

December 1, 1977

# WANG SYSTEMS SOFTWARE INVENTORY

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This document provides a brief description of Wang's Systems Software available as of November 15, 1977. The key functions within the software systems have also been described. Affixed to each description is the publication number of the manual which describes the specific system or function in more detail.

The last section is a KEY WORD INDEX which allows the reader to search for major functions, such as "TC Support Utilities," and the INDEX will refer to the section of this document describing these functions.

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## WANG SYSTEMS SOFTWARE INVENTORY

- 1.0 UTILITIES
- 1.1 ISS UTILITIES
- 1.1.1 Copy-Verify - Copies files (data or program) from one disk platter to another. Verifies copied data. Files are copied in total or selectively according to input parameter. 700-4254A
- 1.1.2 Create Reference File - Used to create, edit or list a reference file containing table of names of files to be copied, verified, or compared. 700-4254A
- 1.1.3 Sort Disk Catalog - Prints a list (on screen or printer) of catalog entries sorted either alphabetically or by starting sector address, or by FILE sequence in the INDEX. Printing of active files, scratched files, or both may be selected. 700-4254A
- 1.1.4 Disk Dump - Prints contents of entire or part of disk file in one of three formats with hexadecimal and alphanumeric content. 700-4254A
- 1.1.5 Decompress Utility - Breaks up multistatement lines of a program so that each statement appears on its own line. Input is any cataloged program file, selected program file, all files or files within alphabetic limits. Output is in a uniform layout. 700-4254A
- 1.1.6 List/Cross Reference - The list component breaks all multistatement lines up and prints each BASIC statement on a separate line. The cross-reference component assembles and prints line number cross-reference, variable cross-reference, DEFFN' cross-reference, and GOSUB cross-reference. 700-4254A
- 1.1.7 Compression Utility - Reduces amount of memory occupied by application program, reduces storage requirements and increases program execution speed. The three steps to compression are: (1) eliminates all REM statements (except first statement line), (2) eliminates all space characters (unless enclosed in quotes), and (3) assigns each line number the maximum number of BASIC Statements consistent with program operation. 700-4254A

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|--------|---|-----------|
| 1.1.8  | Reconstruct Index Utility - Uses file control sectors established during catalog operations to recover disk files after accidental destruction of disk catalog index.   | 700-4254A |
| 1.1.9  | File Status Report - Performs several functions tailored to a multiplexed disk environment, including closing one or all files open to a CPU, printing the CPU status of one or all files, and printing all files currently open to a CPU.        | 700-4254A |
| 1.1.10 | Program Compare - Compares two program files on a line-by-line basis indicating statements that do not match, if a statement exists in one program but not in another, if one program ends before another, and if they end at the same statement. | 700-4254A |
| 1.1.11 | Copy Tape to Disk - Copies from 1 to 99 files from cassette onto disk. Up to 99 tape-resident files may be skipped before the first file is copied and additional sectors may be added.   | 700-4254A |
| 1.2    | <u>ISS SCREEN/DISK SUBROUTINES</u>  |           |
| 1.2.1  | Data Entry - Accepts keyboard entry and checks that its value, length, and number placed before and after the decimal comply with specified limits.   | 700-4254A |
| 1.2.2  | Position Cursor - Moves cursor to any location on display and optionally erases the characters to the right of the new cursor position and lines below it. Both 64 x 16 and 80 x 24 screens are supported.  | 700-4254A |
| 1.2.3  | Alphanumeric Input - Allows keyboard entry of alphanumeric data with or without prompt messages and checks that entry does not exceed maximum field size.   | 700-4254A |
| 1.2.4  | Numeric Input - Allows keyboard entry of numeric data indicating field format with or without prompt messages.  | 700-4254A |
| 1.2.5  | Date Routines - These routines allow entry of data by either Gregorian or Julian form and convert it appropriately.   | 700-4254A |
| 1.2.6  | Operator Wait - Halts program and displays message to key RETURN/EXEC to resume.  | 700-4254A |

- |        |  |           |
|--------|--|-----------|
| 1.2. 7 | Re-enter - Used to signal the operator of an entry error. Displays the word "RE-ENTER" on line 3 of the screen.  | 700-4254A |
| 1.2.8  | Print Routine - Allows a specified character to print a specified number of times.   | 700-4254A |
| 1.2.9  | Limits Next - Returns the names of disk files on a disk in index sector sequence. It also returns the status of the file and whether it is a program or data file.           | 700-4254A |
| 1.2.10 | Search Index - Searches disk catalog index for a specified file name and returns the status of the file.   | 700-4254A |
| 1.2.11 | Open/Close Output - Open for output and subsequently close, disk data files which utilize special header and trailer information. Useful for standardization and protection. | 700-4254A |
| 1.2.12 | Open/Close Input - Open for input and subsequently close disk data files which utilize special header and trailer information.   | 700-4254A |
| 1.2.13 | Free Unused Sectors - Examines a selected file in a disk catalog area and repositions the end of file to deallocate unused sectors.  | 700-4254A |
| 1.2.14 | Allocate Data File Space - Opens a data file and allocates the available sectors between the current end of cataloged files and the end of the cataloged area.               | 700-4254A |
| 1.3    | <u>ISS TRANSLATION TABLE SUBROUTINES</u>   |           |
|        | These subroutines initialize arrays which may be used in the translations of:  | 700-4254A |
|        | 1. EBCDIC to ASCII   |           |
|        | 2. ASCII to EBCDIC   |           |
|        | 3. 2200 to 1200  |           |
|        | 4. 1200 to 2200  | 700-4254A |

1.4 ISS SORT 4

SORT-4 is a subsystem for sorting the records in a disk data file. It is loaded from disk by a user-written set-up program which provides the parameters for the sort. When sorting is complete, SORT-4 can load a specific program module, hence its use as a subsystem to an application program.

1.5 DATA ENTRY II

Preliminary Manual Only

The Wang 2200 Data Entry II System is designed to facilitate error-free capture of data at distributed or local sites. The information captured may be processed locally and/or transmitted physically or via telecommunications to a central processor.

700-4318

Data Entry II has two basic components; Set-up and Production. The Set-up Subsystem is used to define the parameters of the data that will be entered into the Production system. These parameters deal with such variables as the sizes of data fields, various validation tests to be performed on data, screen layouts, and output formats.

The Production Subsystem supports the entering of data and the creation and manipulation of output files.

1.6 RPL (Report Program Language)

700-3766A

RPL utilizes a high-level instruction set for the purpose of generating programs to print reports from existing files. Report formats are determined by the user.

The three BASIC components of RPL are the system program, source program, and object program. The system program contains the logic to create the source and object programs. The source program, which is written in RPL, is compiled, producing BASIC object programs. This can then be executed to produce the report desired.

EASYFORM is utility designed to facilitate and simplify the application of data entry via the forms filling approach. Complete data entry forms can be created by an operator at the keyboard/display. Up to 10 forms can be created and then saved on disk with up to 50 data fields per form. A form may be recalled from the disk and displayed on the screen. The cursor may be moved from field to field, checking data as it is input for such things as type, size, and range. Data records may then be created and saved to disk for processing or transmission to a host computer.

- |       |  |           |
|-------|--|-----------|
| 1.8   | <u>NINE-TRACK TAPE UTILITIES (ROUTINES)</u>  | 700-3673A |
| 1.8.1 | Initialize/Rewrite Volume Label - Creates a label or overwrites an existing label on a nine-track tape.  | 700-3673A |
| 1.8.2 | Write Data on Tape - Is used to write data from memory onto a nine-track tape as specified by the user (data may come from keyboard, cassette, or disk).   | 700-3673A |
| 1.8.3 | Read Data from Tape - Reads data from tape as specified by the user.   | 700-3673A |
| 1.8.4 | Tape to Disk Data Transfer - Used to transfer data from nine-track tape to disk with or without translation.   | 700-3673A |
| 1.8.5 | Disk to Tape Data Transfer - Reads an appropriately formatted disk file and writes it on a nine-track tape.  | 700-3673A |
| 1.8.6 | Card Reader to Tape Data Transfer - Accepts data from standard 80-column (Hollerith) punched cards and creates an unlabeled or a labeled tape depending on the structure of the card deck.   | 700-3673A |
| 1.8.7 | Tape Dump - Dumps data from tape in EBCDIC hexadecimal form and in ASCII alphanumeric form.  | 700-3673A |
| 1.8.8 | Logical I/O Control System - Subroutines which perform the logical control operations and the translation from EBCDIC to ASCII or ASCII to EBCDIC.   | 700-3673A |
| 1.8.9 | Physical I/O Control System - A subroutine which can backspace to write, backspace a record, forward-space to write, backspace a file, forward space a file, rewind, "write" a gap, clean tape, re-read a block, write a File Mark (EOF), write a block, and read a block. | 700-3673A |

1.9	<u>DIGITIZER UTILITIES</u>	700-3729A
1.9.1	Menu Definition - Enables a user to define or recall a menu. A "menu" is a coordinate grid, each of whose squares or "cells" has a unique and identifying name. Each cell name is further associated with a particular operation or routine in the main program.	700-3729A
1.9.2	Area Utility - Computes and displays the area of any polygonal or curvilinear plane figure in scaled units.	700-3729A
1.9.3	Equal Scaling - Computes rotation and displacement factors necessary to convert the digitizer's absolute coordinates into the user's real coordinate system. Additionally, a scale factor is computed for the X and Y axes.	700-3729A
1.9.4	Unequal Scaling - Computes rotation and displacement factors necessary to convert the digitizer's absolute coordinates into the user's real coordinates. Additionally, separate scale factors are computed for the X and Y axes.	700-3729A
1.9.5	Coordinate Transformation - Computes rotation and displacement factors necessary to convert the digitizer's absolute coordinates into the user's real coordinate system; however, it does not compute a scale factor.	700-3729A
1.9.6	Image Storing - Enables a user to digitize a plane figure and store the coordinates in one or more data files on disk or tape.	700-3729A
1.9.7	Image Plotting - Plots images which have been stored on disk with the Image Storing Utility. One or more sections from an image file may be plotted. The image may be enlarged or reduced, and its resolution factors are specified by the operator.	700-3729A
1.9.8	Direction and Distance - Calculates the distance in real units between two digitized points and the angular direction of the new point relative to the user's (real) X axis.	700-3729A
1.9.9	Inquiry/List - Displays and/or prints file names, section ID's, and, optionally, identification records created by the Image Storing Utility.	700-3729A



- 1.9.10 Regression Analysis - Provides a routine for polynomial regression with coefficients only. Printed output includes number of observations (data points), order of the polynomial, input data (X and Y coordinates), summations of the raw data (their values, their powers, and their cross-products), the regression coefficients, and a table containing raw data, corresponding calculated values and their residuals. 700-3729A
- 1.9.11 Interpolation - This program offers the capability to interpolate the values of points on a line between two known points. 700-3729A
- 1.9.12 Backup Routine - Used to create backup copies of data disks containing digitizer images or menu files in systems equipped with a single disk and a tape cassette drive. 700-3729A
- 1.10 CARD READER UTILITIES 700-3865  
(Tape Version)  
700-3866  
(Diskette Version)
- 1.10.1 Card Image Out - Reads Hollerith, program or Binary formats into memory, transfers images to an output buffer and then writes the buffer to a disk platter or a tape cassette. 700-3865  
(Tape Version)
- 1.10.2 Card Image Dump - Reads a card in Hollerith, Wang, or Binary formats or a card image from tape or disk and prints a line number, the record size, and the card image. 700-3865  
(Tape Version)  
700-3866  
(Diskette Version)
- 1.10.3 Card Image to Printer - Reads card images from the card reader, tape, or disk and prints user-defined fields. 700-3865  
(Tape Version)  
700-3866  
(Diskette Version)
- 1.10.4 Card Program List - Lists program cards in a Hollerith or GAEC/Wang deck onto a printer or Selectric typewriter. 700-3865  
(Tape Version)  
700-3866  
(Diskette Version)
- 1.11 PLOTTER UTILITIES 700-3838A
- 1.11.1 Set Plotter Boundaries - Used to initialize, and, subsequently, to reset the limits of the active plotting area. 700-3838A

- 1.11.2 Plot Character String (straight line) - Plots a specified string of alphanumeric characters on a straight line. 700-3838A
- 1.11.3 Plot Character String (circle) - Plots an alphanumeric character string on the circumference of a circle where the center coordinates and radius length have been user specified. 700-3838A
- 1.11.4 Load Character Generation Array - Loads a previously initialized character data file from a disk platter or tape into the receiving character generation array in memory. 700-3838A
- 1.11.5 Plot Line Between Two Points - Plots a straight line between two defined points. The line may be solid, dashed, dotted or dashed/dotted. 700-3838A
- 1.11.6 Plot Coordinate Grid - Plots a grid of horizontal and vertical grid lines within the active plotting area. 700-3838A
- 1.11.7 Plot Circle - Plots a circle whose center point, radius length and "degree of smoothness" are user specified. (A variety of regular polygons may also be produced with this routine.) 700-3838A
- 1.11.8 Plot Border Around Active Plotting Area - Plots a border (solid line, dashed line, dotted line, or dashed/dotted line) around the active plotting area (as is established in "Set Plotter Boundaries"). 700-3838A
- 1.11.9 Plot Instruction Emulator - Enables the programmer to perform a variety of primitive plotter operations with this routine. It is a powerful programming tool for general plotter control. 700-3838A
- 1.11.10 Plotter Control Routine - Used by the Plot Instruction Emulator in order to execute plotting instructions. 700-3838A
- 1.12 TEXT EDITING UTILITIES 700-4043
- 1.12.1 Log On/Off - Logging off clears the terminal number from the "active" file on the system disk. Failure to log off before clearing memory prevents logging on with the same terminal number. Logging on causes System Startup procedures to run. 700-4043
- 1.12.2 Initialize Volume - Creates a volume for storing text on a disk. A volume is a cataloged data file of 1,007 sectors containing a Table of Contents and the necessary pointers to store one or more documents. 700-4043

- 1.12.3 Text Editor - Used for inputting text directly into the system (stored on disk) or for correcting text already stored on disk. 700-4043
1. Text Entry - Inputs text onto a disk.
  2. Positioning the cursor - Used in Edit mode to position the cursor.
  3. Inserting Text - Used in Edit mode to insert a single character, a word, a sentence, or a paragraph.
  4. Deleting Text - Used in Edit mode to delete characters, words, lines, or sentences from the text.
  5. Disk Operations - Allows 15 lines at a time to be read from the disk and displayed, rewrites a page (after editing) back onto the disk, displays the original page prior to changes (before it has been rewritten onto disk), and searches the disk or CRT for a specified word or phrase.
- 1.12.4 Disk Table of Contents - Lists out the Table of Contents in alphabetical order giving the amount of space taken up by each document, line size, and disk space available. 700-4043
- 1.12.5 Copy Text - Serves three functions: 700-4043
1. Copies an entire volume for backup protection.
  2. Copies a single document.
  3. Extracts part of one document and gives it a new name.
- 1.12.6 Move Text - Moves sections of a text within a document (only lines in their entirety may be moved). A section of text to be moved may be a line, paragraph, or many paragraphs. 700-4043
- 1.12.7 Global Replace - Makes the same change to the text as many times as it appears within a document. The two options are: 700-4043
1. Automatically replace every instance of a specified character string with another.
  2. Stop at every instance of a specified character string and either replace it or leave it unchanged.

1.12.8	Delete a Document - Removes unwanted documents from a disk so that new information may be stored in its place.	700-4043
1.12.9	Document/Letter Assembly - Assembles paragraphs and/or documents or creates form letters to be printed out (names and addresses may be saved for letters).	700-4043
1.12.10	Print Addresses - Will print names and addresses (if they were saved).	700-4043
1.12.11	Print a Document - Produces printed output of text stored on disk either formatted or unformatted as specified.	700-4043
1.12.12	Data Conversion Program - Converts text stored on disk in the original text editing format to the format currently used by the new version of text editing.	700-4043
1.13	<u>TC SUPPORT UTILITIES</u>	700-4086
1.13.1	Data Entry I - Used to create a TC format disk data file, or to edit, delete, rearrange, create, and list records in an existent TC formatted disk data file.	700-4086
1.13.2	De-Atomize - Is used to de-atomize a BASIC language program currently stored on disk in Wang's standard program file format and also convert the program file into a TC formatted disk data file suitable for transmission to a remote site.	700-4086
1.13.3	Atomize - Is used to atomize a BASIC language program previously received from a remote site and currently stored as a TC formatted disk data file. The TC format is automatically converted into Wang's standard file format.	700-4086
1.13.4	Initialize Atom Table - Can be used to recover after accidental destruction of the atom table on the TCS system disk if a backup disk is not available.	700-4086
1.14	<u>3741 - 2200 UTILITIES</u>	Preliminary Manual Only
1.14.1	Convert 3741 to TC Format - Converts a selected 3741 file to a 2200 TC format file.	
1.14.2	Convert TC Format to 3741 - Converts a selected 2200 TC format file to a 3741 file.	

- 1.14.3 List 3741 - Lists a 3741 - Lists a 3741 file on a printer. Data is not formatted and non-printable characters will be printed as a question mark (?).
- 1.14.4 List 2200 TC Formatted File - Lists a 2200 TC formatted file on the printer. Data is not formatted, and non-printable characters will be printed as a question mark (?).
- 1.14.5 List 3741 Catalog - Displays a list of the files on a 3741 disk.
- 1.14.6 Dump 3741 Sector(s) - Displays 3741 sectors on the 2200 CRT. Data is not formatted and non-printable characters will be printed as a question mark (?).
- 1.14.7 Application/Subroutines - Allows the user to integrate a special application program with this system of 3741 access subroutines. The subroutines are reread (read a record prior to current record position), write (write a record to an open 3741 file), write (write a record to an open 3741 file), backspace (position to any location in an open 3741 file), skip (position to any location in an open 3741 file), write end (update the EOD indicator of an open cataloged 3741 file), open old (open and existing file on a 3741 disk), open new (create and open a new file on a 3741 disk), close (clear the file open flag), limits (get the sector addresses of the BOE, EOE, and EOD of a 3741 file).

1.15 GUS (Graph Utility System)

700-4335

The Graph Utility System provides a convenient methodology for creating, updating, and saving the information necessary for initiating a plot. The system consists of a stand-alone program which enables the user to draw and label 2 and 3 dimensional graphs of several types, variable size, and from varying data sources, on any plotter currently supported by Wang.



2.0 LANGUAGES

2.1 BASIC

700-3231F/700-3038H

Wang system 2200 BASIC is an algorithmic language modeled after the BASIC language first written at Dartmouth College. The language is a powerful tool due to its extensive capabilities with disk operations, matrix commands, and General I/O. Yet, due to its similarity to the English language, it enables a person to become familiar with it with relative ease.

2.2 BASIC-2 (2200VP)

700-4080

BASIC-2 is a modified version of the original BASIC which has been enhanced to provide several new alphanumeric/binary operations, improved I/O, a revised math package, more powerful edit features, and improved decision-making capabilities. Other features and benefits have made this a powerful and extremely versatile programming language well suited for both technical and commercial applications.





### 3.0 ACCESS METHODS

#### 3.1 KFAM-3

700-4070

KFAM-3 is a mode of random access (using the tree structure) which creates and maintains an index of the individual records and their locations in the file. The index KFAM constructs and maintains is kept as a cataloged file on a disk. KFAM-3 requires that all records must be of a fixed length. It supports four record types. The first is a record written with no blocking, meaning each record occupies exactly one sector. The records may be written with or without control bytes; however, the key must be located in the same position within each record. The second type of record is an array type of blocked records where records must be written in array form with control bytes. The key must be located in the same position within each record. It may be part of a field, but may not span fields (thus, it may not include control bytes). The key may not be a numeric field or any part of a numeric field. The block of records may not exceed one sector in length and may not have more than 38 fields per record. The third type of record is contiguous blocked records where all fields of a given record are stored contiguously on the disk. Records may or may not be written with control bytes; however, to use KFAM reorganization, control bytes are mandatory. All records must be the same length and a block of records may not exceed one sector in length. The key must be located in the same position within each record. The fourth type of record is multiple sector records where each record occupies more than one sector; however, each record must occupy the same number of sectors. The key must be located in the same position within each record. The key may be located in any sector, but may not span sectors. Records may be written with or without control bytes. Records may be up to 255 sectors in length; however, KFAM reorganization requires that records may not exceed 40 sectors in length and more than 12K of memory is required if record length exceeds 8 sectors.

The key of a KFAM record may be from 1 to 30 bytes of alphanumeric data. The key may not be a numeric field. The first byte of an active key may not contain the value HEX (FF) nor may the key contain a value of all bytes HEX (00).

3.2

KFAM-4

700-4070

KFAM-4 is a modification of KFAM-3 designed for a disk multiplexed environment. It allows up to 4 CPU's to access a KFAM disk file and includes protective procedures designed to prevent destructive intrusions of one CPU into the file operation of another CPU. Its restrictions for file initialization and procedures are the same as those for KFAM-3.

3.3

KFAM-5

700-4254A

KFAM-5 (designed for a multiplexed environment) adheres to the same regulations as KFAM-4; however, it has some new features. One of the new features is REOPEN which allows user to change the access mode of a currently open multiplexed KFAM file. The access modes in KFAM-5 are also new and they include inquiry, read only, shared, exclusive, and nonmultiplexed. Another new feature of KFAM-5 is the ability to find the previous record in the user file in logical key sequence.

KFAM-5 supports not only the four record types supported by KFAM-3 and KFAM-4, but also allows for BA mode blocked records. BA mode blocked records share the same characteristics of contiguous blocked records; however, they have no control bytes and they require absolute sector addressing.

During initialization of a KFAM-5 file, it is possible to enter a password which will later be required when a CPU seeks to access that file. In essence, KFAM-5 was designed to offer as much protection combined with flexibility as would be needed whenever more than one terminal shares a disk data file.

3.4.

KFAM UTILITIES

700-4254A

700-4070

3.4.1

Initialize KFAM file - Catalogs an area on the disk for the User File or Key File or both. It creates the KDR record (the first record of the key file containing vital user-supplied information about the User and Key Files), a null key file and a trailer record.

3.4.2

Key File Creation - Creates a Key File for the records in an existing User File requiring only that the operator know the key for the last record in the User File in physical sequence.

700-4070

- 3.4.3 KFAM Reorganization - Based on an input KFAM file (Key file and User file) constructs a new output User File containing active records only, written in ascending key sequence. It creates a new key file based on the new user file. 700-4070
- 3.4.4 Reallocate KFAM File Space - Is used in conjunction with Disk Copy and Reorganize to lengthen or shorten KFAM Key Files and User Files. 700-4070
- 3.4.5 Disk Copy and Reorganization - This program copies a file from one disk to another. It may be used in conjunction with Reallocate KFAM File Space or it may be used alone to copy any cataloged file (as in 3.4.4) to another disk. 700-4070
- 3.4.6 Print Key File - Prints the current contents of the KDR record and the key index records, for specified key file. 700-4070
- 3.4.7 Key File Recovery - Permits a Key File which has been destroyed to be reconstructed from the data in the User File. 700-4070
- 3.4.8 Conversion Utilities - Used to convert files originally created under KFAM-1 or KFAM-2 to KFAM-3. There is another conversion utility to convert KFAM-3 files to KFAM-4. 700-4070

TAM is comprised of a set of subroutines which, when incorporated into a user-written application program, allow for the addressing and manipulation of individual 2236 terminals and the 2236 terminal controller.

4.0 OPERATING SYSTEMS

4.1 EDITING

700-3231F/700-3038H

Editing on the 2200T allows redefining a statement line, deleting a line, inserting a new line, inserting in or deleting from a line, or changing a portion of a line. The 2200 also allows character erasing and line removal during current entry and renumbering the line numbers in a program. The 2200T also has provision for debugging programs in memory. Programs may be halted to print values and then continued, stepped through manually or stepped through automatically. A TRACE feature is also available.

4.2 Editing on the 2200VP allows all of the same editing and debugging features as the 2200T; however, the way some of these operations are performed has been improved.

700-4080



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