps of Engineers' Hydrologic Engineering Center Data Storage System, or HEC-DSS, is a database system designed to efficiently store and retrieve scientific data that is typically sequential. Such data types include time series data, curve data, spatial-oriented gridded data, and textual data (such as this manual). The system was designed to make it easy for users and application programs to retrieve and store data. HEC-DSSVue (HEC-DSS Visual Utility Engine) is a graphical user interface program for viewing, editing, and manipulating data in HEC-DSS database files.

HEC-DSS originated at the Hydrologic Engineering Center in 1979 under the direction of Dr. Art Pabst. Since that time, many have worked on the development of the HEC-DSS software and the HEC-DSS utility programs, including William Charley, Al Montalvo, Carl Franke, Paul Ely, Robert Carl, Dennis Huff, Mike Perryman and numerous others.

Mr. William Charley led the software design and development team, as well as created the main interface screen and other components. Resource Management Associates (RMA) of Fairfield, California, under the direction of Dr. John DeGeorge, aided in the development of HEC-DSSVue. The RMA staff included Richard Rachiele, who translated the DSSMATH functions into Java, Mark Ackerman, who wrote the math function screens and plug-in capabilities, Shannon Newbold, who was responsible for the graphics and Peter Morris, who designed and implement the graphical editor. Mike Perryman of HEC led the development of the scripting capabilities.

Dr. Cassie Carter, under contract with RMA, wrote the initial draft of this manual. Shannon Larson, William Charley, and Mike Perryman wrote updates for the current version of this document. Amanda Waller and Penni Baker tirelessly reviewed, corrected and formatted the document for publication.

