

A package of useful programs to get you started.

Utility Library



Applications of the Hewlett-Packard System 45

Save Software Development Time

When you unpack your System 45, you will find a collection of general-purpose software that introduces you to the computer and its enhanced BASIC programming language. Hewlett-Packard developed the Utility Library to simplify the time-consuming problem of writing your own programs for commonly used computer routines. With this foundation, you can begin utilizing the System 45 immediately — whatever your application needs.

In addition to being useful in its problem-solving capacity, the Utility Library gives you examples of programming techniques and familiarizes you with the system's interactiveness, features and potential.

The Utility Library manual explains how each main program and subprogram works, as well as how to use them. Variable lists, references, and annotated listings are given so you will have all the necessary information to modify any program.

Useful Main Programs

The main programs in the Utility Library are stand-alone in nature. After inserting the tape cartridge and loading the program, you can enter your data directly through the System 45's keyboard. Once the data has been entered, you can call up subprograms to perform algorithms on your data. The results are then displayed on the System 45's CRT or printed on the optional hard-copy thermal printer.

Time-Saving Subprograms

The subprograms contained in the Utility Library provide you quick access to commonly used routines frequently needed when doing your ap-



The System 45 is a powerful, friendly, desktop computer with a typewriter keyboard, CRT, thermal printer, high-speed magnetic tape drive and an enhanced BASIC language processor — all integrated into a single easy-to-use package.

plication programs. These subprograms operate independently of the main programs, giving you the flexibility to incorporate them into your main program as needed.

Drivers have also been provided to allow you to use the subprograms directly without having to write your own programs. However, the drivers and subprograms are stored separately to allow you the option of providing your own drivers with minimal effort.

Table of Contents

The Utility Library contains the following main programs and subprograms. Subprograms are marked with an asterisk.

Sorting Section

- Fast Sort of a Numeric Vector* — allows sorting of a one dimensional array, or any subset of the array, into ascending or descending order.

- Minimal Storage Sort of a Numeric Vector* — like Fast Sort of a Numeric Vector, but it is slower and occupies less memory space.
- Fast Sort of a Numeric Array* — allows sorting a two-dimensional array on any row or column into ascending or descending order, maintaining column or row integrity.
- Minimal Storage Sort of a Numeric Array* — like Fast Sort of a Numeric Array, but it is slower and occupies less memory space.
- Fast Sort of a String Vector* — allows sorting a one-dimensional string vector into either ascending or descending order.
- Minimal Storage of a String Vector* — like Fast Sort of a String Vector, but slower and it occupies less memory space.

Numerical Analysis Section

- Polynomial Rootfinder* — will find all roots, Z , of polynomials of the form:

$$a_0 + ib_0 + (a_1 + ib_1)Z + (a_2 + ib_2)Z^2 + \dots + (a_n + ib_n)Z^n = 0$$
 These roots are found by expressing the polynomials in terms of Siljak functions using the method of steepest descent to determine the zeros.
- Bisection Rootfinder* — will search for solutions of $F(x) = 0$ over an interval $[a, b]$ where you define the continuous real-valued function $F(x)$. The function may be of the form:

$$a_0 + a_1x^{e_1} + a_2x^{e_2} + \dots + a_nx^{e_n}$$
 with a_j real and e_j rational (e.g., $x^3 + 3x^{3/2} + \sqrt{x}$) or Transcendental (e.g., $\sin(x) + \cos(x)$).
- Numerical Interpolation* — computes a curve $S(x)$ that passes through the N data points (x_i, y_i) supplied by you. It then computes the functional value, integral and derivative, at any point t_j on the curve when t_j is in the interval (x_1, x_n) using the Cubic Spline method.

- Numerical Integration* — approximates $\int_a^b f(x)dx$ for a user-defined continuous function of $f(x)$ on the interval $[a, b]$ using Simpson's rule.
- Simultaneous Linear Equations* — solves a set of simultaneous linear equations, or indicates if there is no solution.

Information Management Section

- Backup Program — allows copying of programs from one storage medium to another (for creation of data bases, increasing speed-of-file access, etc.)
- File Initialization — takes your inputs on the kinds of fields and the expected amounts of data and creates files of the proper length. All overheads, linked-lists and directory information are automatically set up for easy maintenance.
- File Access — permits you to access data files in a variety of different ways (for data entry, editing, deleting and reporting) after file initialization has been performed.

Financial Section

- Loan Amortization — computes and prints a complete amortization schedule for a loan.
- Savings Account/Compound Interest Analyzer — computes and prints a table of a savings account operated upon by compound interest.
- Household Budget Analyzer — helps plan and record your own or your family's household budget for a year.

Statistics Section

- Array Statistics* — will take a two-dimensional matrix and return two vectors: one containing the means of the rows or columns and the other containing the variances of the rows or columns.
- Family Regression* — takes a set of (x, y) coordinates and fits Linear, Logarithmic, Exponential, and Polynomial curves. It also computes Analysis of Variance tables

and plots the computed curves. (Plots are optional).

- Pie Charts* — plots pie charts on CRT and includes raw numbers, percentages, titles and labels.
- Bar Graphs* — plots bar graphs on the CRT and includes raw numbers, percentages, titles and labels.

Graphics Section

- Block Lettering* — plots alpha and numeric figures intended for creation of overhead transparencies and slide graphics.
- Simple Function Plot — plots a defined function between a minimum and maximum x and labels the axes.
- Iterative Parameter Plot — like Simple Function Plot but retains previous plot and permits superimposing new functions over and over.
- Picture Construction and Entity Creation — permits simple line drawings and complex pictures to be interactively created on the CRT — featuring menu selection and "rubber banding."

The Program Package

The Utility Library program package includes:

- Two tape cartridges which contain numerous enhanced BASIC programs and sub-programs.
- A manual which contains a description of each program, short form operating procedures and a longer in-depth description of each program.

Equipment Configuration

Depending upon the particular program(s) you choose, different hardware configurations are required. These requirements plus available options are listed in the Utility Library manual along with each program description.

