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SPLA CONTROL NUMBER:

This form should be completed and submitted with the program package to the SHARE Program Library Agency at the address shown above. Standards and instructions for submitting programs are in the "SHARE Program Library Standards Manual".

(1) Program Number (to be filled in by SPLA) 360D-04.4.012

(2) System Type (machine) S/360, S/370

(3) Search Key ..... TSO Analysis
System measurement
Time Sharing Performance
Simulation

(4) Programming Language ..... PL/1, Fortran, BAL

(5) Author's Name and Address ..... B.J. DiMarsico
Bell Telephone Laboratories Inc.

(6) Direct Inquiries to Name and Address ..... (if different than Author)
Technical Assistance
Not Currently Available

(7) Title of Program ..... TSO Performance Analysis Routines

(8) Submitter's Installation Membership Code..... BT

(9) Submitter's Own Program Identification and Suffix(Optional)...

(10) Primary Subject Code.....

(11) Operating or Monitor System Required 360/OS MVT/TSO/TCAM 40

(12) New or Revision Code (if revision, show prior Program Number in Item 1).. R

(13) Year Completed.....

(14) Date of Submittal..... 8/29/73

(15) Documentation (number of original pages submitted)..... 154

(16) Abstract (should contain sufficient information for a reader to determine the value of the program). Listed on the reverse side of this form are subjects which may serve as a guide for a descriptive abstract.

360D-04.4.012

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Bell Laboratories

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State Transaction Analysis Routine

The following change is suggested for the state transition analysis routine: sometimes TSO, and especially CPS under TSO issues a tput with the hold option (or owait condition) with the first tput.

Logical state 5 input cards

OLD STATE	ENTRY CODE	NEW STATE	OUTPUT	REMARKS
.	.	.	.	
.	.	.	.	
5	14	9	0	time slice end
5	3	6	0	long wait
5	41	10	0	svc
5	2	11	0	input wait
5	-34	12	0	tput end
5	29	22	1	logoff
add 5	-2	20	0	output wait
.	.	.	.	
.	.	.	.	

Two corresponding changes

Also remember to change the first card of input, which is the number of logical states in the model, for the state program and the report histogram program.

B. J. DiMarsico
Evaluation and Interactive Systems

Bell Laboratories

360 D 04.4.012

TSO PERFORMANCE ANALYSIS ROUTINES

USERS GUIDE

J. F. MARANZANO
B. J. DI MARSICO

TSO ANALYSIS/SYSTEM MEASUREMENT/TIME-SHARING PERFORMANCE/SIMULATION

360D-04.4.012

NOTE: The abstract and documentation for this program is written for two tapes. The two tapes have been combined into one for easier dissemination by the SHARE Program Library Agency (SPLA).

The first portion of the one tape that is disseminated contains the Performance Analysis Routines and it consists of 7 files. The second portion of the tape contains the TSO Terminal Simulator program and it contains 18 files.

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TABLES AND FIGURES

Bell Laboratories

subject: Users Guide for the TSO Performance Analysis Routines

date: March 21, 1972

from: B. J. Di Marsico
J. F. Maranzano

MEMORANDUM FOR FILE

A set of programs has been written to analyze trace tapes produced by the TSO (Time Sharing Option of OS) system.* The programs are:

1. Time History Plotting Routine
2. Command Measurement Analysis Routine
3. State Transition Analysis Routine
4. Command State Transition Routine
5. Histogram Report Generation

This memorandum describes how one can use each program. It also outlines the design of each program with a description of the structure of the important arrays and their sizes.

The programs are ordered in terms of depth of analysis required; the Time History Plotting Routine provides a good first look, the Command Measurement Analysis Routine yields information about the commands recorded on the tape, and the State Transition Analysis Routine affords a detailed look at the events that make up each time sharing transaction, while the Command State Transition Routine provides a detailed analysis by command type. The Report Generation program is used with the Command State Transition Routine to produce histograms of command timings and with the State Transition Routine to provide histograms of event times and counts (e.g., response time, number of swaps, think time).

---

* Tools for Evaluation and Maintenance of the Time Share Option of OS/360/370; [redacted]

Since all of these programs use the TSO trace tape, a brief description of its format is appropriate.

SECTION 0

TSO TRACE TAPE FORMAT

A TSO trace facility has been provided by IBM to allow the installation user to monitor the running of his TSO system. The trace facility may be turned on and off at selected periods to monitor important events and prevent undue recording overhead.

The trace tape (illustrated in Fig. 1) is started with a 3-word header containing the number of 3-word entries in each record, followed by a set of "normal entries", and ended with a trailer record containing the date of recording. Occasionally a "lost data" record is found on the tape that contains the number of 3-word entries lost because of a slow recording rate.

The most common entry on the trace tape, the normal entry, contains the time sharing job internal identification (TJID), an entry code indicating the cause of the event, a word of flags to further subdivide certain entry codes and the time of day recorded in timer units (26.04 μsec per timer unit). Three of the normal entries are immediately followed by additional entries containing data that did not fit into the initial three words. These events are:

1. Command entries that are followed by the command name,

2. Logon entries that are followed by the USERID, and

3. FE serviceability entries that are followed by a variable number of 3-word groups of diagnostic data.

The normal entry codes are listed in Fig. 2 along with their meaning. Some of the more useful ones are described below.

Entry code 0 is recorded at the beginning and at the ending of each command. The difference of beginning and ending times is a measure of the response of the command.

Entry code 2 is recorded when the TJID is waiting for terminal I/O. When entry code 2 is followed by entry

code 34, it indicates completion of terminal I/O, and the difference in time is an indication of the think time of the TSO user. Since entry code 2 also indicates the number of free buffers available for terminal I/O, it is used to adjust the TCAM buffer parameters for optimal core usage.

Entry code 3 indicates that a TJID is waiting for an event other than I/O to complete before proceeding. Examples of this condition, later described as "long wait", are: WTOR, STIMER, ENQ, and WAIT macro executions.

Entry code 4 indicates that a swapped-out user is ready to run while entry codes 12 thru 19 mark the preparation for swapping, swapping, and restoring of the user after swapping.

Entry codes 41 and 42 occur in pairs and indicate that the time sharing user has lost control of the CPU because of a SVC. By counting the occurrences of these entry code pairs, the number of transient SVC's used by a particular TJID can be established. A full list of the entries codes appears in Fig. 2.

SECTION 1

TIME HISTORY PLOTTING ROUTINE

The Time History Plotting Routine displays the trace tape entry codes defined in the previous section in columns across the page (one column per active user). Each event is time stamped with the elapsed time (seconds.msec) since the start of the tape. The maximum number of columns (the maximum number of active users) that can be displayed is 23. The right most two columns on each page record the total number of users waiting on the ready queue. A typical page of Time History Plot Output is shown in Fig. 3.

An explanation of each possible event that can be displayed for an active user is described below:

A. Events on Time History Plot (Alphabetical Order)

a. END ASM

The end of the command (or subcommand) ASM has occurred (entry code 0)

b. END G 21

Signals that a TGET end of 21 characters has been completed. (TGET end means that a terminal read has been satisfied).

c. END P 7

Signals that a TPUT end of 7 characters has been completed. (TPUT end means that a terminal write has been satisfied).

d. ENQ

A enqueue wait condition (entry code 45) has occurred; the users' program is a candidate for swapping out.

e. IN

The user's program has been swapped into the foreground region. This entry signals the end of the swap-in function (entry code 17).

f. IWAIT

The user's program has gone into an input wait condition because a TGET was issued and the data was not present in the TCAM buffers. The user is either typing or thinking; his program is eligible for swap-out.

g. LØGØN Z5A

Userid Z5A has logged on (entry code 25) and has been assigned the time sharing internal job identification (TJID) associated with the column in which the word LØGØN appears.

h. ØUT

The user's program has been swapped out of the foreground region. This entry signals the beginning of the swap-out function (entry code 14).

i. ØWAIT

The user's program has gone into an output wait condition because the number of buffers depleted from the buffer pool for this user has exceeded the installation defined limit (ØWAITHI). The user's program is swapped out until the number of buffers still assigned him reaches the installation defined low water mark (ØWAITLØ).

j. READY

The user has satisfied a waiting condition and his program is placed on a ready queue. The number of users on the ready queue is printed at the right most edge of the listing.

k. SVC 21

Twenty-one loads of transient SVCs' have occurred since the last entry code of any other type. This entry is a count of the trace tape entry code 41, 42 pairs.

m. T.S.

The user's program has exceeded a time slice value and is a candidate for swapping.

B. CONTROL CARDS

The program is written in Fortran and prints the entire tape. Therefore, the only cards necessary are the JCL to invoke the program, an FT10F001 ddcard to identify the trace tape, and an FT06F001 for printing the results.

An example of the JCL to run this program is shown in Fig. 4.

C. DESIGN SPECIFICATIONS

The Time History program is written in Fortran. It is capable of processing data events for 23 simultaneous users of the TSO system. The restriction of 23 users is to provide readability; the starting location of each unique user (TJID) is separated by 5 characters.

The program reads and decodes each TS trace tape entry into (1) the TJID, (2) the entry code (ICODE), and (3) the elapsed time since the start of the tape (TOD). The program uses ICODE as an index into the array REASON to access the eight character reason message to be printed. Similarly the program uses ID as an index into the array IX to access the number of spaces to position the entry on the page. These spaces are then stored into a dynamic format statement, IFMT, from which the time of day, reason, and optionally a name is printed. The name (NAME(1)) is used for LOGON entries, command starts and ends, or to contain a number to be printed for TGET, TPUT, or SVC entries.

Entry Code 1 indicating timeslice end is not associated with an ID. Therefore, the program must remember who is active in the foreground region and assign the timeslice end entry to that ID. If there is more than one foreground region there is no conventient way for the program to associate the timeslice entry correctly with the proper user. An attempt to remember which foreground user was swapped in first only solves the timeslice problem if the installation defines the same minimum timeslice value for all regions. What is needed from IBM or an installation is an associated TJID for Entry Code 1 on the trace tape.

SECTION II

COMMAND MEASUREMENT ANALYSIS ROUTINE

The Command Measurement Analysis Routine is used to collect and report the time and/or counts of the following events:

1. Command and subcommand usage
2. Terminal think and response time
3. Timeslice expirations
4. Task Dispatching
5. Swapping
6. Swap failures

The purpose of this routine is to provide load and usage characteristics of the TSO system.

A. REPORT FORMAT

The Command Measurement Routine will analyze trace tape data between user defined starting and stopping times. The user also defines those commands which he wants the program to analyze (see Control Cards for Command Measurement Analysis Routine). These user defined commands are placed in the Command Look up Table. Each unique command name is assigned an integer index (starting with one). This is done in order to minimize the storage required to identify a command. The uniqueness of names means that commands like EDIT and E will have the same index.

The program produced a data set of command timing that can be used to produce histograms for each command or sets of commands (e.g., all commands classified as trivial). The data set is made up of 30 two word

integer records. The first word is the index identifying the command, and the second word is the elapsed time of the command in modified timer units (M seconds = N timer units * 52.08/10**6). This data set can be sorted numerically within each index and can be used to either print the list of commands with their elapsed time value, or to produce histograms of each command. Several indices can be combined to produce data for combinations of commands. A word of warning is appropriate here. The elapsed times calculated are from command start to command end. This means that commands like EDIT will include all user think and typing time for subcommands. For commands such as EDIT, this measure is not an accurate portrayal of any response of the system. A better program to use for command response measurement in those cases would be the Command State Transition Routine.

In addition to a data set of command timings, the Command Analysis Routine also produces a set of summary reports that are explained below.

1. Command Usage Statistics

   A single report is generated for each unique command defined in the Command Look up Table.

   The report contains the command name and three columns of data:

   1. The Userid or blank (if the user logged-on before the trace tape was started).

   2. The average elapsed time in seconds to process the command.

   3. The count of the number of times the command was executed.

   An example of four such command reports is shown in Fig. 5.

2. Timer Expiration Analysis

   The Timer Expiration Analysis (see Fig. 6) provides counts of the number of timeslice ends, the number of terminal waits (either IWAIT, or OWAIT), and the number of non I/O (long) waits per userid. The number of terminal waits is equivalent to the number of transactions.

If the number of timeslice ends is large compared to the number of terminal waits, then either the installation has chosen an inappropriate value for their timeslice parameter, or the installation's time sharing load contains many long running commands for which corrective action may be warranted. Non I/O wait is defined as waiting for a condition that is not tape or disk I/O (terminal I/O wait is included as a non I/O wait). The difference between the Non I/O Wait Count and Terminal Wait Count gives the number of wait conditions due to enqueuing on a device (ENQ), a write to operator with reply (WTOR), a set timer (STIMER), or a wait macro execution. Since the last three events are seldom used in a time sharing environment, the count gives some measure of the bottleneck caused by enqueuing on resources.

3. User Ready Report

The User Ready Report (see Fig. 6) counts the number of times a user is put on a ready queue, and the number of times a restored user has a pending non I/O wait condition. This non I/O Wait is caused because:

1. The TGET or TPUT SVC's are not resident
2. The user has two outstanding wait conditions

If the number of times a restored user has a pending wait condition is high, the installation should consider first making the TGET, TPUT SVC's (IGC0009C, IGC09301, IGC0003C) resident.

4. Task Dispatch Report

The Task Dispatch Report (see Fig. 7) gives the number of task switches caused by:

1. Background Tasks
2. System Tasks
3. Time Sharing Tasks
4. Wait State Tasks

The ratio of the number of Time Sharing Tasks to Background Tasks is a gross indication of the number of times that the CPU switches between foreground and background tasks.

Since each task switch generates an entry on the TSO trace tape and since task switching occurs at a high rate (measured on the 370/155 under HASP as 50 per second) these entry codes tend to cause overflowed trace buffers (lost data records). It is possible with a small modification to the trace program to omit processing these entries.

5. Quiesce, Swap Out, Swap In, and Restore Reports

The swapping functions quiesce, swap out, swap in, and restore are presented as separate reports. Each report provides a column for the userid, the average time to perform the function in seconds, and a count of the number of swaps.

The Quiesce function prepares the user for swapping out and to insure that all control blocks, etc. will be correct when the user is returned to the foreground region. This is assured by purging outstanding I/O requests, dequeuing allocation requests, and general housekeeping.

Swap Out is the time to move all bytes of a program and data used by the foreground routine to the swapping device. This time will depend on the number of bytes to be swapped (swapping load), the method of swapping (serial or parallel), but mostly on the device to which the swap is taking place. Once Swap Out is completed the highest priority user on the ready queue will be swapped in. Restore then is the function of re-actuating the user's program at the point where it left off. A sample of these four reports is shown in Fig. 8.

6. Response/Think Time Analysis

The final report (see Fig. 9) provides:

1. The userid
2. Average values for user think and response time in seconds
3. The average number of characters used when issuing terminal I/O
4. The average number of buffers left in the buffer pool at each terminal wait condition.
5. The number of transactions per userid.

The average values for think time and response time gives a cursory look at how the system is performing. (See State Transition Analysis Routine for more detailed examination of system performance.)

The average number of characters used in terminal I/O gives an indication of the value to choose for the TIOC buffer size (BUFSIZE).

The number of buffers left in the pool provides an indication of how the pool is being depleted. Buffer Pool depletion is controled by the size of the pool (BUFNØ), and the maximum number of buffers each user may remove (OWAITHI). This measurement then provides a handle for choosing BUFNO and OWAITHI.

B. CONTROL CARDS

The program is written in Fortran and is directed to analyze a certain portion of the TSO trace tape by an input card containing a starting and stopping time. The program also reads the list of user defined commands (Command Dictionary) about which statistics will be summarized.

The trace tape which is read as logical unit ten (10) is processed until the user defined end time is reached or an end of file is encountered. At that point the program analyzes the data and produces the reports.

Report output is printed on the usual Fortran output unit six (6). In addition, each command that is encountered on the tape is listed regardless of whether it is processed or rejected. Those that are processed are also individually written onto logical unit eight (8) for histogram production (see the previous section for the format of the data set).

An example of the control cards and data cards needed to process trace data collected between 12:32 p.m. and 1:20 p.m. on data set DEC31 is shown in Figure 10. The first data card gives the title that will appear on the top line of each report, (in this case the title is the date). Based on the data cards, the program will produce summaries for the ALLOCATE, ASM, CALL, EDIT and TIME commands. The raw data will be written onto an existing data set called HIST DATA on a 2314 disk pack labelled TSWRK1. (see Fig. 10 - note that a blank input card is required.)

C. DESIGN SPECIFICATIONS

The Command Measurement Routine is written in Fortran with several assembler language functions for bit manipulation. The important arrays are:

1. Transfer Vector Table (ITV) dimensioned for 20 unique user-ids (each ID requires 20 words). (see Fig. 11)

2. Command Count Table (ICCT) dimensioned for 20 unique user-ids (each ID requires 120 words - 3 words per command). (see Fig. 12)

3. Quiesce, Swap Out, Swap In and Restore Arrays (IQUE, ISWØ, ISWI, IRES respectively) each dimensioned for twenty user-ids (each ID requires 3 words). (see Fig. 13)

4. Response/Think Table (IRESP) dimensioned for twenty user-ids (each ID requires 9 words). (see Fig. 14)

5. Command Dictionary (LØØKUP) dimensioned for 100 command names. (Each command name requires 3 words). (see Fig. 15)

As can be seen from above, the storage required for the arrays is dependent on the maximum number of unique user-ids that the installation expects to LOGON during a test period. For twenty user-ids the storage required for these arrays is:

ITV	20x20 = 400 words	= 1600 bytes
ICCT	120x20 = 2400 words	= 9600 bytes
Swapp	4*(3x20) = 240 words	= 960 bytes
IRESP	9x20 = 180 words	= 720 bytes
LØØKUP	100x3 = 300 words	= 1200 bytes
		14080 bytes

To increase the number of processed users, an installation should increase the dimension of each of the above arrays, increase the DATA statements that initialize the arrays to zero, and change the variable MAXID to the chosen maximum number of unique user-ids.

To increase the number of commands in the dictionary, an installation should increase the dimension of LØØKUP, increase the zeroing DATA statement, and change MAXUP appropriately (MAXUP = 3 * maximum number of commands). The format of these arrays is shown in Figs. 11 to 15.

The routine processes all data between the user defined starting and ending times before producing any summary reports. Each entry code is processed by a computed GØTØ statement. Those entry codes to be ignored will cause a branch to statement 80. Each entry code to be tabulated will cause a branch to statement N (where N is equal to the entry code for those entry codes greater than six and is equal to the entry code plus one for those less than or equal to six - e.g., entry code 0 branches to statement 1).

Statement 500 checks for the "end time" condition and branches to statement 1000 on such a condition. Statements 1000 to 9000 produce the summary reports.

The format statements follow a numbering convention for easy maintenance. Each format statement used to produce reports is numbered from 900 to 989. The middle digit is related to the report; whereas the last digit is a code for title (7), subtitle (9), and spacing (8). An example for the timer expiration (report number 2)is shown below:

```
927  FØRMAT(52X, 'TIMER EXPIRATION ANALYSIS')
929  FØRMAT(15X, 'USER-ID', 10X, 'NØ ØF TS ENDS', 10X,
   1 'NØ ØF TERM WAITS', 10X, 'NØ ØF NØN I/O WAITS')
928  FØRMAT(15X, A7, 15X, I7, 15X, I7, 23X, I7)
```

Two exceptions of this convention are: (1) those reports that use a common spacing format statement (Command reports (report 1) uses 958 for spacing, Swap Failures (report 6) uses 928 for spacing), (2) the Swapping reports all have the same format except for page titles which are labelled 957, 956, 955, 954.

Format statements 998, 997, 996, 995 are top of page, single space, double space, and triple space respectively.

Subroutines

Three subroutines are used by the Command Analysis Routine. GETD is used to read records from the trace tape and deblock them for processing. This subroutine should be changed if records are blocked differently than 2048 bytes.

The function KFUNC is used to match two four byte character strings. The function is negative if the two strings matched and at least one trailing blank existed (e.g., ASM¢), zero if the two strings matched and no trailing blanks (ALLØ), and positive if the match failed, blanks or not. KFUNC is used to determine when a match existed between TSO commands.

The HISTØ subroutine is used to block command data for writing to a disk file. It writes 240 byte records containing 2 word entries. Word one is the command index, and word two is the elapsed time required to process that command in modified Timer Units (M Timer Units * 52.28/10**6 = N seconds).

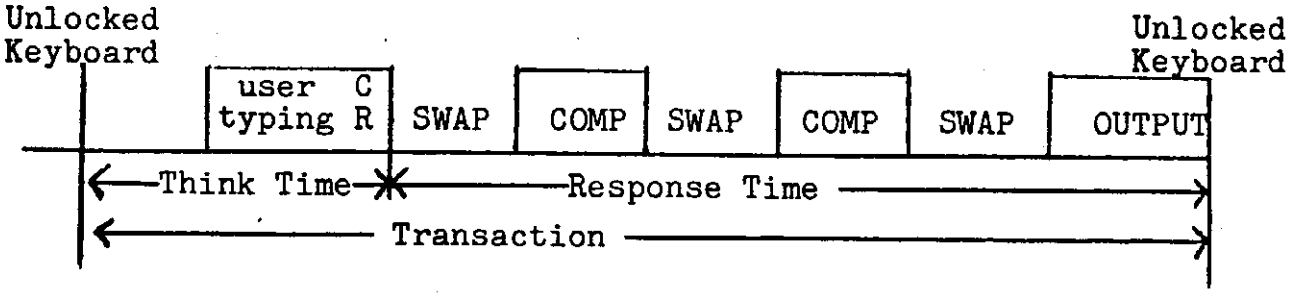
SECTION III.

STATE TRANSITION ANALYSIS ROUTINE

A. INTRODUCTION

The State Transition Analysis Routine reads a model of a time sharing transaction and processes each entry code on the TSO trace tape according to this model. The model was first described by Mr. R. McNeill of IBM, but has been expanded to provided more detailed information.

A transaction is defined as the elapsed time between unlocked keyboard commands (e.g., READY). In a simplified form, the transaction can be divided as shown below.



For the evaluation of the TSO system it is necessary to divide the transaction further to measure the critical events and to locate system bottlenecks.

The State Transition Analysis Routine is designed to record timing and count data for each state described in the Decision State Table. This table, therefore, is the model of a Transaction under which data is analyzed. Because the routine operates on the trace tape data as specified by this table, the model can be readily changed (within some initialization restrictions) to allow the user to consider different divisions of a transaction.

As an example of one model of a transaction consider Fig. 16. In this model the different components of the transaction are represented by the states ((N)), while the trace tape entry codes indicating a transition from one state to another are represented by the vectors connecting the states. Notice that each state has an implied vector back to itself for all entry codes that are to be ignored. Each state is labelled with the reason the transaction has entered that state; for example, time spent in State 6 is the accumulation of all swapping out time due to time slice end. Furthermore, since the transaction is

defined as the elapsed time between "unlocked keyboards", State 2 represents the begin/end state for all transactions except logon and logoff.

Consider the hypothetical transaction described below and illustrated in Fig. 17.

The user has just received a READY message (unlocked keyboard, State 2). The user begins typing a command e.g., TIME) which is stored into buffers in the TCAM message area. The user's program (called so because it resides in the foreground region for this user but may be a system routine, e.g., the command processor) has been swapped out pending completion of the typing. When the user depresses the end-of-line key, an interrupt is generated and the user's program is made ready (State 3). Note that the accumulated time in State 2 is, therefore, the user preparation time (often called Think time). When the user's program reaches the top of the ready queue the program is swapped in (State 4) and execution begins (State 5). In the case of a simple command like TIME, no disk I/O is required and the user's program continues to execute until complete or time slice ended (State 6, State 3, State 4) after which execution continues (State 5).

Once the program has finished executing, output is sent via a TPUT macro to the TCAM buffers. The user's program is not swapped out with the initiation of terminal I/O unless there is a shortage of TCAM buffers. When a shortage occurs, the user is swapped out indicated by a terminal output wait condition (State 11).

In the normal case, however, the user's program completes the output transfer to TCAM buffers and continues executing. In this example the program will then provide the user with another READY message at which point the user is swapped out for terminal input wait (State 12) and the transaction ends.

Two important loops in the model have not yet been discussed. State 10 is entered when the user's program issues a transient SVC and cannot be swapped out until its fetch is successfully completed. Therefore, State 10 provides a count of the number of transient SVC's loads in each transaction.

The other important loop (State 7, 8, 9) in the model occurs when the user's program is put in a wait state because of enqueuing on a device (ENQ), issuing a wait

on timer macro (STIMER), issuing a write to operator with reply macro (WTOR), or issuing a WAIT macro.

Consider the more comprehensive model of Fig. 18. In this model we have separated response time into interactive response (from carriage return to first TPUT) and system response (from carriage return to IWAIT). The system response states are a replication of the interactive portion of the model; the transition from state 5 to state 12 indicates that output has been sent to the terminal (a TPUT end has occurred).

B. OUTPUT FORMAT

The output of the State Transition Analysis Routine is a data set that can be processed by the Report Generation program. The output data set (called Transaction Output Array) contains N entries, each of which is associated with a connecting vector leaving a state in the model. Each entry is used to accumulate time and counts of the use of that path from a state and will have the following format:

1. Accumulated elapsed time in modified timer units (1 Timer Unit = 52.08* 10** -6 sec) from entering the state until leaving on this vector (TRANS(N).ACCUM FIXED BINARY(31)).

2. The number of times the state was left on this vector (TRANS(N).COUNT FIXED BINARY(31)).

3. The state that the vector is leaving (TRANS(N).STATE FIXED BINARY(31)).

The time spent in a state is the summation of the times associated with the vectors leaving that State. An example of a Transaction Output Array is shown pictorially in Fig. 19.

The data set is written in variable length records (RECFM=V) and Blocksize of 1204 bytes. The Blocksize is user defined on the JCL.

C. CONTROL CARDS

The State Transition Analysis Routine is written in PL/I and reads the TSO trace tape between user defined start and end times. The output of the program is a data set that can be processed by the Report Generation Histogram Routine.

4. A negative entry code is used to distinguish that an entry has two meanings (entry code 2 means IWAIT (+2) and OWAIT (-2)). The negative sign is chosen when word 2 of the three word trace tape entry is negative (high order bit = 1).

A full set of the JCL and data cards (including the decision state table) for the model of Fig. 16 is described in Fig. 20. The JCL indicates that trace data recorded between 11:53 am and 1:20 pm on tape BX1028 with a data set name DEC27 will be processed. The first data card is the number of vectors, the second card is the start and stop time (Hours, Minutes), each subsequent card contains the old state, entry code, new state and output code for the model.

D. DESIGN SPECIFICATIONS

The State Transition Analysis Routine is written in PL/I and has user defined variable size arrays. The structure of the major arrays is shown below.

1. TJID Table - one entry for each unique user-id. The cell OLDSTATE will be the current pointer within the model for each TJID. The initial size of the TJID table was dimensioned for 30 unique id's (controlled by variable MAXID) and is separated into

```
ØLDSTATE  FIXED  BINARY (15)
LØGIC     FIXED  BINARY (15)
```

The variable LOGIC is used for initialization of each TJID. The value of LOGIC indicates how far along the initialization the TJID has proceeded:

0 - no initialization
1 - an IWAIT has occurred
2 - initialization is complete
3 - a LOGON has occurred

2. Decision State Table - contains the user defined state model:

```
ØSTATE  FIXED  BINARY (15)  old state
ECODE   FIXED  BINARY (15)  entry code
NSTATE  FIXED  BINARY (15)  new state
IØCØDE  FIXED  BINARY (15)  output code
```

A set of these variables exists for each vector in the model.

3. Transaction Output Table is used to collect time or count for each state in the model for each TJID. The format of this table is shown pictorially in Fig. 19. Each entry in the table is formatted as follows:

```
START   FIXED  BINARY (31) starting time when
                           state is entered

ACCUM   FIXED  BINARY (31) elapsed time in state

COUNT   FIXED  BINARY (31) the number of times
                           the state is entered

STATE   FIXED  BINARY (31) the state number
```

The program is independent of the model requested within some initialization restrictions. These restrictions are needed because a trace tape can be started at any time within a TSO work load, and occasionally "lost data" records are encountered meaning that some expected entry code may never occur. The restrictions are:

(1) that the model start in state 1

(2) an entry code 30 (LOGON) followed by a READY message (TPUT of 7 characters) causes transfer to state 2, and

(3) state 2 be defined as the think time state which is initially arrived at from state 1 or by the occurrence of an entry code 2 (IWAIT) followed by an entry code 15 (Swap Out End) Combination.

These restrictions make sure that all transactions start at the same place. The code will skip all tracetape entry codes until one of the initial conditions is reached. For example if a user is in the middle of an ASM Command and the trace tape is started, the ASM command will not be processed by the program but the very next transaction (command) will. After a "lost data" record, all arrays are cleared to zero and an initial condition is again sought.

Although not advisable, the user of the program could bypass these initial conditions by modifying the code starting at the label SEARCH.

SECTION IV.

COMMAND STATE TRANSITION ROUTINE

4. INTRODUCTION

The Command State Transition Routine is used to measure the interactive response time of classes of commands. The program uses a model (see Figs. 21 and 22) similar to the State Transition Routine, where the states of the model represent elapsed times for events, and the vectors connecting the states are trace tape entry codes.

Commands are separated into one of seven classifications each of which is assigned a pseudo entry code as defined below:

Classification	Pseudo Entry Code
1) Trivial	50
2) Non-Trivial	51
3) Data Dependent	52
4) EDIT	53
5) SAVE	54
6) TEST	55
7) EXEC	56

These classifications are chosen to provide the user with a wide diversification of data and to handle special cases (e.g., the EXEC command processes stored set of commands that can be completed without any user intervention and therefore represent one transaction).

The model works as follows. Think Time is accumulated in state 1. Once a user has typed a command and hit carriage return, he is placed upon a ready queue (State 2). When the user is swapped in, an entry code 0 with the command name is registered on the trace tape. This command name is used by the program to search a installation defined dictionary of commands. Associated with each name in the dictionary is a pseudo entry code. When a command name match is found the pseudo entry code is used in place of entry code 0.

Consider that the user typed a TIME command (classified as trivial in our dictionary, pseudo entry code 50) control in the model would pass to state 50. State 50 would be the elapsed time to process the TIME command and send output to the user since State 50 is exited by terminal I/O (TPUT or IWAIT). The addition of State 50 and State 2 times would be the interactive response time for that command. The transaction would end when a command end entry code (-50) was found. Non-trivial (51) and data dependent (52) commands work similarly.

If the command had been EDIT, control would have passed to State 53. State 53 time would be the elapsed time for the edit processor to fetch the data set under modification and to answer the user. Subsequently, each edit subcommand would cause a loop through States 4, 5, 6, 7. Since State 7 is entered when the user is swapped into the foreground region and is left on a terminal I/O the elapsed time in that state is the summation of the interactive response times for the edit subcommands. A separate loop is used when a SAVE subcommand is encountered (States 55, 10, 11, 12, 13).

The reason for separating the first EDIT answer and SAVE subcommand from the other edit trivial subcommands was that both required data set management (fetch and storing of the user's data set) and therefore are not considered trivial commands. (Looking at our data for these subcommands reinforces this definition since the time to access the data set for EDIT was an order of magnitude larger than the manipulation of the modifications into the temporary work space).

The final loop of importance in the model is to handle the EXEC command. Since EXEC reads a prestored list of commands from the disk and processes them without user intervention, the entire execution is treated as one transaction. Furthermore, since any commands (trivial, nontrivial or data dependent) could be in the prestored list, there is no attempt to classify EXEC as belonging to any set.

B. OUTPUT FORMAT

The output of the Command State Transition Analysis Routine is a data set that is used by the Report Generation program to produce histograms of the commands by type; Trivial, Non-Trivial, Data Dependent, EDIT, TEST, EXEC, and SAVE under EDIT. The output data set contains N entries, each of which is associated with a vector in the model. Each entry in this Transaction Output Array is used to accumulate elapsed time in the states of the model and will have the following format:

1. Accumulated elapsed time in modified timer units (One Time Unit = 52.08* 10** -6 sec) for the vector (T(N).ACCUM FIXED BINARY (31)).

2. The number of times that the state was left on this vector (T(N).COUNT FIXED BINARY (31)).

3. The state that the vector is leaving (T(N).STATE FIXED BINARY (31)).

The time spent in a state is the summation of the times associated with the vectors leaving that state.

The program also produces a summary report that tallies the average value of the interactive response for each command encountered on the trace tape and also present in the Command Dictionary. This summary gives indications of which commands are the "heavy" command in TSO. It can also be used to verify that the user's choice of a classification for a command is correct. An example of a summary is shown as Fig. 23.

C. CONTROL CARDS

The Command State Transition Routine is written in PL/I and will process a TSO trace tape between user defined start and end times. The user also specifies the commands for which analysis is requested, and classifies them as trivial (50), nontrivial (51) and data dependent (52).

In addition, the user defines the model under which the commands will be processed. Because TSO processes commands inconsistently (e.g., some commands generate command end before TPUT end, others generate the codes in the opposite order; some commands end on IWAIT others end on command end) it is suggested that installations use the model given in Fig. 21 as the existing program handles the inconsistencies in command processing.

Figure 24 shows the JCL required to analyze trace data between 8:40 pm and 9:10 pm recorded as data set JAN9.W18D25 on tape BX1029. Notice that the first card (NM) is used to give the number of vectors in the model (N), and the number of commands in the user defined dictionary (M). It is followed by the start and end time card (Hours, Minutes) and then the model. (Each card represents OLD START, pseudo or real entry code, and NEW START.)

D. DESIGN SPECIFICATIONS

The Command State Transition Routine which is written in PL/I calculates the interactive response time of classes of commands. The program contains variable sized externally defined arrays. The first user supplied data card (NM) contains the number of vectors in the model (N) and the number of commands in the dictionary (M) and is used to size the arrays. The first parameter (N) is used to size the Decision State Table (DS), and the Transaction Output Array (T). The second parameter (M) is used to size the command name dictionary array DICT. The structure of these arrays is as follows.

1. The Decision State Table is used to store the model and contains elements for the old state, entry code value, and new state:

```
OLD    FIXED  BINARY (15)
ECODE  FIXED  BINARY (15)
NEW    FIXED  BINARY (15)
```

2. The Transaction Output Array is used to store data about each transaction for each USERID. It is two dimensional (N vectors by MAXID ids) and contains elements to save the starting time a state is entered, the accumulated elapsed time that the transaction remained in this state in modified timer units (1 TU = 52.08* 10** -6 secs), the number of times the state was left on a particular vector, and the state number:

```
START  FIXED  BINARY (31)
ACCUM  FIXED  BINARY (31)
COUNT  FIXED  BINARY (31)
STATE  FIXED  BINARY (31)
```

3. The command name dictionary is used to contain the user selected command names and user defined categories (trivial 50, non-trivial 51, data dependent 52, EDIT 53, SAVE 54, TEST 55, and EXEC 56) for each name:

```
NAME   CHAR (12)
ECODE  FIXED  BINARY (15)
```

4. The TJID table is used to keep track of the current position (state) within the model for each TJID. It also is used to describe that initialization has been completed for a particular TJID:

```
OLD    FIXED  BINARY (15)
LOGIC  FIXED  BINARY (15)
```

The initialization bits in LOGIC have the following meaning:

0 no initialization
1 command start found - go to State 1
2 Logon found

5. MAXID is used to define the maximum number of TJID's to be processed in each run. It has been initialized to 30 and can be changed by an installation. Increasing MAXID will require additional memory for execution; approximately 5*N words per ID (where N is the number of vectors and is defined as 40 for the given model).

E. RESTRICTIONS

This program is not as flexible as the State Transition Analysis Routine because of anomalies of command handling by TSO. The program assumes that transactions will start and end in State 1. Furthermore, State 2 must be defined as the ready queue time.

The interactive response time is the elapsed time from carriage return to terminal output (TPUT). It is therefore the summation of ready queue time and the execution time (CPU and I/O) to process the command. Since State 2 (the ready queue time) is common to all execution time states (50 thru 56) the time in State 2 is added by the program to the time of the appropriate State. In order to do this the program assumes that state 2 is left on vectors that are triggered by command starts only.

With these several restrictions it is suggested that this model not be changed by the user of the program without a detailed examination of the program listing. The program does assume that certain states have predefined meaning and are connected to other specific states.

SECTION V.

HISTOGRAM REPORT GENERATION ROUTINE

The State Transition Analysis Routine and the Command State Transition Analysis Routine produce records of TSO transactions that are summarized by the Histogram Report Generation Routine. Each input record has N entries, one for each vector in the state diagram (see the Section on State Transition Analysis Routine). The entries contain:

1. The number of the state.
2. The accumulated elapsed time (in timer units) for the state.
3. The number of times the state was entered.

The user of the program relates states to events (e.g., Ready Queue time is time from states, 3, 8, 15, 17) and defines the histogram intervals. The program uses this information to produce the histogram picture (see Fig. 25).

A. REPORT FORMAT

Histograms are a pictorial presentation of data values. The data is slotted into cells to give a presentation

of the distribution of the values. All data values that fit between the lower cell limit and the upper cell limit are assigned to that cell and the count for that cell is increased by one (for example a data value of 6.325 would fit in the cell 6.0 to 6.5).

Histograms for TSO data can be produced for time values (e.g., response time) or for count values (e.g., the number of SVC's). Since the report format is identical for time and count data (the units for time is seconds, count is pure numbers) the explanation below will describe only a time histogram.

The top two lines of the report provide the summarized statistics of the data:

1. Total - accumulated seconds for all occurrences of the event

2. Average - the total seconds divided by the number of transaction ($\bar{x}$).

3. Standard deviation = $\frac{1}{p-1}\left(\sqrt{\left(\sum_{i=1}^{p} x_i\right)^2 - \frac{\bar{x}^2}{p}}\right)$

   where p = number of transactions

   x_i = accumulated seconds for transaction i

   $\bar{x}$ = average

4. Minimum - smallest elapsed time for any transaction

5. Maximum - largest elapsed time for any transaction

The statistics without overflow line is the same as described above except all data values which exceed the last histogram value are not included (see below for cell specifications).

The FREQUENCY line on the histogram provides the number of transactions that belong in each cell. The summation of these numbers is the total number of transactions processed.

The number of data values in each cell are represented graphically by asterisks (*). Each asterisk is weighted (e.g., one asterisk equals 4 data values) to provide the maximum display on the page. The left hand side of the picture is labelled with the value of each asterisk.

The two lines at the bottom of the histogram are the cell limits in seconds and the percentage of transactions that fall in each cell.

The cell limit defines the maximum value for that cell; all data less than the cell limit fit into that slot. For example, the data values 5.0 to 5.999 ... fit into the cell labelled 6.0, whereas a data value of 6.0 fits into the cell labelled 7.0.

Each histogram has a underflow and an overflow cell. The underflow contains all data values less than the user defined starting value. For example, if the user defined 1.0 as the starting value, all data values less than 1.0 would be listed in the first cell (labelled 1.0). The overflow cell contains all data values greater than the user defined range. These data values are shown as the last line of asterisks on the histogram and are labelled with the interval one greater than the user defined range. (See Control Cards for Histogram Report Generation).

B. CONTROL CARDS

The Histogram program is written in PL/I and processes raw data from a disk data set created by the State Transition and Command State Transition Analysis Routines. The program reads from the data set identified by the TRACEOT ddcard and prints on the SYSPRINT data set. Input cards are read from the SYSIN file.

The first input card contains:

1. the number of vectors in the state diagram (N)
2. the number of histograms to be processed (M)
3. an indicator (0 for State Transition Reporting, 1 for Command State Transition Reporting)

These values are needed to dimension the arrays for data. Subsequently there are M sets of three cards that specify parameters for each histogram.

Card 1 of the set contains the indication of the type of data (TIME or COUNT) and the title of the histogram.

'TIME' 'ENQUEUE WAIT TIME IN SECONDS - 1/7/72'

'COUNT' 'NUMBER OF ENQUEUE WAITS 1/7/72'

Card 2 of the set contains the number and states to be combined (added) to provide the histogram. As an example of a card 2 consider the calculation of the time on all ready queues which is obtained by adding the data values of states 3, 8, 15, 17. Card 2 would then have the form:

```
4   3,8,15,17
```

Card 3 of the set contains the user defined starting value, number of cells and cell interval for the histogram. If the user specified.

```
0.0,5.0,0.5
```

on Card 3 the histogram would have 5 cells plus an underflow and an overflow cell; and each cell would have a 1/2 second spacing as shown below:

An example of the JCL and data cards required to produce two histograms (one of ready queue time, and one of SVC count) from data produced by the State Transition Routine on data set MODEL is shown in Fig. 26.

C. DESIGN SPECIFICATIONS

The histogram program is coded in PL/I and designed to be driven from the user defined control cards. The arrays are dimensioned based on the number of histograms to be produced and the amount of data contained in each transaction (both of which are specified by the user.)

The program handles 2000 transactions (about 2 hours of trace data with 25 users) in each pass. The array called TABLE is used to hold the processed data. Each element of TABLE represents a point in a histogram (e.g., one point in the SVC count histogram is the summation of data values for state 10, 18.)

Once 2000 transactions have been processed or the input data set end of file is encountered, the data for each histogram is slotted into cells and the histogram is printed. The 2000 transaction limit can be changed by modifying the variable MAXTRAN; such a modification may require a larger region of memory for program execution.

Indicative messages are printed if errors are encountered. These messages fall into five categories:

1. NO VARIABLES OR DATA - there is no data for the states specified.

2. TOO MUCH DATA - there are more than 2000 transactions for this histogram.

3. ALL DATA UNDERFLOW - all the data values for a histogram are smaller than the user defined lower limit.

4. ALL DATA OVERFLOW - all the data values for a histogram are larger than the user defined upper limit.

5. NO STANDARD DEVIATION - all data values are identical.

SECTION VI.

TAPE KEY

This section describes how an installation compiles and creates load modules of the programs. All the previous control card sections indicate that the programs are stored on a JØBLIB dataset called TSO; the control cards in this section describe how that data set is built.

An installation should punch out the instream catalog procedure from the first file on the tape (see Fig. 27). This is used rather than starting a reader to the tape because of the differences in acceptable JOB cards at various installations.

The instream catalog procedure is used to:

(1) create and catalog a TSO source data set (STSO) and a TSO load module data set (named TSO);

(2) copy the source data from the tape files to the STSO data set;

(3) assemble, compile, and link edit the programs creating load modules in the data set TSO.

This instream catalog procedure will call the standard IBM compilers and assembler:

1. assembler F

2. PL/I level F

3. Fortran H

The installation user also supplies symbolic parameters for the volume and unit for the source and load module data sets. These parameters are called SVØL,SUNIT,LVØL, LUNIT respectively. A symbolic parameter TUNIT is also used to identify the unit name of an 800 BPI, 9 track drive. The symbolic parameter SCRH defines the unit name of scratch data sets.

As an example, assume that a user wants the source data set on a 2314 with the volume serial number of PERM21, and the load module on a 3330 with the volume serial number of TSWRK, he would then execute the procedure as follows:

```
//    JOB     ...
instream procedure cards
//    EXEC    TSOGEN,SVØL=PERM21,SUNIT=2314,
//            LVØL=TSWRK,LUNIT=3330
 /*
```

The default units for SUNIT and LUNIT are 2314, whereas TUNIT defaults to 2400, but the user must supply SVØL and LVØL. The scratch unit (SCRH) default is SYSDA.

A list of the contents of each file on the tape (which is 9 track, 800 BPI) is shown in Figure 27.

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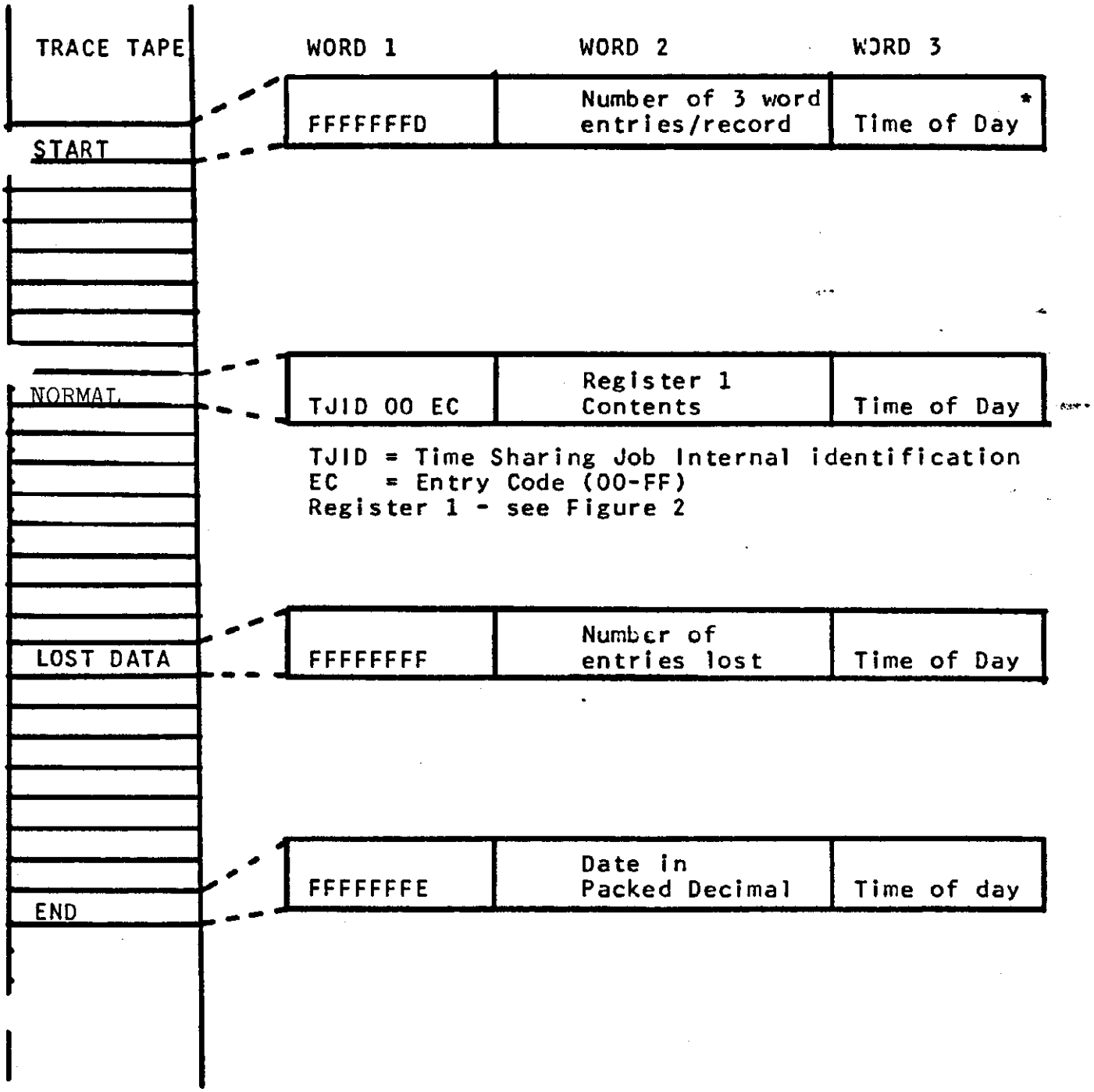
Tables and Figures



TJID = Time Sharing Job Internal identification
EC = Entry Code (00-FF)
Register 1 - see Figure 2

* Time of Day in Timer Units (1 Timer Unit = 26.04 microsec)

Figure 1: Trace Tape Data Format

Entry Code	Reason for Entry	Register 1
0	Command about to be processed	next entry is name
1	Time slice has expired	
2	User is waiting for terminal I/O. Swap him out.	Bit 0: 0=input 1=output bytes 3,4=# of free buffers
3	User's tasks in non-I/O wait.	
4	Swapped out user ready to run.	
5	Restored user is still in non-I/O wait.	
6	User is setting must complete for owned resources.	Estimated must complete time.
7	User is no longer in must complete status.	
8	A task switch to background task is being dispatched.	
9	A task switch to a system task is being dispatched.	
10	A task switch to a new t.s. task is being dispatched.	
11	A task switch has resulted in a system wait.	
12	Quiesce is started.	
13	Quiesce is complete.	
14	Swap out start.	
15	Swap out complete.	
16	Swap in start.	
17	Swap in complete.	
18	Restore is started.	
19	Restore is complete.	
20-24	Reserved.	
25	Pass Logon information for accounting purposes.	Next entry is USERID
26	Time of day must be altered.	
27	Specify size region for specific foreground region.	Region number.
28	Reserved.	
29	Logoff, release TJID	
30	Logon, put user into region.	Region id.
31	Obtain region id for size.	Region size.
32	Swap in failed.	Bit 0: 0=logon,1=not logon.
33	Swap out failed.	
34	TGET,TPUT was satisfied.	Bit 0: 0=TGET,1=TPUT
35	Attention interrupt received.	
36	Permanent terminal I/O error.	
37	Logoff, logical disconnect.	
38-39	Reserved.	
40	Region failed.	Region ID.
41	Do not swap out user.	
42	Allow swap out of user.	
43	Logoff, update accounting.	
44	FE diagnostics.	Bits 5-7: n where 2(n+1) entries follow
45	User in enqueue wait. Swap him out.	

Figure2: Entry Code Table

Reference: IBM Manual-C 28 6698- TSO Option Guide

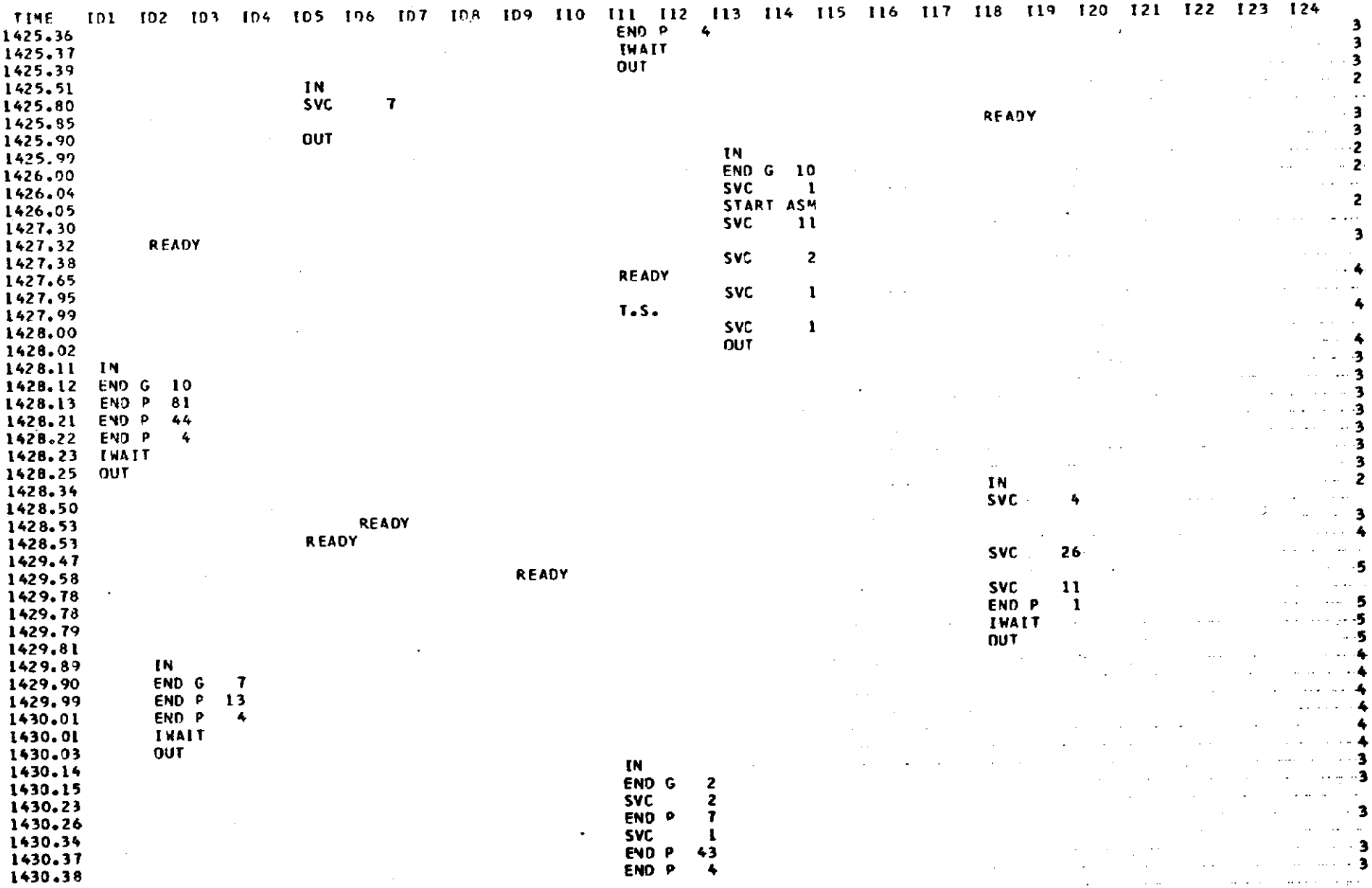


Figure 3: Time History Example

```
//SYSUDUMP  DD  SYSOUT=A
//                DCB=(BLKSIZE=2048)
//                DISP=SHR,UNIT=2400,
//FT10F001  DD  DSN=DEC28,VOL=SER=BX1020,
//FT06F001  DD SYSOUT=A
//    EXEC    PGM=TIME
//JOBLIB  DD  DSN=TSO,DISP=SHR
//       JOB    ...
```

Figure 4: JCL For Time History Plotting

COMMAND ANALYSIS REPORT

DELETE

USER-ID	AVERAGE TIME	COUNT
FH	67.629	3
VIC	18.140	1

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COMMAND ANALYSIS REPORT

EDIT

USER-ID	AVERAGE TIME	COUNT
	75.456	4
IBM	38.361	2
FH	348.047	3

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COMMAND ANALYSIS REPORT

EXEC

USER-ID	AVERAGE TIME	COUNT
	9.642	1
FH	14.772	1

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COMMAND ANALYSIS REPORT

FREE

USER-ID	AVERAGE TIME	COUNT
VIC	41.664	1

Figure 5: Command Summary Reports

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TIMER EXPIRATION ANALYSIS

SER-ID	NO OF TS ENDS	NO OF TERM WAITS	NO OF NON I/O WAIT
IBM	2	17	23
[illegible]M	1	10	8
	8	136	147
VIC	2	24	33

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USER READY REPORT

USER-ID	NO OF USER READIES	NO OF NON I/O USER READIES
IBM	25	14
IBM	11	5
FH	151	113
VIC	33	20

Figure 6: Timer Expiration Analysis & User Ready Report

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TASK DISPATCH REPORT

NO OF BG TASKS	NO OF SYSTEM TASKS	NO OF NEW TS TASKS	NO OF WAIT TASK
59607	71929	10420	74850

Figure 7: Task Dispatch Report

Figure 8: Swapping Functions

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QUIESCE REPORT

USER-ID	AVERAGE TIME	COUNT
	0.019	77
IBM	0.028	41
	0.022	9
IBM	0.042	23
FH	0.020	205
VIC	0.019	48
	0.017	22

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SWAP OUT REPORT

USER-ID	AVERAGE TIME	COUNT
	0.145	76
IBM	0.215	41
	0.162	9
IBM	0.210	23
FH	0.136	204
VIC	0.146	48
	0.142	22

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SWAP IN REPORT

USER-ID	AVERAGE TIME	COUNT
	0.279	75
IBM	0.354	44
	0.171	10
IBM	0.195	24
FH	0.141	209
VIC	0.160	48
	0.141	22

09/27/71 PAGE 18
RESTORE REPORT

USER-ID	AVERAGE TIME	COUNT
	0.005	75
IBM	0.005	44
	0.006	10
IBM	0.004	24
FH	0.006	209
VIC	0.005	47
	0.005	22

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RESPONSE/THINK TIME ANALYSIS

USER-ID	AVERAGE THINK	AVERAGE RESPONSE	AVERAGE OUTPUT	COUNT
	18.151	29.477	99.053	28
IBM	10.798	19.826	9.155	9
	21.880	3.193	9.907	2
IBM	5.632	9.110	10.298	4
FH	16.477	4.378	23.002	80
VIC	18.711	12.643	57.852	17
	15.184	2.155	28.341	16

Figure 9: Response/Think Time Analysis

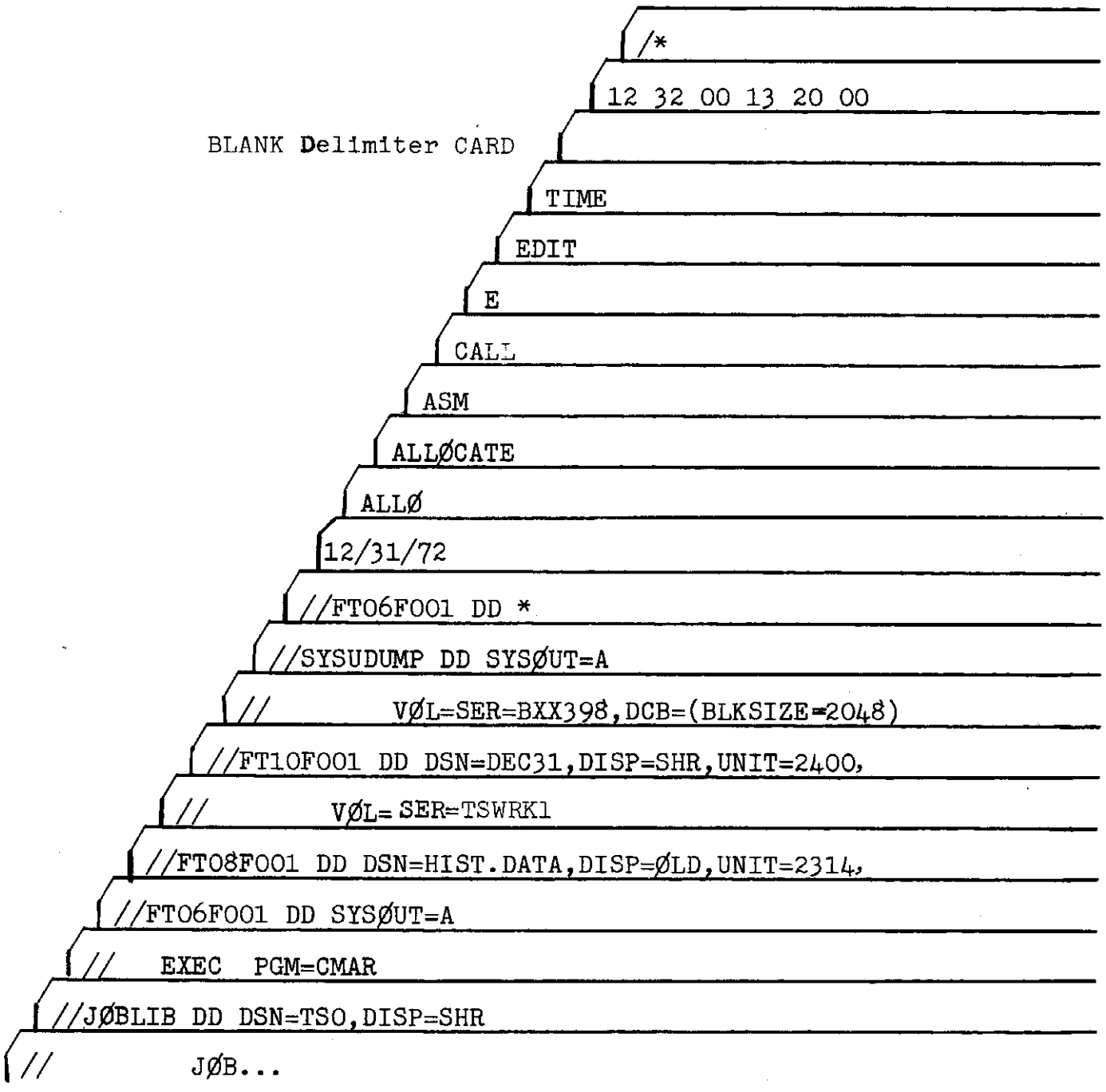


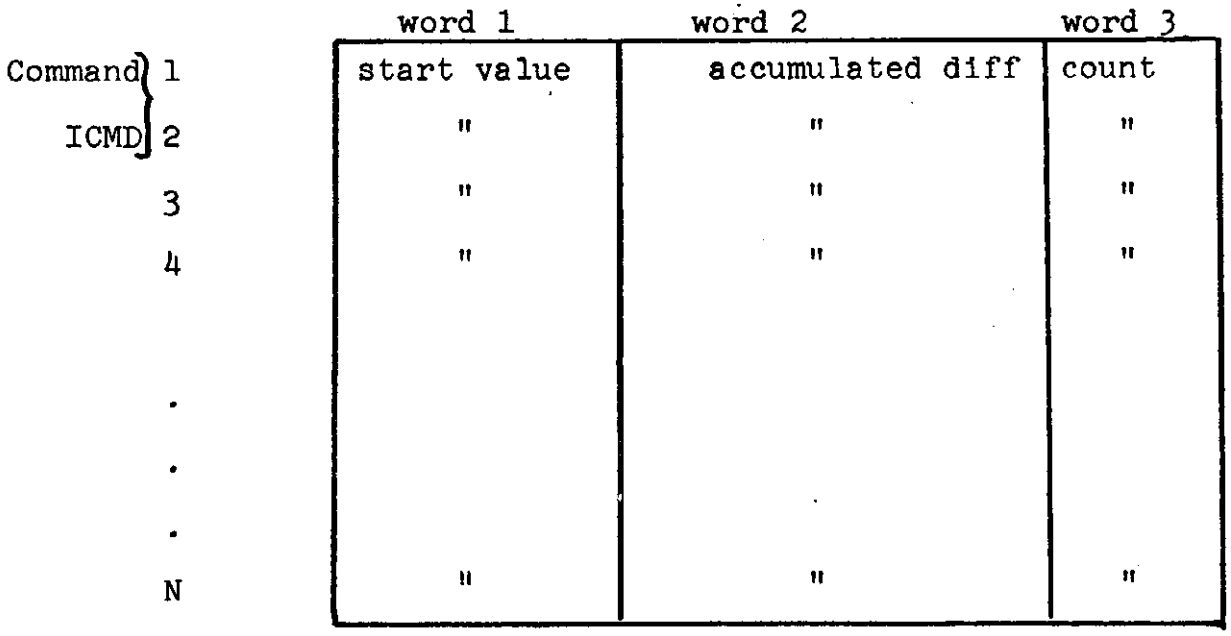
Figure 10: Control Cards for Command Measurement Routine

$TJID_1$	W1	W2-3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
$TJID_2$	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
:																			
$TJID_n$	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

The Transfer Vector Table has 20 words for each TJID. The values of the words are as follows:

W1- alternate id or zero
W2,3- USERID
W4- count of t.s. end
W5- count of terminal waits
W6- count of non-I/O waits
W7- count of user readies
W8- count of user non I/O readies
W9- pointer to quiesce table
W10- pointer to swap out table
W11- pointer to swap in table
W12- pointer to restore table
W13- count of terminal errors
W14- pointer to command table
W15- count of swap in failures
W16- count of swap out failures
W17- pointer to response table
W18-20 reserved for future use

Figure 11: Transfer Vector Table

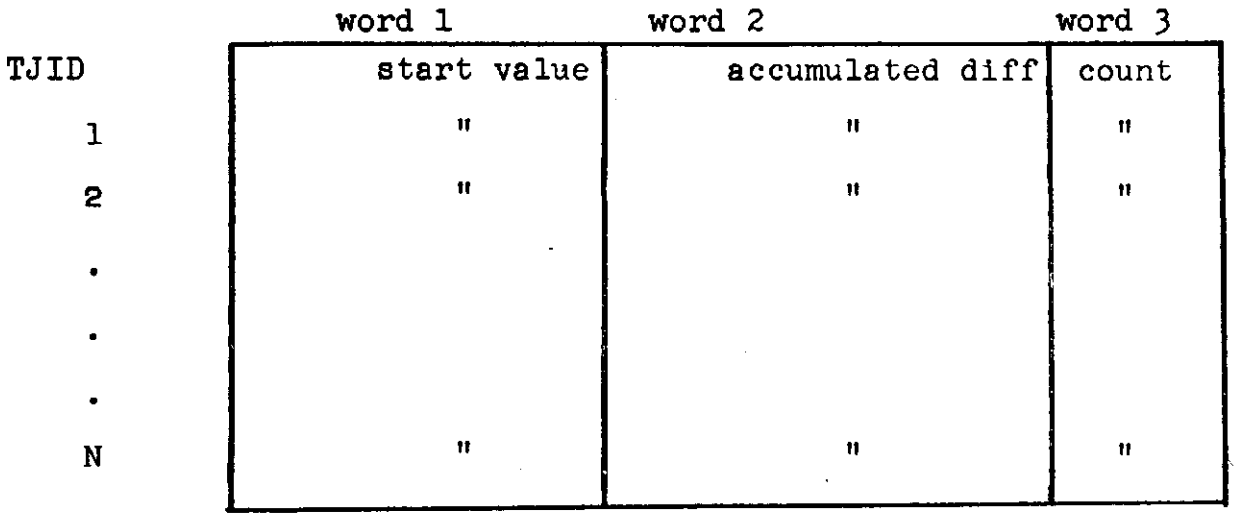


A Command Count Table (ICCT) exists for each TJID. Each entry in the table is used to record time and count information for one command. For example, to update the count for the command CALC (ICMD=4) of TJID number 19 the following code is used:

```
NCCT = ITV (14, 19)      Index to Command Count Table
                           for ID19
ICMD = 4

ICCT (3, ICMD, NCCT) = ICCT (3, ICMD, NCCT) + 1
```

Figure 12: Command Count Table



Format of Quiesce table IQUE, Swap Out ISWO, Swap In ISWI, restore table IRES

A 3-word entry exists for each TJID. A pointer exists in the Transfer Vector Table (ITV) for each table. To access the count of Swap Outs of $TJID_5$ the following code could be used:

```
    NSWO = ITV (10, 5)          Index to table for TJID5

  ICOUNT = ISWO (3, NSWO)
```

Figure 13: Quiesce, Swap Out, Swap In, Restore Tables

	word 1-2	word 3
WORD 1-3	ACCOUNT	1
4-6	ALLOCATE	2
.	ALLOC	2
.	ASM	3
.	CALC	4
	CALL	5
	CANCEL	6
	COBOL	7
	COB	7
	CONVERT	8
	CON	8
	COPY	9
	DELETE	10
	.	
	.	
	.	
	WAIT	N

Command Lookup Table contains 3 words for each command.

The Command Measurement Analysis Routine uses this table to provide a unique index for each unique Command. The index, called ICMD, is then used to access a cell in the Command Count Table to accumulate time for a command.

Figure 15: Command Lookup Table

PROGRAM _____ SEQUENCE NO. _____

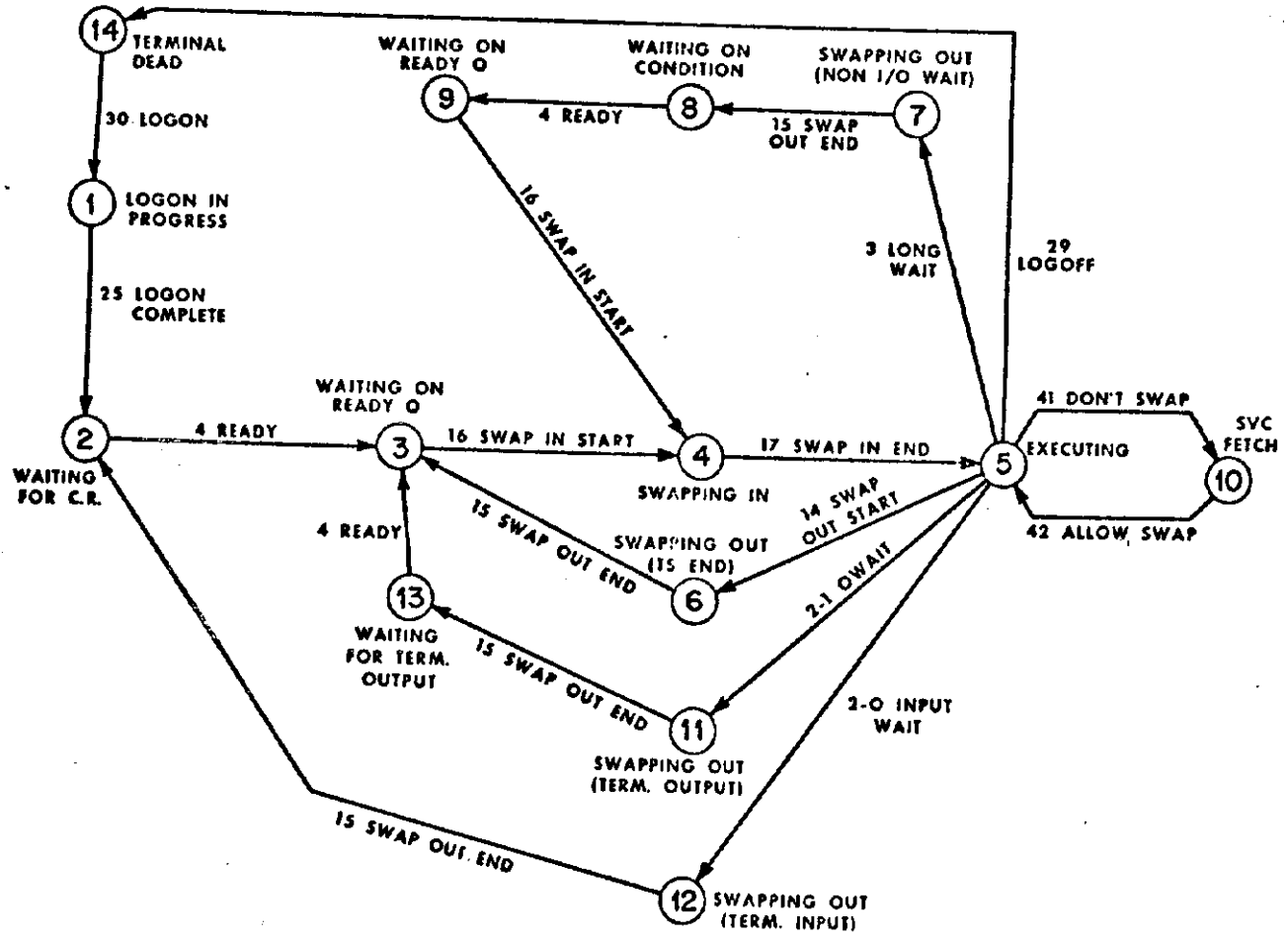


Figure 16: Model of a Transaction

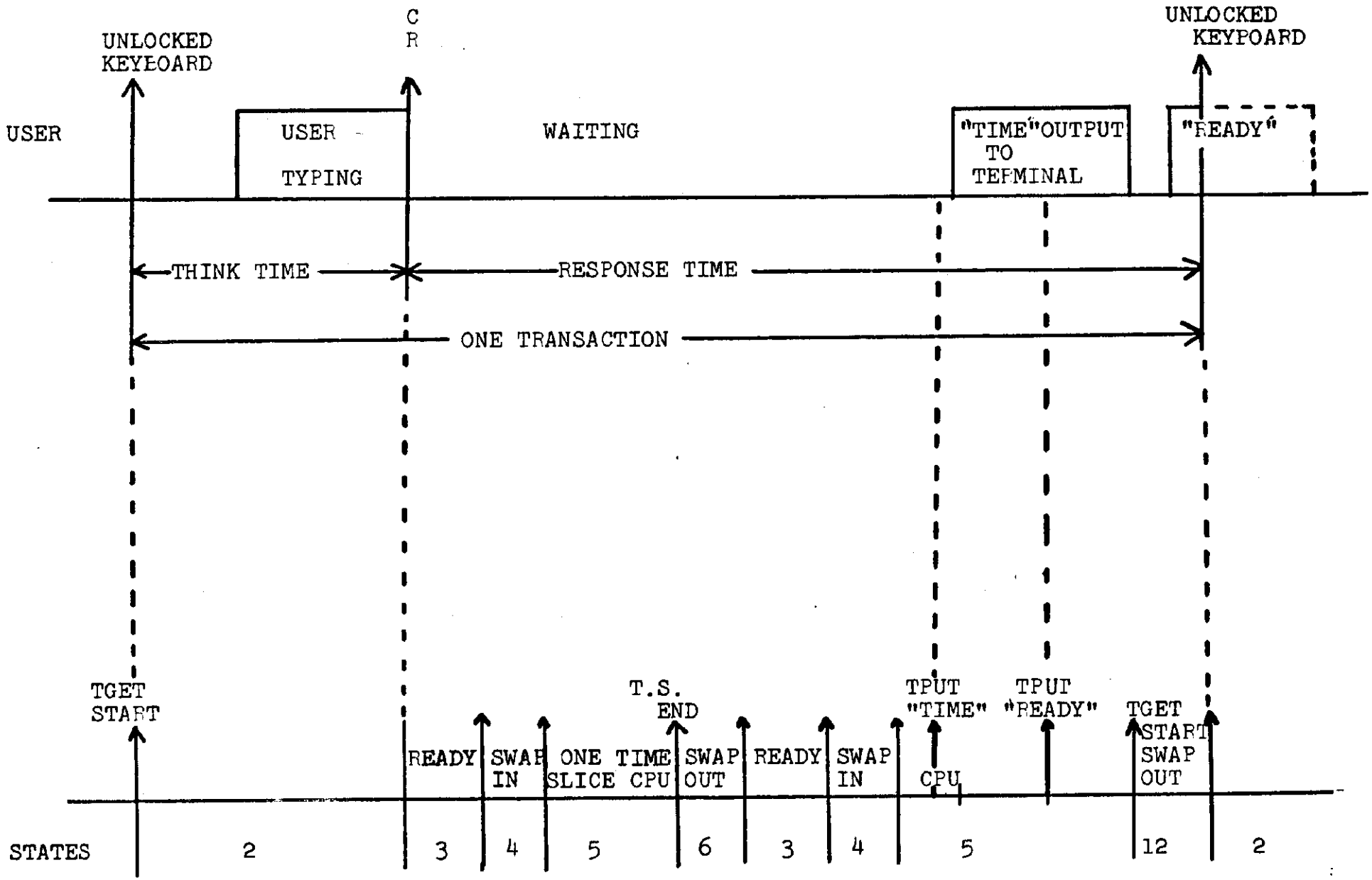


Figure 17: Example of a Transaction

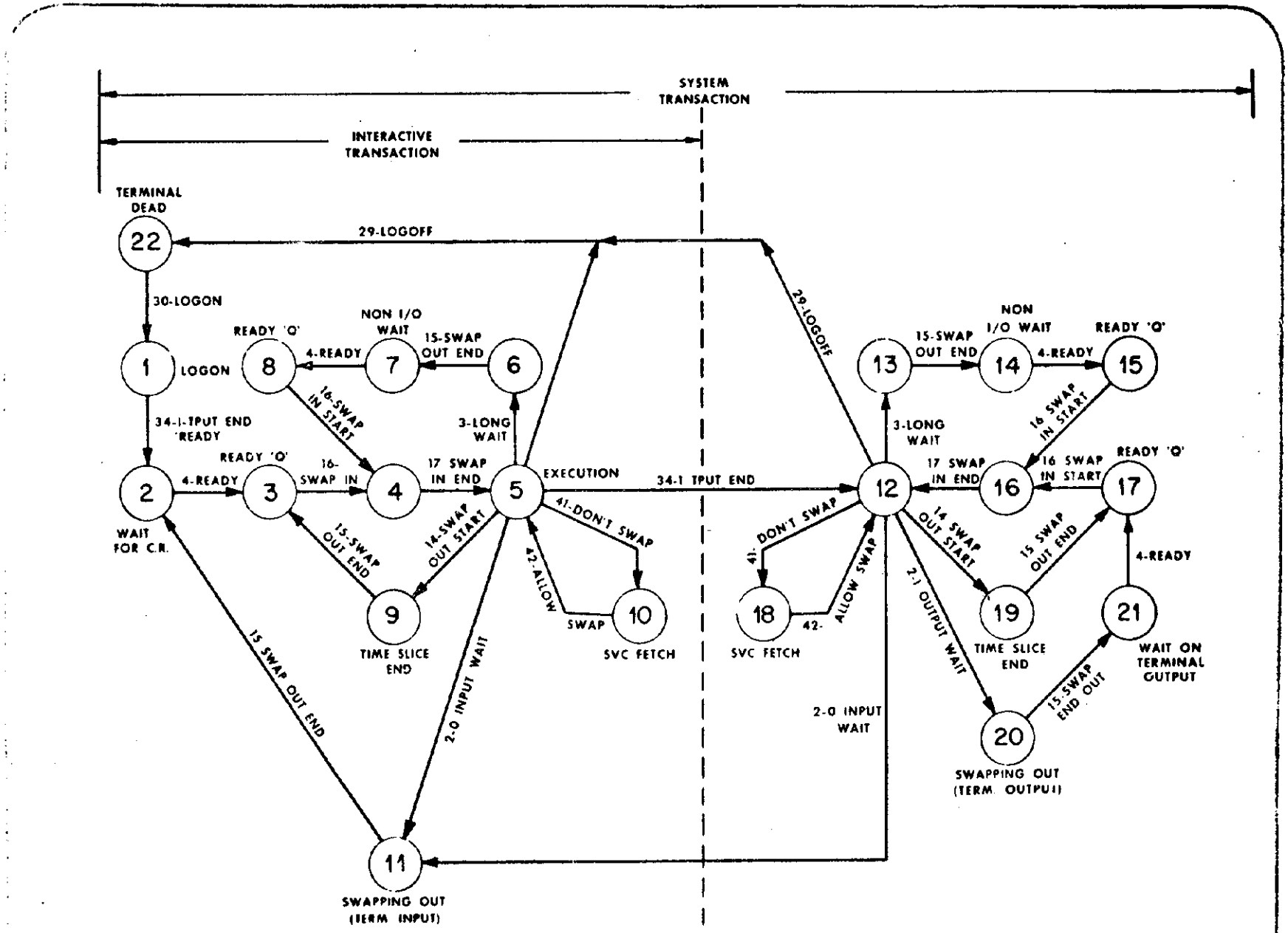


Figure 18: A more comprehensive model

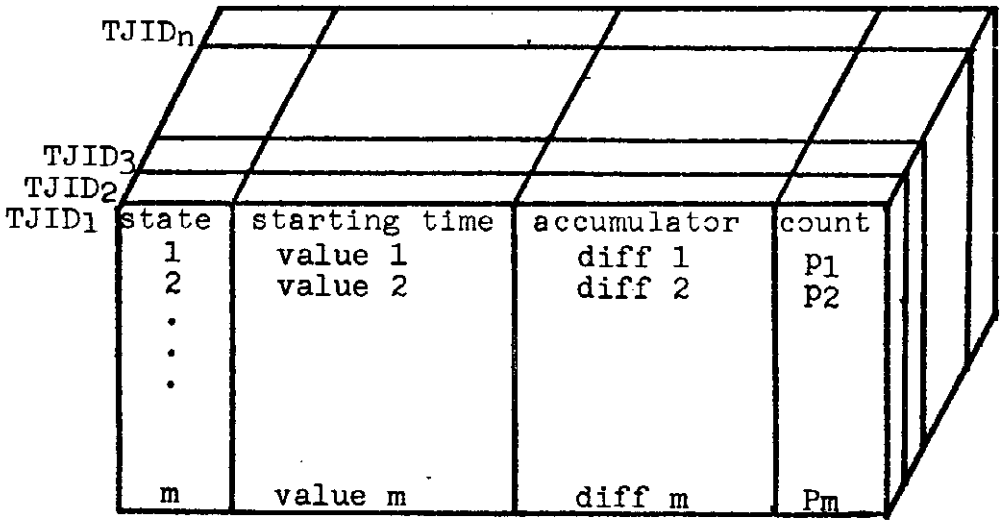
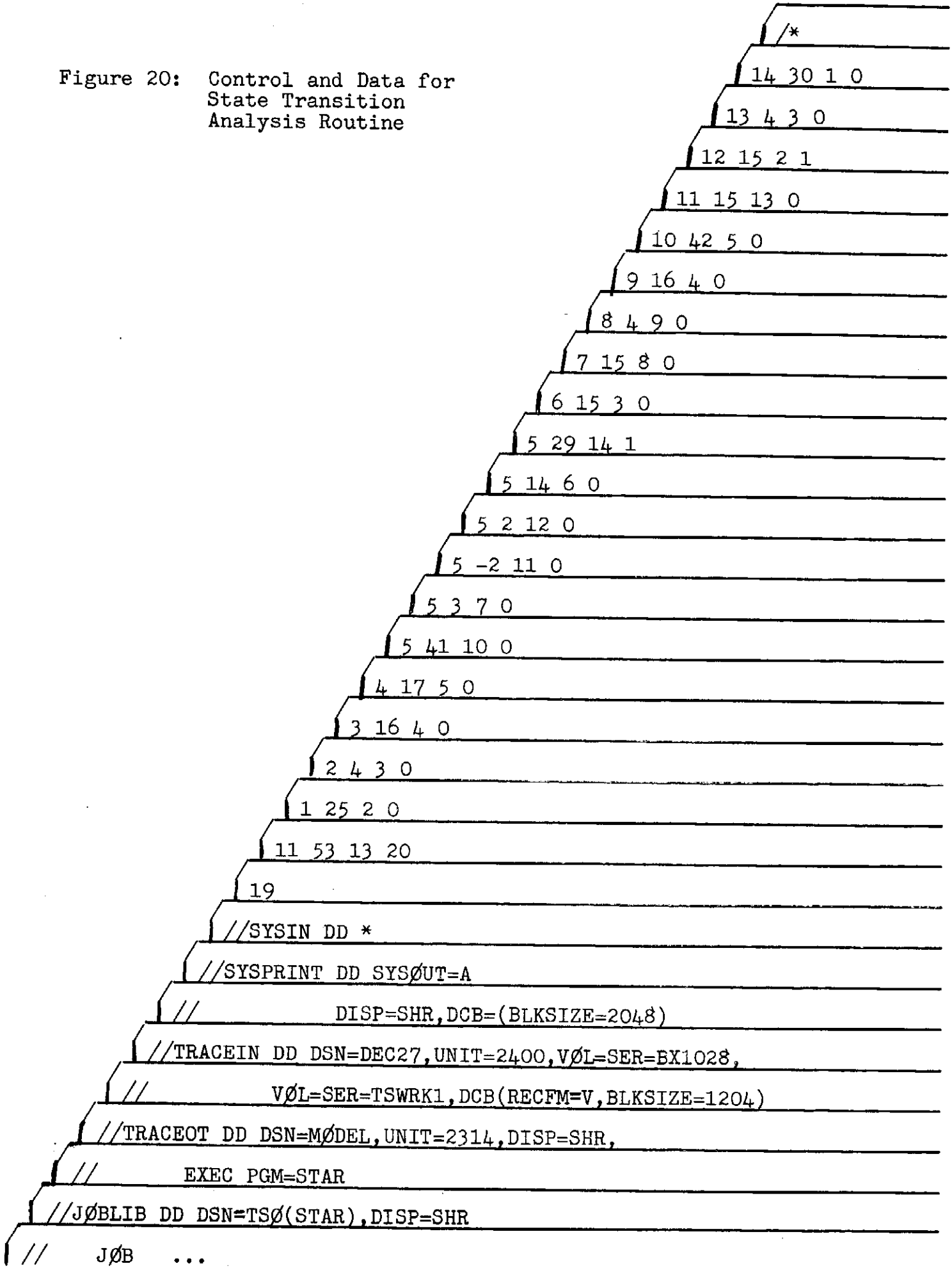


Figure 19: Transaction Output Array

Figure 20: Control and Data for State Transition Analysis Routine



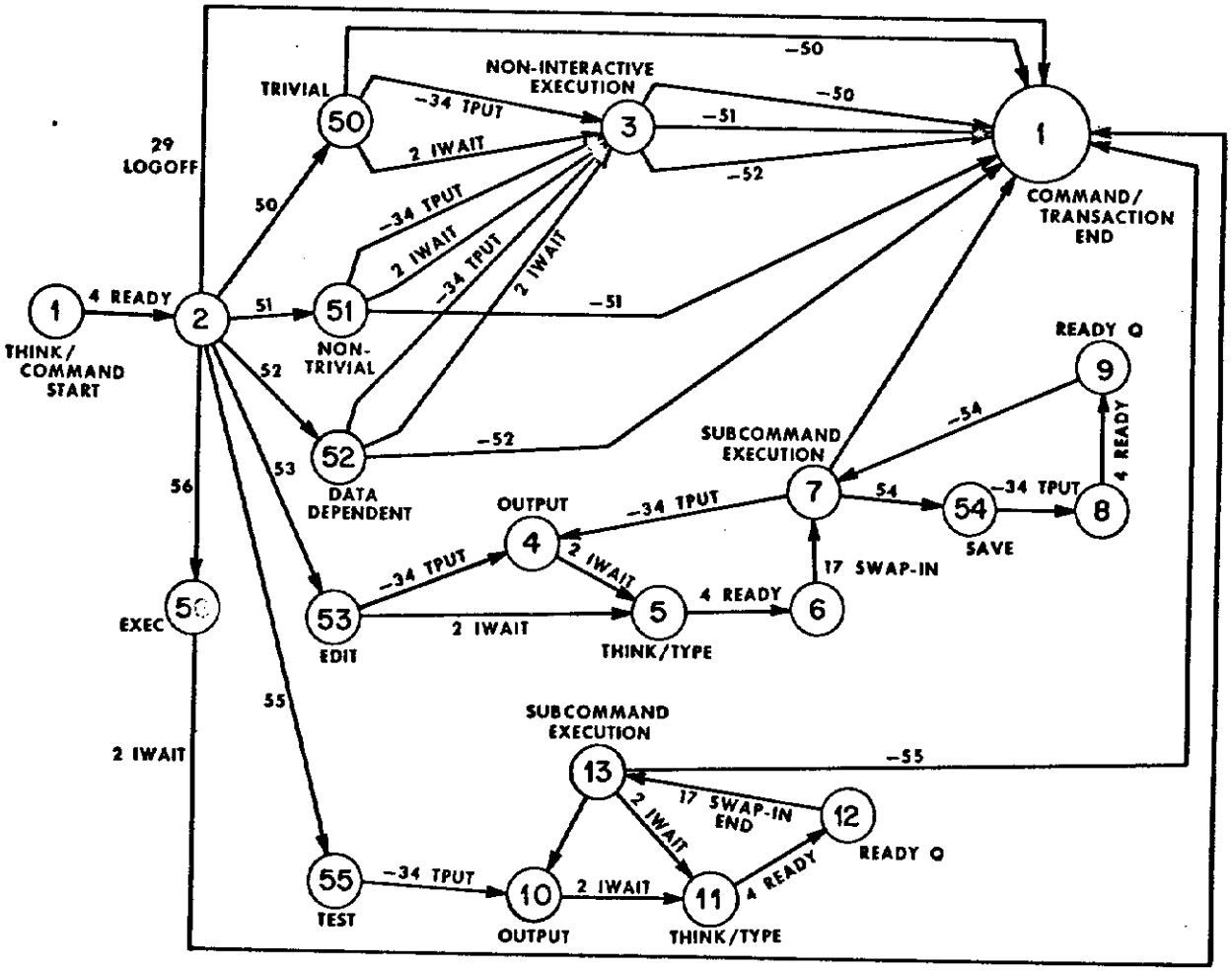


Figure 21: Command State Transition Model

OLD STATE	ENTRY CODE	NEW STATE	
1	4	2	Think time
2	50	50	Trivial
2	51	51	Non trivial
2	52	52	Data dependent
2	53	53	EDIT
2	55	55	TEST
2	56	56	EXEC
50	-34	3	Trivial execution
50	2	3	
50	-50	1	
51	-34	3	Non-trivial execution
51	2	3	
51	-51	1	
52	-34	3	Data dependent execution
52	2	3	
52	-52	1	
3	-50	1	
3	-51	1	
3	-52	1	
53	-34	4	
53	2	5	EDIT
4	2	5	
5	4	6	
6	17	7	
7	-34	4	EDIT subcommands
7	2	5	
7	54	54	SAVE
7	-53	1	
54	-34	8	enter for SAVE
8	4	9	
9	-54	7	exit for SAVE
55	-34	10	enter for **TEST**
55	2	11	
10	2	11	
11	4	12	user ready
12	17	13	
13	-34	10	TPUT or I**WAIT** end subcommand
13	2	11	
13	-55	1	exit for EDIT
56	2	1	exit for EXEC

Figure 22: Decision State Table for Command Transaction Model

********** SUMMARY **********

NUMBER OF VECTORS= 40 NUMBER OF NAMES= 50

TIME FRAME= 19 19

GENERATED TRANSACTIONS= 159

COMMAND NAME-PSEUDO ENTRY CODE	COUNT	AVERAGE TIME
ACCOUNT	0	0.00
ALLOC	19	1.05
ALLOCATE	0	0.00
ASM	8	60.63
CALL	9	0.78
CCN	0	0.00
CONVERT	0	0.00
COPY	0	0.00
D	10	4.57
DELETE	15	7.24
E	8	19.76
EDIT	31	17.28
EX	0	0.00
EXEC	19	32.37
FORT	2	1.74
FREE	2	0.21
H	0	0.00
HELP	2	0.39
L	5	4.45
LIST	3	1.89
LISTA	0	0.00
LISTALC	0	0.00
LISTB	0	0.00
LISTBC	0	0.00
LISTC	0	0.00
LISTCAT	1	4.02
LISTC	0	0.00
LISTDS	2	2.51
LINK	16	20.99
LOAD	0	0.00
LOADGO	0	0.00
OPER	0	0.00
OPERATOR	0	0.00
PROF	0	0.00
PROFILE	0	0.00
PROT	0	0.00
PROTECT	0	0.00
REN	0	0.00
RENAME	0	0.00
S	0	0.00
SAVE	32	1.21
ST	0	0.00
STATUS	0	0.00
SE	0	0.00
SEND	1	1.58
TERM	0	0.00
TERMINAL	0	0.00
TEST	2	1.50
TIME	1	2.73
USERS	2	1.11

Figure 23: Command State Transition Summary

Figure 24: JCL For Command State Transition Routine

```
//     JOB     ....
//JOBLIB DD DSN=TSO,DISP=SHR
//MOD EXEC PGM=COMND,TIME=10,REGION=200K
//SYSPRINT DD  SYSOUT=A
//TRACEIN DD UNIT=TAPE9,DISP=OLD,VOL=SER=RX1029,DSN=JAN9.W18D25,
//    LABEL=(4,BLP),DCB=(RECFM=VB,BLKSIZE=2048)
//TRACEOT DD DSN=&MODEL,UNIT=SYSDA,DISP=(,PASS),VOL=SER=WSCR17,
//       DCB=(RECFM=V,BLKSIZE=1204),SPACE=(CYL,(3,1))
//SYSIN DD *
40 50
20 40 21 10
1 4 2
2 50 50
2 51 51
2 52 52
2 53 53
2 55 55
2 56 56
50 -34 3
50 2 3
50 -50 1
51 -34 3
51 2 3
51 -51 1
52 -34 3
52 2 3
52 -52 1
3 -50 1
3 -51 1
3 -52 1
53 -34 4
53 2 5
4 2 5
5 4 6
6 17 7
7 -34 4
7 2 5
7 54 54
7 -53 1
54 -34 8
8 4 9
9 -54 7
55 -34 10
55 2 11
10 2 11
11 4 12
12 17 13
13 -34 10
13 2 11
13 -55 1
56 2 1
'ACCOUNT' 51
'ALLOC' 51
'ALLOCATE' 51
'ASM' 52
'CALL' 52
'CON' 52
'CONVERT' 52
'COPY' 52
'D' 51
'DELETE' 51
'E' 53
```

```
'EDIT' 53
'EX' 56
'EXEC' 56
'FORT' 52
'FREE' 51
'H' 52
'HELP' 52
'L' 52
'LIST' 52
'LISTA' 51
'LISTALC' 51
'LISTB' 51
'LISTBC' 51
'LISTC' 51
'LISTCAT' 51
'LISTD' 51
'LISTDS' 51
'LINK' 52
'LOAD' 52
'LOADGO' 52
'OPER' 51
'OPERATOR' 51
'PROF' 51
'PROFILE' 51
'PROT' 50
'PROTECT' 50
'REN' 51
'RENAME' 51
'S' 54
'SAVE' 54
'ST' 50
'STATUS' 50
'SE' 50
'SEND' 50
'TERM' 50
'TERMINAL' 50
'TEST' 55
'TIME' 50
'USERS' 50
/*
//HIST EXEC PGM=REPORT,TIME=5,REGION=200K
//SYSPRINT DD SYSOUT=A
//TRACEOT DD DSN=&MODEL,UNIT=SYSDA,VOL=SER=WSCR17,DISP=(OLD,DELETE),
//      DCB=(RECFM=V,BLKSIZE=1204)
//SYSIN  DD  *
40 11 1

  'TIME'        'TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 50
 0.001,18.0,0.5
  'TIME'    'NON-TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 51
 0.01,18.0,1.0
  'TIME' 'DATA-DEPEND.  COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 52
 0.001,10.0,10.0
 'TIME' 'AVG. TIME IN EXEC COMMAND(CLIST)'
 1 56
 0.001,14.0,10.0
 'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN EDIT'
 2 6,7
 0.01,18.0,1.0
 'TIME' 'TIME FOR EDIT TO RESPOND'
 1 53
 0.01,18.0,1.0
```

```
'TIME' 'AVG. SAVE INTERACTIVE RESPONSE IN EDIT'
1  54
0.01,18.0,1.0
'TIME' 'SAVE RESPONSE TIME UNDER EDIT'
2 9,54
0.01,14.0,5.0
'TIME' 'ALL TRIVIAL RESPONSE TIMES(INCLUDES EDIT MODE)'
3 6,7,50
0.01,18.0,1.0
'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN TEST'
2 12,13
0.01,18.0,1.0
'TIME' 'TIME FOR TEST TO RESPOND'
1 55
0.01,18.0,1.0
/*
```

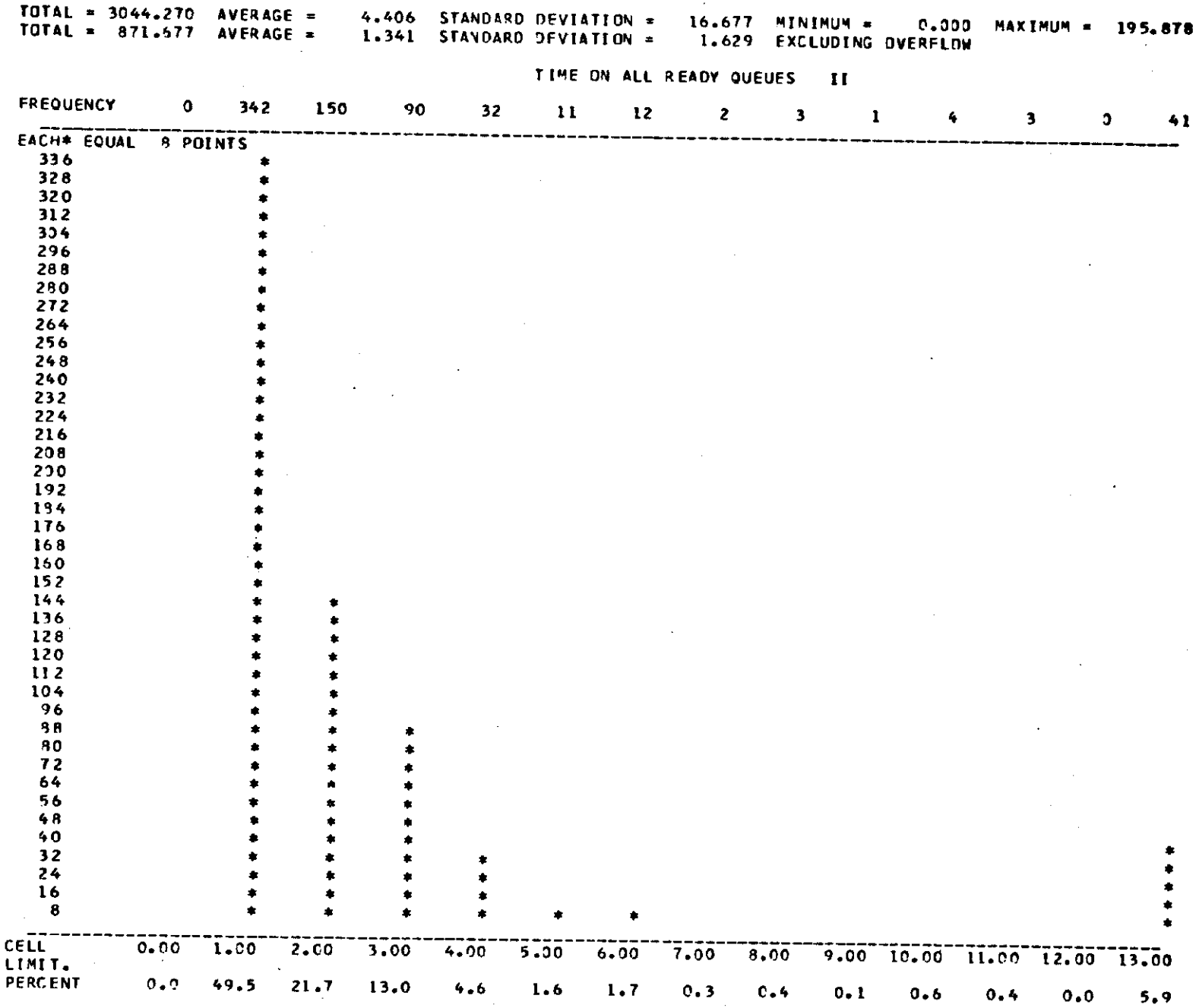


Figure 25: Histogram of Ready Queue Time

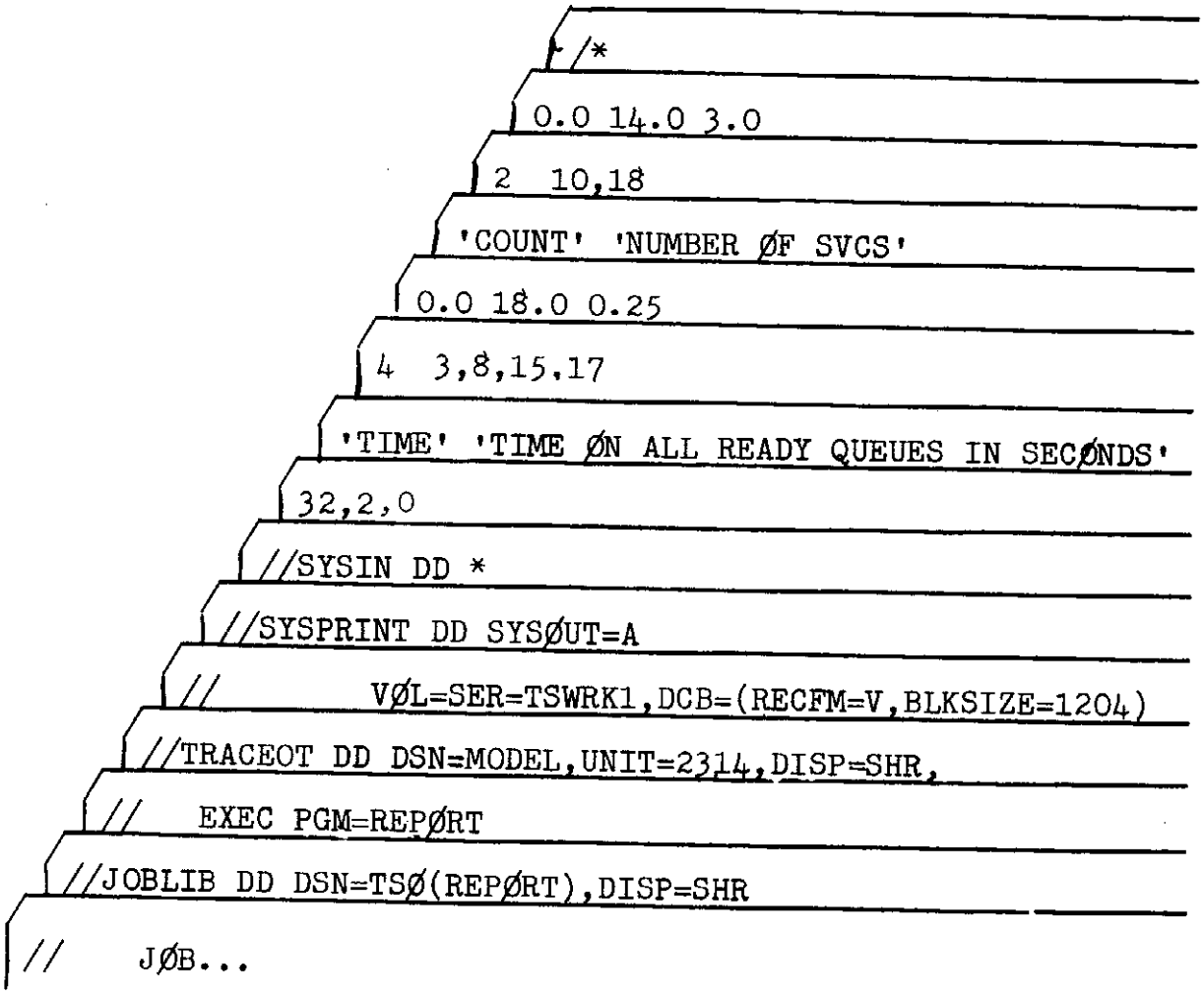
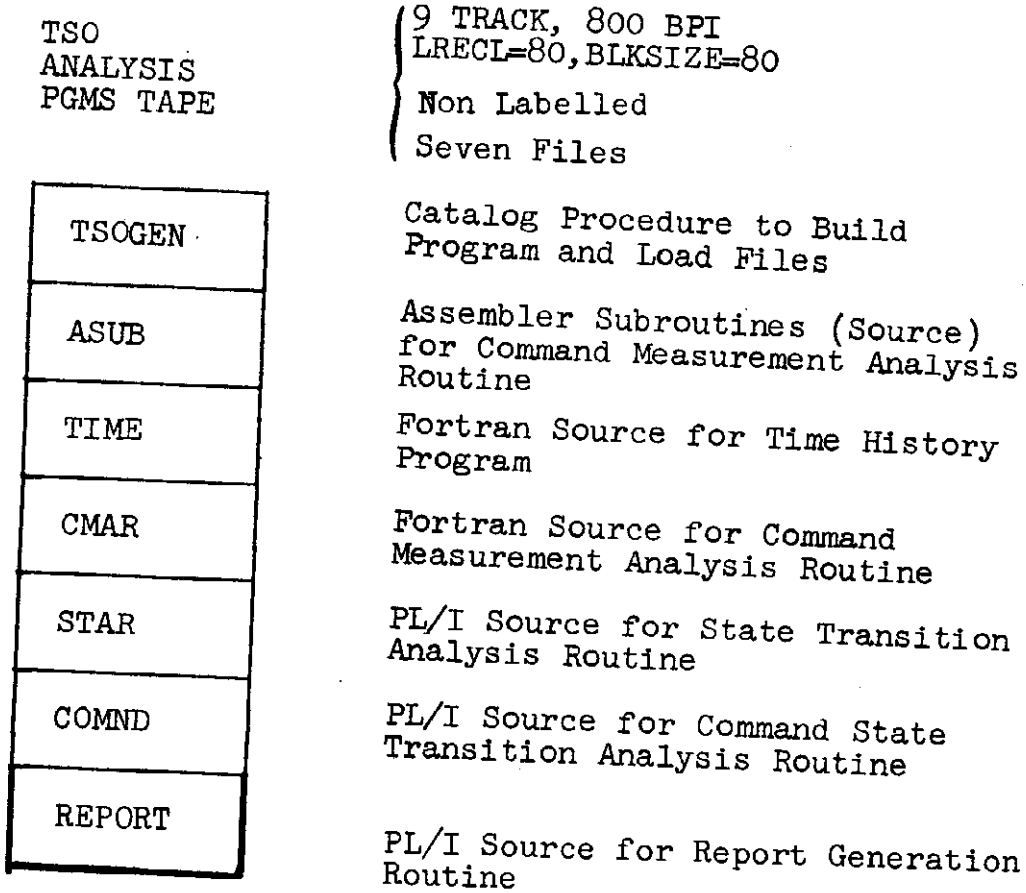


Figure 26: Control Cards for Report Generation




```
//      JOB      ...
//E  EXEC  PGM=IEBGENER,REGION=160K    PUNCH OUT INSTREAM PROCEDURE
//SYSPRINT  DD  SYSOUT=A
//SYSIN  DD    DUMMY
//SYSUT1 DD  DSN=FILE1,UNIT=2400,DISP=(OLD,KEEP),
//             VØL=SER=TSØPGMS,LABEL=(1,NL),
//             DCB=(RECFM=FB,LRECL=80,BLKSIZE=80)
//SYSUT2  DD SYSØUT=B
```

Figure 27: Tape Key for Analysis Programs

APPENDIX A

I. List of control cards and data cards for the State Transition Analysis Routine (STAR) and Report Generation Routine (REPORT) of the expanded state model shown in Figure 18.

II. List of control cards and data cards for the Command State Transition Analysis Routine (COMND) and Report Generation Routine (REPORT) for classification of commands by type. (same as Figure 24)

```
//             JOB     ...
//JOBLIB DD DSN=TOS,DISP=SHR
//MOD EXEC PGM=STAR,TIME=10,REGION=150K
//SYSPRINT DD  SYSOUT=A
//TRACEIN DD UNIT=TAPE9,DISP=OLD,VOL=SER=BX1703,DSN=JAN9.W24
//TRACEOT DD DSN=MODEL.BRI,UNIT=SYSDA,DISP=(,PASS),VOL=SER=WSCR10,
//      DCB=(RECFM=V,BLKSIZE=1204),SPACE=(CYL,(3,1))
//SYSIN DD  *
32
11 38 12 18
1 -34 2 0
2 4 3 0
3 16 4 0
4 17 5 0
5 14 9 0
5 3 6 0
5 41 10 0
5 2 11 0
5 -34 12 0
5 29 22 1
6 15 7 0
7 4 8 0
8 16 4 0
9 15 3 0
10 42 5 0
11 15 2 1
12 3 13 0
12 14 19 0
12 41 18 0
12 2 11 0
12 -2 20 0
12 29 22 1
13 15 14 0
14 4 15 0
15 16 16 0
16 17 12 0
17 16 16 0
18 42 12 0
19 15 17 0
20 15 21 0
21 4 17 0
22 30 1 0
/*
//HIST EXEC PGM=REPORT,TIME=5,REGION=250K
//SYSPRINT DD SYSOUT=A
//TRACEOT DD DSN=MODEL.BRI,UNIT=SYSDA,VOL=SER=WSCR10,DISP=(OLD,DELETE),
//      DCB=(RECFM=V,BLKSIZE=1204)
//SYSIN  DD  *
32 16 0
'TIME' 'INTERACTIVE RESPONSE TIME, OHIO STATE-13.30-15.00'
9  3,4,5,6,7,8,9,10,11
0.0,18.0,0.50
'TIME' 'INTERACTIVE RESPONSE TIME  II'
9 3,4,5,6,7,8,9,10,11
10.0,12.0,4.0
'TIME' 'SYSTEM RESPONSE TIME IN SECONDS'
19 3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21
0.0,14.0,1.00
'TIME' 'SYSTEM RESPONSE TIME IN SECONDS  II'
```

(I) - cont'd

```
19 3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21
0.0,15.0,4.0
'TIME' 'SYSTEM RESPONSE TIME IN SECONDS   III'
19 3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21
60.0,15.0,4.0
'TIME' 'USER THINK TIME IN SECONDS'
1 2
0.0,14.0,5.0
'TIME' 'TOTAL SWAPPING TIME FOR A TRANSACTION- SECONDS'
8 4,6,9,11,13,16,19,20
0.0,18.0,0.05
'TIME' 'TOTAL EXECUTION TIME IN SECONDS'
4  5,10,12,18
0.0,15.0,0.4
'TIME' 'TIME ON ALL READY QUEUES IN SECONDS'
4  3,8,15,17
0.0,18.0,0.25
'TIME' 'TIME ON ALL READY QUEUES   II'
4 3,8,15,17
0.0,12.0,1.0
'TIME' 'ENQUEUE WAIT TIME IN SECONDS'
2 7,14
0.0 12.0,1.0
'COUNT' 'NUMBER OF ENQUEUE WAITS'
2 7,14
0.0,12.0,1.0
'COUNT' 'NUMBER OF TIMES ON READY Q = # OF TIMES SWAPPED'
4  3,8,15,17
0.0,14.0,1.0
'COUNT' 'NUMBER OF OUTPUT TERMINAL WAITS'
1  21
0.0,14.0,1.0
'TIME' 'OWAIT TIME FOR OUTPUT TO COMPLETE IN SECONDS'
1  21
0.0,14.0,5.0
'COUNT' 'NUMBER OF SVCS'
2  10,18
0.0,14.0,3.0
/*
```

```
//             JOB     ...
//JOBLIB DD DSN=TOS,DISP=SHR
//MOD EXEC PGM=COMND,TIME=10,REGION=200K
//SYSPRINT DD  SYSOUT=A
//TRACE   DD  DSN=&MODEL,UNIT=SYSDA,DISP=(,PASS),VOL=SER=WSCR17,
//      DCB=(RECFM=V,BLKSIZE=1204),SPACE=(CYL,(3,1))
//SYSIN DD *
40 50
OP 56 1
1 4 2
2 50 50
2 51 51
2 52 52
2 53 53
2 55 55
2 56 56
50 -34 4
50 2 3
50 -50 1
51 -34 3
51 2 3
51 -51 1
52 -34 3
52 2 3
52 -52 1
3 -50 1
3 -51 1
3 -52 1
53 -34 4
53 2 5
4 2 5
5 4 6
6 17 7
7 -34 4
7 2 5
7 54 56
7 -53 1
54 -34 3
8 4 9
9 -54 7
55 -34 10
55 2 11
10 2 11
11 4 12
12 17 13
13 -34 10
13 2 11
13 -55 1
56 2 1
'ACCOUNT' 51
'ALLOC' 51
'ALLOCATE' 51
'ASM' 52
'CALL' 52
'CON' 52
'CONVERT' 52
'COPY' 52
'D' 51
'DELETE' 51
```

```
'E' 53
'EDIT' 53
'EX' 56
'EXEC' 56
'FORT' 52
'FREE' 51
'H' 52
'HELP' 52
'L' 52
'LIST' 52
'LISTA' 51
'LISTALC' 51
'LISTB' 51
'LISTBC' 51
'LISTC' 51
'LISTCAT' 51
'LISTD' 51
'LISTDS' 51
'LINK' 52
'LOAD' 52
'LOADGO' 52
'OPER' 51
'OPERATOR' 51
'PROF' 51
'PROFILE' 51
'PROT' 50
'PROTECT' 50
'REN' 51
'RENAME' 51
'S' 54
'SAVE' 54
'ST' 50
'STATUS' 50
'SE' 50
'SEND' 50
'TERM' 50
'TERMINAL' 50
'TEST' 55
'TIME' 50
'USERS' 50
/*
//HIST EXEC PGM=REPORT,TIME=5,REGION=200K
//SYSPRINT DD SYSOUT=A
//TRACFOT DD DSN=&MODEL,UNIT=SYSDA,VOL=SER=WSCR17,DISP=(OLD,DELETE),
//      DCB=(RECFM=V,BLKSIZE=1204)
//SYSIN  DD  *
40 11 1
 'TIME'        'TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
1 50
0.001,10.0,0.5
 'TIME'    'NON-TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
1 51
0.01,10.0,1.0
 'TIME' 'DATA-DEPEND.  COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
1 52
0.001,10.0,10.0
'TIME' 'AVG. TIME IN EXEC COMMAND(CLIST)'
1 56
0.001,14.0,10.0
```

```
'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN EDIT'
2 6,7
0.01,18.0,1.0
'TIME' 'TIME FOR EDIT TO RESPOND'
1 53
0.01,18.0,1.0
'TIME' 'AVG. SAVE INTERACTIVE RESPONSE IN EDIT'
1  54
0.01,18.0,1.0
'TIME' 'SAVE RESPONSE TIME UNDER EDIT'
2 9,54
0.01,14.0,5.0
'TIME' 'ALL TRIVIAL RESPONSE TIMES(INCLUDES EDIT MODE)'
3 6,7,50
0.01,18.0,1.0
'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN TEST'
2 12,13
0.01,18.0,1.0
'TIME' 'TIME FOR TEST TO RESPOND'
1 55
0.01,18.0,1.0
/*
```

```
NAME    IKJEAI00        IKJEAI00
VERIFY  0174    45F0C1B0,952C5003,4770C194,
                58105004,43A05004,54A0C69C
REP     0174    41F0194,95085003,4740C1B0,
                950B5003,4720C1B0,47F0C194
```

The second modification is to allow subcommands of EDIT to be included on the trace tape. Applicable to 20.1.

The trace entry is the same as that for a command except that the two high-order bits of register one are B'11' on subcommand start and B'01' on subcommand end. The remainder of the high-order byte of register one is the return code from the subcommand processor on subcommand end. The source module changed is in 360S-UT-506.

```
./       CHANGE NEW=PS,NAME=IKJEBEMA
./       NUMBER INSERT=YES,SEQ1=55200020,NEW1=55201000,INCR=500
*************************************************************************
***                                                                   ***
***      PATCH TO PROVIDE TRACING ON SUBCOMMAND START                 ***
***                                                                   ***
         LA    1,X'C0'                 SUBCOMMAND START CODE        WVD
         SLL   1,24                    SHIFT TO HI BYTE             WVD
         OR    1,PTSCMREG              MERGE SUBCOMMAND NAME ADDR   WVD
         TSEVENT PPMODE                REQUEST A TRACE              WVD
***                                                                   ***
***      END OF PATCH TO PROVIDE TRACING ON SUBCOMMAND START          ***
***                                                                   ***
*************************************************************************
./       NUMBER INSERT=YES,SEQ1=56000020,NEW1=56001000,INCR=500
***                                                                   ***
***      PATCH TO PROVIDE TRACING ON SUBCOMMAND END                   ***
***                                                                   ***
         LR    BRNCHREG,15             SAVE RTN CODE                WVD
         LA    1,X'40'                 SUBCOMMAND END CODE          WVD
         OR    1,15                    MERGE RETURN CODE            WVD
         SLL   1,24                    SHIFT TO HI BYTE             WVD
         OR    1,PTSCMREG              MERGE SUBCOMMAND NAME ADDR   WVD
         TSEVENT PPMODE                REQUEST A TRACE              WVD
         LR    15,BRNCHREG             RTN CODE SAVED OVER PATCH    WVD
***                                                                   ***
***      END OF PATCH TO PROVIDE TRACING ON SUBCOMMAND END            ***
***                                                                   ***
*************************************************************************
```

The third trace modification provides dummy LOGON entries for all users who are on the system when the trace writer is started. The source module changed is in 360S-CI-555.

```
./       CHANGE NEW=PS,NAME=IKJFATR1
./       DELETE SEQ1=8600,SEQ2=8620
./       NUMBER INSERT=YES,SEQ1=8590,NEW1=8591,INCR=1
*********************************************************************
***                                                               ***
***      PATCH TO PROVIDE FAKE LOGON TRACE ENTRIES                ***
***                                                               ***
#5       EQU   5                        TJID AND ENTRY CODE       WVD
#4       EQU   4                        SIZE OF A TJB             WVD
#8       EQU   8                        TJB POINTER               WVD
#6       EQU   6                        PTR TO AVAIL SPACE IN BUFFER WVD
#E       EQU   14                       NUMBER OF TJB'S           WVD
#F       EQU   15                                                 WVD
TJBSTAT  EQU   6                                                  WVD
TJBNJB   EQU   X'80'                    "NOT IN USE" FLAG         WVD
TJBUSER  EQU   28                       HOME OF USERID            WVD
*
         TIME  TU                                                 WVD
         L     #F,CVTTSCVT(,@2)         --> TSCVT  (@2 --> CVT)   WVD
         LH    #4,TSCVTSZU(,#F)         SIZE OF A TJB             WVD
         LH    #E,TSCVTNTJ(,#F)         # OF TJBS                 WVD
         L     #8,TSCVTTJB(,#F)         --> FIRST TJB             WVD
         L     #F,228(,@3)              TRCBPTR                   WVD
         L     #6,TRCNEXT(,#F)          --> AVAIL SPACE IN BUFFER WVD
         LA    #5,0                                               WVD
USERLOOP TM    TJBSTAT(#8),TJBNJB       TJB IN USE?               WVD
         BO    NEXTTJB                  NO - SKIP                 WVD
         SLL   #5,16                    TJID TO LEFT HALF         WVD
         LA    #5,25(,#5)               ADD IN ENTRY CODE         WVD
         ST    #5,0(,#6)                PUT IN BUFFER             WVD
         SRL   #5,16                    RESET TJID                WVD
         ST    @1,4(,#6)                DATE                      WVD
         ST    @0,8(,#6)                AND TIME IN BUFFER        WVD
         MVC   12(8,#6),TJBUSER(#8)     USERID TO BUFFER          WVD
         LA    #6,24(,#6)               BUMP BUFFER POINTER       WVD
NEXTTJB  LA    #8,0(#4,#8)              BUMP TO NEXT TJB          WVD
         LA    #5,1(,#5)                AND NEXT TJID             WVD
         BCT   #E,USERLOOP                                        WVD
         ST    #6,TRCNEXT(,#F)          UPDATE TRCNEXT            WVD
***                                                              ***
*********************************************************************
```

********** SUMMARY **********

NUMBER OF VECTORS= 40 NUMBER OF NAMES= 50

TIME FRAME= 19 19

GENERATED TRANSACTIONS= 159

COMMAND NAME-PSEUDO ENTRY CODE	COUNT	AVERAGE TIME
ACCOUNT	0	0.00
ALLOC	19	1.05
ALLOCATE	0	0.00
ASM	8	60.63
CALL	9	0.78
CCN	0	0.00
CONVERT	0	0.00
COPY	0	0.00
D	10	4.57
DELETE	15	7.24
E	8	19.76
EDIT	31	17.28
EX	0	0.00
EXEC	19	32.37
FORT	2	1.74
FREE	2	0.21
H	0	0.00
HELP	2	0.39
L	5	4.45
LIST	3	1.89
LISTA	0	0.00
LISTALC	0	0.00
LISTB	0	0.00
LISTBC	0	0.00
LISTC	0	0.00
LISTCAT	1	4.02
LISTC	0	0.00
LISTDS	2	2.51
LINK	16	20.89
LOAD	0	0.00
LOADGO	0	0.00
OPER	0	0.00
OPERATOR	0	0.00
PROF	0	0.00
PROFILE	0	0.00
PROT	0	0.00
PROTECT	0	0.00
REN	0	0.00
RENAME	0	0.00
S	0	0.00
SAVE	32	1.21
ST	0	0.00
STATUS	0	0.00
SE	0	0.00
SEND	1	1.58
TERM	0	0.00
TERMINAL	0	0.00
TEST	2	1.50
TIME	1	2.73
USERS	2	1.11

Figure 23: Command State Transition Summary

Figure 24: JCL For Command State Transition Routine

```
//     JOB     ....
//JOBLIB DD DSN=TSO,DISP=SHR
//MOD EXEC PGM=COMND,TIME=10,REGION=200K
//SYSPRINT DD  SYSOUT=A
//TRACEIN DD UNIT=TAPE9,DISP=OLD,VOL=SER=RX1029,DSN=JAN9.W18D25,
//    LABEL=(4,BLP),DCB=(RECFM=VB,BLKSIZE=2048)
//TRACEOT DD DSN=&MODEL,UNIT=SYSDA,DISP=(,PASS),VOL=SER=WSCR17,
//       DCB=(RECFM=V,BLKSIZE=1204),SPACE=(CYL,(3,1))
//SYSIN DD *
40 50
20 40 21 10
1 4 2
2 50 50
2 51 51
2 52 52
2 53 53
2 55 55
2 56 56
50 -34 3
50 2 3
50 -50 1
51 -34 3
51 2 3
51 -51 1
52 -34 3
52 2 3
52 -52 1
3 -50 1
3 -51 1
3 -52 1
53 -34 4
53 2 5
4 2 5
5 4 6
6 17 7
7 -34 4
7 2 5
7 54 54
7 -53 1
54 -34 8
8 4 9
9 -54 7
55 -34 10
55 2 11
10 2 11
11 4 12
12 17 13
13 -34 10
13 2 11
13 -55 1
56 2 1
'ACCOUNT' 51
'ALLOC' 51
'ALLOCATE' 51
'ASM' 52
'CALL' 52
'CON' 52
'CONVERT' 52
'COPY' 52
'D' 51
'DELETE' 51
'E' 53
```

```
'TIME' 'AVG. SAVE INTERACTIVE RESPONSE IN EDIT'
1  54
0.01,18.0,1.0
'TIME' 'SAVE RESPONSE TIME UNDER EDIT'
2 9,54
0.01,14.0,5.0
'TIME' 'ALL TRIVIAL RESPONSE TIMES(INCLUDES EDIT MODE)'
3 6,7,50
0.01,18.0,1.0
'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN TEST'
2 12,13
0.01,18.0,1.0
'TIME' 'TIME FOR TEST TO RESPOND'
1 55
0.01,18.0,1.0
/*
```

TSO TERMINAL SIMULATOR

ABSTRACT

The TSO Terminal Simulator is a program that simulates IBM 2741 terminals attached to the Time-Sharing Option of OS/360. It can be used to provide a controlled, repeatable load for performance measurement, testing and tuning of TSO. All measurement of TSO is accomplised through the use of a companion package, the TSTRACE Analysis Routines. Documentation for the Simulator includes an Installation and Operation Guide, a Program Logic Manual, and a listing of the source code.

TSO TERMINAL SIMULATOR

INSTALLATION AND OPERATION GUIDE

BELL LABORATORIES
Holmdel, New Jersey
March 1972

W. V. Dietrich

```
'EDIT' 53
'EX' 56
'EXEC' 56
'FORT' 52
'FREE' 51
'H' 52
'HELP' 52
'L' 52
'LIST' 52
'LISTA' 51
'LISTALC' 51
'LISTB' 51
'LISTBC' 51
'LISTC' 51
'LISTCAT' 51
'LISTD' 51
'LISTDS' 51
'LINK' 52
'LOAD' 52
'LOADGO' 52
'OPER' 51
'OPERATOR' 51
'PROF' 51
'PROFILE' 51
'PROT' 50
'PROTECT' 50
'REN' 51
'RENAME' 51
'S' 54
'SAVE' 54
'ST' 50
'STATUS' 50
'SE' 50
'SEND' 50
'TERM' 50
'TERMINAL' 50
'TEST' 55
'TIME' 50
'USERS' 50
/*
//HIST EXEC PGM=REPORT,TIME=5,REGION=200K
//SYSPRINT DD SYSOUT=A
//TRACEOT DD DSN=&MODEL,UNIT=SYSDA,VOL=SER=WSCR17,DISP=(OLD,DELETE),
//      DCB=(RECFM=V,BLKSIZE=1204)
//SYSIN  DD  *
40 11 1

  'TIME'        'TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 50
 0.001,18.0,0.5
  'TIME'    'NON-TRIVIAL COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 51
 0.01,18.0,1.0
  'TIME'  'DATA-DEPEND.  COMMAND INTERACTIVE RESPONSE TIME IN SEC.'
 1 52
 0.001,10.0,10.0
 'TIME' 'AVG. TIME IN EXEC COMMAND(CLIST)'
 1 56
 0.001,14.0,10.0
 'TIME' 'AVERAGE INTERACTIVE RESPONSE TIME IN EDIT'
 2 6,7
 0.01,18.0,1.0
 'TIME' 'TIME FOR EDIT TO RESPOND'
 1 53
 0.01,18.0,1.0
```

TSO TERMINAL SIMULATOR
INSTALLATION AND OPERATION GUIDE

Introduction

This guide contains information needed to install and operate the TSO Terminal Simulator. It describes the content and format of the applicable files on the distribution tape, discusses the installation of a Type 1 SVC routine that may be required, outlines the Simulator parameters that may be modified before assembly, and discusses OS SYSGEN considerations, execution JCL and REGION requirements. The remainder of the distribution tape contains sample scripts for use with the Simulator. Detailed information about Simulator internals is contained in the TSO Terminal Simulator Program Logic Manual.

Note that the TSTRACE analysis routines can be used without the Simulator to measure a "live" TSO system. The Simulator is intended for use by system programmers to provide a controlled, artificial load for use in measuring and tuning TSO. This document is intended for the system programmer who will install and use the Simulator.

Distribution Tape

The distribution tape is 9-track, unlabeled, [redacted] It contains 80-byte records in 1600-byte blocks. File one contains source code for the Simulator and file two contains source code for a Type 1 SVC routine needed by the Simulator to provide the initial zero protect key.

SVC Routine

If your system has an unused Type 1 entry in SVCTABLE, change the CSECT name of the SVC routine in file two to correspond to the unused SVC number, assemble the SVC routine and link-edit it into the nucleus using the procedure described in the System Programmer's Guide, GC28-6550. For example, if the available number is 248, change the CSECT name from IGC999 to IGC248. The SVC routine, when invoked with register zero equal to zero, returns control to the point where it was invoked with a zero protect key in supervisor state. When

called with register zero negative, it returns with the problem protect key in problem state. If your system already has a user SVC routine that provides the zero-key function (such as the CPS SVC), that SVC may be used instead of the one supplied with the Simulator. A note of caution: once the SVC routine is installed, your system becomes vulnerable to accidental or deliberate destruction due to inappropriate use of protect key zero and supervisor state. This is not usually a problem as long as programmers with a mischievious or destructive streak do not learn the SVC number.

If no unused SVC number is available, the simulator may be run with protect key zero as a system task. Consult an IBM SE for assistance in installing a new system task.

Assembling the Simulator

There a several installation-dependent parameters which may be changed before assembling the Simulator. The symbol 'USERSVC' should be EQUated to the number of the Type 1 SVC that the Simulator will use to obtain its initial zero protect key. The symbol '#TERM' sets the maximumun number of terminals that may be simulated. If more than 24 terminals will be used, the EQU for '#TERM' should be set to the larger value. Up to 63 terminals can be accommodated by the Simulator. The Simulator uses another SVC number for "private" communication with its SVC filter routine. That number is specified as 129 in the EQU for 'SVCNO'. If the number 129 is in use, that EQU should be changed to any other unused number. Note that this SVC number is distinct from and unrelated to the Type 1 SVC discussed in the previous section.

The MACROs LOADCAW and TRCHEND contain MEXIT cards which may be removed to turn on tracing of CCWs and IOBs before and after simulated channel-end. These traces are useful for debugging.

SYSGEN Considerations

If you are planning a SYSGEN, you may want to make special provisions for the Simulator. First, make sure there is an entry in SVCTABLE for the Type 1 user SVC routine discussed above. Second, you may want to generate additional UCB's so that you can simulate more terminals than are actually available. The Simulator requires a UCB for each port being simulated, but a physical device is not required. They should be generated as '2741P'. If you simulate ports for which no

device is present, you will have to start the Simulator before starting TCAM. Otherwise, the Simulator can be started while TCAM and TSO are running.

Execution JCL

The REGION size required for running the Simulator can be computed by adding to the basic size of the Simulator (26K), 1K for each terminal being simulated plus a number of 2K blocks sufficient to hold two buffers for each script file. For example, to simulate ten terminals with each script file having a blocksize of 1680, the REGION required would be 26K plus 5K for each port, or a total of 76K.

```
//        EXEC PGM=SIMULATE,REGION=76K,PARM=25
//SYSPRINT DD SYSOUT=A,DCB=BLKSIZE=1320
//IN001    DD DSN=SCRIPT1,DISP=SHR
//IN002    DD DSN=SCRIPT2,DISP=SHR
             .
             .
             .
//IN010    DD DSN=SCRIPT10,DISP=SHR
//SYSIN    DD *
51,52,53,54,55,56,57,58,59,5A
/*
```

The PARM value on the EXEC card specifies the "think time" in seconds. The think time is the time period during which the simulated terminal keboard is "unlocked". The default value is 12 seconds. The SYSPRINT DD card must specify a blocksize, and the value must be a multiple of 132. The DD cards named IN001 thru IN010 define the script datasets for the ten simulated terminals. DDNAMEs may continue in sequence through IN063 when more terminals are used. The script datasets can be either fixed (blocked) format with a logical record length of 80 bytes or variable (blocked) with a logical record length of up to 84 bytes. The card following SYSIN is a fixed-format control card that specifies the unit addresses of the ports to be simulated. The addresses must be specified as two-digit hexadecimal numbers starting in column one and separated by single blanks or commas. Up to 24 addresses may be specified on each card. Additional cards have the same format as the first unit address card. The units specified must all be on channel zero. The number of unit addresses specified determines the number of terminals to be simulated on a given run.

If real users are expected to use TSO while the Simulator is running, all of the telephones connected to ports in any TCAM line group containing a simulated port should be made busy. If any port in a given line group is being simulated, the entire line group will be unavailable to real users.

The Simulator must never be cancelled by the operator or by the system for exceeding time or line limits. If it is cancelled, it will not be able to restore the address portion of the Supervisor Call New PSW, and the system will crash as soon as the Simulator's code is overlaid by another job. Instead of cancelling, reply 'stop' to the Simulator's WTOR. After the reply is accepted, the simulator will re-issue the WTOR. The Simulator will normally stop after at most one think-time-interval. If, for some reason, it does not stop, a reply of 'dump' to the outstanding WTOR will terminate it.

Sample Scripts

The sample scripts supplied on the distribution tape are not proported to be representative of any particular type of TSO load. They do not exercise all of the features of TSO, and they do not necessarily reflect the way Bell Laboratories uses TSO. They are provided merely as a sample of one way the Simulator can be used to load a TSO system.

There are six collections of commands, subcommands, and data (scripts). They are contained in files 3 thru 8 of the distribution tape (format: F(1600,80)). All of the scripts take about the same length of time to execute. They are designed to be "self-cleaning" in the sense that they can be run repeatedly without any intervention.

Script Composition

Command	Number	Percent
ALLOCATE	60	30
ASM	5	2.5
CALL	5	2.5
COPY	1	0.5
DELETE	11	5.5
EDIT	24	12.0
EXEC	12	6.0
FORT	1	0.5
FREE	52	26.0
HELP	1	0.5
LINK	6	3.0
LIST	6	3.0
LOGOFF	6	3.0
LOGON	6	3.0
TEST	1	0.5
USERS	1	0.5

Subcommands of TEST

AT	5
GO	32
LIST	21
OFF	4
Assign value	1

Subcommands of EDIT

CHANGE	32
DELETE	7
FIND	15
HELP	2
INPUT	15
INSERT	5
LIST	19
RENUM	2
SAVE	23
TOP	9
UP	10
VERIFY	13
Implicit replace	5

The USERS command is a locally implemented command that lists the USERIDs of all logged-on users. The COPY and LIST commands are Program Products.

Each script has from one to three associated datasets. All except script one reference a dataset named userid.SHAKES.TEXT, which is on file nine of the distribution tape. This is a short EDIT dataset. All of the associated datasets are fixed blocked (1600,80). The association of datasets with scripts is summarized in the following table.

Associated Datasets

Script	File#	Dataset Name	File#
1	3	STSOZ1A.COMP.ASM	10
2	4	STSOZ2A.SHAKES.TEXT	9
		STSOZ2A.SCRIPT.FORT	11
		STSOZ2A.ZTIME.ASM	12
3	5	STSOZ3A.SHAKES.TEXT	9
4	6	STSOZ4A.SHAKES.TEXT	9
		STSOZ4A.F01.FORT	13
		STSOZ4A.F04.FORT	14
5	7	STSOZ5A.SHAKES.TEXT	9
		STSOZ5A.P03.PLI	15
		STSOZ5A.SYN.PLI	16
6	8	STSOZ6A.SHAKES.TEXT	9
		STSOZ6A.P04.PLI	17
		STSOZ6A.MUSERS.ASM	18

TSO TERMINAL SIMULATOR

PROGRAM LOGIC MANUAL

BELL LABORATORIES
Holmdel, New Jersey
March 1972

W. V. Dietrich

TSO TERMINAL SIMULATOR
PROOGRAM LOGIC MANUAL

Introduction

This manual describes the method of operation of a program that can provide an artificial load for a TSO system by simulating a group of IBM 2741 terminals. Flowcharts for the program are provided in Appendix A. Instructions for using the Simulator are contained in the "TSO Terminal Simulator Installation and Operation Guide".

Method of Operation

The program simulates remote terminals by intercepting I/O requests from TCAM (Telecommunications Access Method). TCAM issues all I/O requests via EXCP and IOHALT macros. The simulator modifies the address portion of the Supervisor Call New PSW so that it points to the simulator's SVC filter routine. This routine, invoked whenever an SVC instruction is executed, tests for an SVC number of zero (EXCP) or 33 (IOHALT). If the number is one of these, the routine determines whether or not the request pertains to one of the terminals being simulated. If it does, appropriate information is stored in the simulator's tables and the SVC filter routine exits to TCAM. When the SVC is not a TCAM I/O request pertaining to a terminal being simulated, the routine passes control to the OS SVC interrupt handler.

During initialization, the simulator attaches a task that will accept a reply from the operator to terminate the run. It also issues a STAE macro specifying an exit routine that will restore the address portion of the SVC New PSW in case of an ABEND. It then increases its limit and dispatching priorities so that they are higher than TCAM's and reads control cards specifying the unit numbers of the ports to be simulated. It attaches a task (SIMTASK) to simulate the I/O for each of the ports. The main task then enters a loop during which it writes all input and output messages for the simulated ports to SYSPRINT.

The Simulator was implemented using multiple tasks because of the idiosyncracies of TCAM. In the initial implementation, a single task operated for all simulated terminals. Upon

finding an IOB address stored by the SVC filter routine, it would interpret the channel program, moving data as necessary, until a "channel end" condition was encountered. At that point it would store the necessary information in a queue in order to delay the simulation of channel end for an appropriate amount of time, and go on to the next I/O request, if any.

The nature of TCAM's channel programs, however, illustrated a basic inadequacy of this design. For example, when TCAM has data to send to the terminal, it issues an EXCP for a channel program begining with a WRITE that has the "chained data" and "suppress transfer" bits set and a count of three. The next command is a TRANSFER-IN-CHANNEL that points back to the WRITE. Such a channel program would, of course, cause the simulator to loop endlessly (since it must run at a priority higher than TCAM) unless some special action were taken. It was necessary to suspend execution of that channel program for a short period (0.1 sec) so that TCAM could have a chance to modify the address in the TRANSFER-IN-CHANNEL command to point to a "real" WRITE command that would send the first unit of data. TCAM channel programs are, in general, not complete when they are started, and similar situations occurred in both read and write processing when the simulator would, in effect, get ahead of TCAM, interpreting channel programs that TCAM had not finished building. Since the simulator had to suspend each channel program several times before reaching channel end, meanwhile switching to process channel programs for other ports in order to simulate the parallelism of the multiplexor channel, it became clear that redesigning the simulator so that there would be a separate task for each port would greatly simplify the program logic and would provide a base from which modifications and extensions could more easily be made.

In the current implementation, each of the simulator tasks begins by obtaining and initializing a dynamic storage area and opening the DCB for its script dataset. It looks up the address of the UCB for its port, gets the associated DEB pointer from the RQE specified in the UCB, and effectively removes the link between IOS and TCAM for that terminal by replacing the Appendage Vector Table in the DEB with a list of addresses that point to a 'BR 14' instruction or a 'B 4(14)' in the case of the channel-end and abnormal-end appendages. This is done to prevent an interrupt occurring on the real port from being recognized by TCAM. It then issues an IOHALT on that UCB to terminate the operation that was outstanding from TCAM and disables the line. The SIMTASK also issues a STAE macro specifying an exit routine that will inform the

operator that the SIMTASK has ABENDed and restore the appendage vector table in TCAM's DEB so that TCAM can resume using the line group. It then proceeds to simulate the execution of the channel program specified in the IOB associated with the RQE.

Considering the communication between TCAM and one of its terminals, TCAM is always in one of three states: reading data from the terminal, writing data to the terminal, or monitoring the terminal for an ATTENTION interruption. A read operation completes when the terminal user hits RETURN. The terminal sends a circle-c and locks the keyboard. TCAM then replies with the required circle-d and writes data (if there is any to send) to the terminal. If, when the output data is exhausted, TCAM has not received a request from the foreground region to read the terminal, TCAM initiates a PREPARE command to monitor for ATTENTION. When TCAM receives a request to send output to the terminal, it issues an IOHALT macro to cancel the PREPARE and writes the data to the terminal. If the next request from the forground region is to get data from the terminal, TCAM sends a circle-c to unlock the keyboard and then issues a PREPARE command to receive the circle-d that the terminal sends back. The PREPARE is chained to a READ-INHIBIT that reads the data from the terminal.

When it is posted by the SVC filter routine due to interception of an EXCP for its port, the SIMTASK begins to simulate the execution of the I/O request by branching to the Start I/O Appendage that was specified in the DEB for the line group. After the Start I/O appendage returns, the SIMTASK decodes the first channel command and branches to the appropriate section of code to prepare to simulate the operation requested. It then invokes the PCI appendage if the PCI flag is set in the CCW and "executes" the channel command. If command or data chaining is indicated, it proceeds similarly with the next CCW unless a short delay is necessary in order to allow TCAM to "catch up".

When a channel end condition is encountered, the SIMTASK copies any output that was sent into a buffer to be printed by the main task and then waits an appropriate length of time before branching to the Channel End appendage. If the operation was a write, the time interval in seconds is computed as 0.08 times the number of characters transmitted. This interval simulates a terminal printing rate of 12.5 characters per second, an average of the 2741 and TTY rates. In the case of a read operation, the interval is a fixed value which is supplied as a parameter to the program. This interval corresponds to the user "think time". After the

Channel End appendage returns, the SIMTASK waits until posted by the SVC filter routine when another EXCP for its port is intercepted.

In order to monitor for ATTENTION when a terminal is locked, TCAM issues a PREPARE command. The SIMTASK keeps track of whether its "terminal" is locked or unlocked. When it encounters a PREPARE and the terminal is locked, it simply waits until posted by the SVC filter routine. TCAM will issue an IOHALT macro to halt the PREPARE before it again writes to the terminal. When it is posted due to interception of the IOHALT, the SIMTASK invokes the Channel End appendage with the IOB completion code set to X'48' instead of the normal X'7F' to indicate that the PREPARE has been halted.

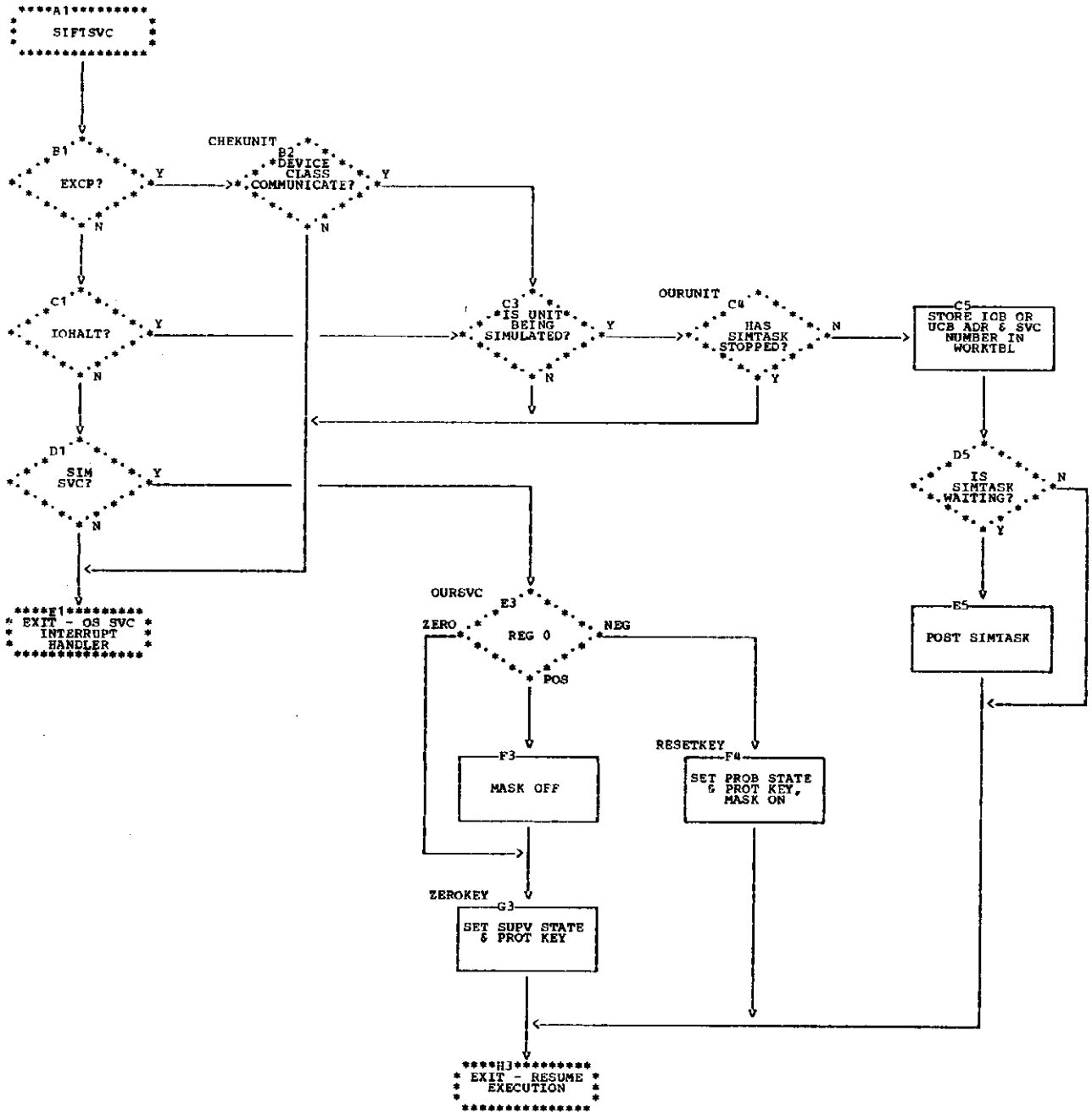
As it is now implemented, the simulator runs as a standard OS job with a non-zero protect key. It obtains a zero protect key initially through an installation-supplied SVC. Subsequently, it uses its own SVC filter routine to shift between problem and supervisor state. To eliminate the need for an initial zero-key SVC, the simulator could be run as a system task.

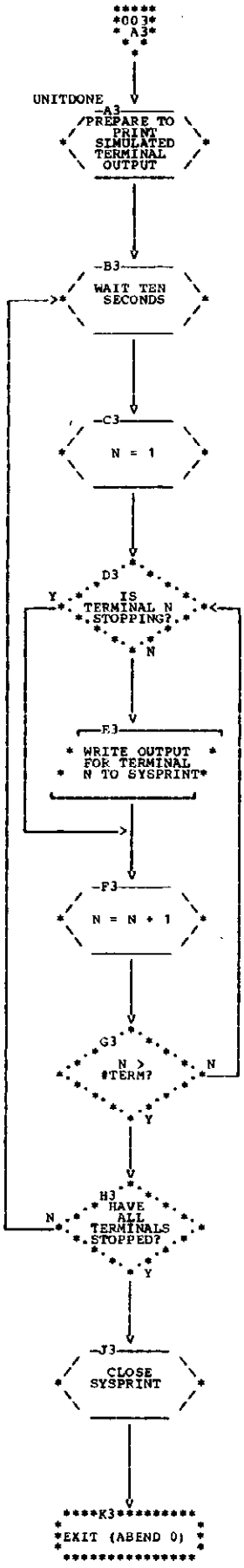
If real users are expected to use TSO while the simulator is running, all of the phones connected to ports in any TCAM line group containing a simulated port should be made busy. If any port in a given line group is being simulated, the entire line group will be unavailable to real users because the Appendage Vector Table in the DEB will have been modified as described above.

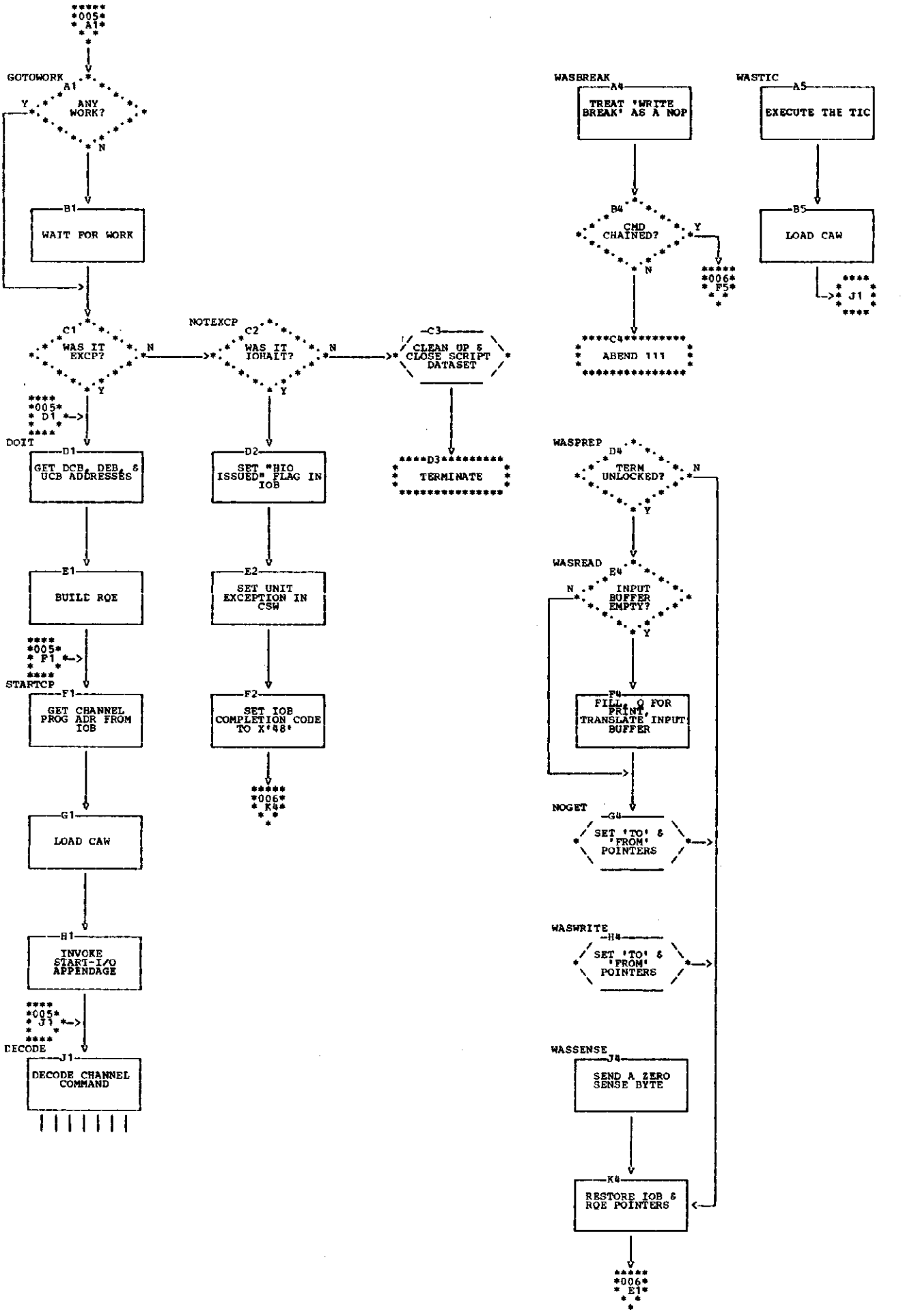
To stop the simulator, the operator should reply 'stop' to the WTOR issued at initialization. The simulator must never be cancelled by the operator or by the system for exceeding time or line limits. If it is cancelled, the simulator will not be able to restore the address portion of the SVC New PSW and the system will stop as soon as the simulator's code is overlaid by another job. To avoid problems in systems where HASP, ASP, or any other programs that modify the SVC New PSW are running, all such programs should be terminated in the inverse order of that in which they were started. Specifically, in a HASP environment, the simulator should be started last and stopped first. After receiving the 'stop' reply, the operator communication task will re-issue the WTOR. If, for some reason, the simulator does not stop, a reply of 'dump' will terminate it.

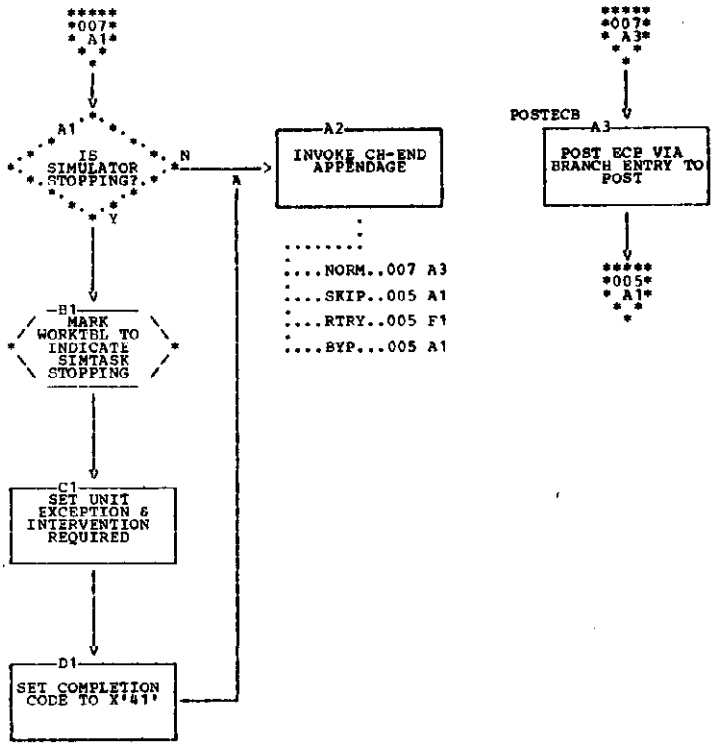
Although the simulator has been tested only with TCAM and a simple BTAM program, the simulation technique is general and

is applicable to any IBM/360 teleprocessing system which employs only EXCP and IOHALT macros for terminal communication.


A1
SIFTSVC
B1
EXCP?
Y
N
CHEKUNIT
B2
DEVICE CLASS COMMUNICATE?
Y
N
C1
IOHALT?
Y
N
C3
IS UNIT BEING SIMULATED?
Y
N
OURUNIT
C4
HAS SIMTASK STOPPED?
N
Y
C5
STORE IOB OR UCB ADR & SVC NUMBER IN WORKTBL
D1
SIM SVC?
Y
N
D5
IS SIMTASK WAITING?
N
Y
E1
EXIT - OS SVC INTERRUPT HANDLER
OURSVC
E3
REG 0
ZERO
NEG
POS
E5
POST SIMTASK
F3
MASK OFF
RESETKEY
F4
SET PROB STATE & PROT KEY, MASK ON
ZEROKEY
G3
SET SUPV STATE & PROT KEY
H1
EXIT - RESUME EXECUTION


003
* A3*
UNITDONE
-A3
PREPARE TO PRINT SIMULATED TERMINAL OUTPUT
-B3
WAIT TEN SECONDS
-C3
N = 1
D3
IS TERMINAL N STOPPING?
Y
N
-E3
WRITE OUTPUT FOR TERMINAL N TO SYSPRINT
-F3
N = N + 1
G3
N > #TERM?
N
Y
H3
HAVE ALL TERMINALS STOPPED?
N
Y
-J3
CLOSE SYSPRINT
****K3*********
*EXIT (ABEND 0) *


005 A1
GOTOWORK
A1
ANY WORK?
Y
N
B1
WAIT FOR WORK
C1
WAS IT EXCP?
N
Y
NOTEXCP
C2
WAS IT IOHALT?
N
Y
C3
CLEAN UP & CLOSE SCRIPT DATASET
D3
TERMINATE
005 D1
DOIT
D1
GET DCB, DEB, & UCB ADDRESSES
D2
SET "BIO ISSUED" FLAG IN IOB
E1
BUILD RQE
E2
SET UNIT EXCEPTION IN CSW
005 F1
STARTCP
F1
GET CHANNEL PROG ADR FROM IOB
F2
SET IOB COMPLETION CODE TO X'48'
006 K4
G1
LOAD CAW
H1
INVOKE START-I/O APPENDAGE
005 J1
DECODE
J1
DECODE CHANNEL COMMAND
WASBREAK
A4
TREAT 'WRITE BREAK' AS A NOP
B4
CMD CHAINED?
Y
N
006 F5
C4
ABEND 111
WASTIC
A5
EXECUTE THE TIC
B5
LOAD CAW
J1
WASPREP
D4
TERM UNLOCKED?
N
Y
WASREAD
E4
INPUT BUFFER EMPTY?
N
Y
F4
FILL Q FOR 'PRINT, TRANSLATE' INPUT BUFFER
NOGET
G4
SET 'TO' & 'FROM' POINTERS
WASWRITE
H4
SET 'TO' & 'FROM' POINTERS
WASSENSE
J4
SEND A ZERO SENSE BYTE
K4
RESTORE IOB & RQE POINTERS
006 E1


*****
007
* A1*
A1
IS SIMULATOR STOPPING?
N
Y
A
A2
INVOKE CH-END APPENDAGE
.
.
.....
:
:....NORM..007 A3
:
:....SKIP..005 A1
:
:....RTRY..005 F1
:
:....BYP...005 A1
B1
MARK WORKTBL TO INDICATE SIMTASK STOPPING
C1
SET UNIT EXCEPTION & INTERVENTION REQUIRED
D1
SET COMPLETION CODE TO X'41'
*****
007
* A3*
POSTECB
A3
POST ECB VIA BRANCH ENTRY TO POST
*****
005
* A1*

SIM
SYMBOL TYPE ID ADDR LENGTH LC ID

EXTERNAL SYMBOL DICTIONARY

16.59 3/20/72

SYMBOL	TYPE	ID	ADDR	LENGTH	LC ID
	PC	01	000000	000010	
SIM	SD	02	000000	000A1C	
WORKTBL	LD		000B84		02
SIMECB	LD		000154		02
FREEQ	LD		001278		09
PRTBL	LD		000214		02
DELAY	LD		00127C		09
STOPFLAG	LD		001280		09
UNITABLE	LD		0002B8		02
UCBLOCK	ER	03			
STOPFLAG	ER	04			
DELAY	ER	05			
SIMTASK	ER	06			
AVTSAVE	ER	07			
FREEQ	ER	08			
SIMTASK	SD	09	000A40	000B1C	
UCBLOOK	LD		001180		09
AVTSAVE	LD		001248		09
BUFPOOL	ER	0A			
WORKTBL	ER	0B			
SIMECB	ER	0C			
PRTBL	ER	0D			
UNITABLE	ER	0E			
BUFPOOL	SD	0F	001610	004B40	

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LOC  OBJECT CODE    ADDR1 ADDR2  STMT  SOURCE STATEMENT                                F150CT70  3/20/72
                                    2 *  TSO TERMINAL SIMULATOR - WRITTEN BY W. V. DIETRICH - 11/71          60.00
                                    3 *                                  201-949-3135                       70.00
                                    4 *                                  ROOM 2F-416                        80.00
                                    5 *                                  BELL LABORATORIES                  90.00
                                    6 *                                  HOLMDEL N.J. 07733                 100.00
                                    7 *                                                                     110.00
                                    8 *          REQUIRES AN INSTALLATION-SUPPLIED SVC TO SET SUPV STATE    120.00
                                    9 *            AND PROTECT KEY ZERO.                                    130.00
                                   10 *                                                                     140.00
                                   11 *          THIS PROGRAM MUST NEVER BE CANCELLED.                      150.00
                                   12 *          INSTEAD, REPLY 'STOP' OR 'DUMP' TO TERMINATE.              160.00
                                   13 *                                                                     170.00
                                   14 *       SEE PAGE 5 FOR ASSEMBLY PARAMETERS                            180.00


                                   16          MACRO                                                        200.00
                                   17          AREADEF                                                      210.00
                                   18 AREA     DSECT                                                        220.00
                                   19 SAVE     DS    18F                                                    230.00
                                   20 DECWK    DS    D                                                      240.00
                                   21 WORKSLOT DS    A                  --> OUR SLOT IN WORKTBL             250.00
                                   22 ECBADR   DS    A                  --> OUR ECB                         260.00
                                   23 RQE      DS    0F                                                     270.00
                                   24 RQEUCB   DS    F                                                      280.00
                                   25 RQEIOB   DS    F                                                      290.00
                                   26 RQEDEB   DS    F                                                      300.00
                                   27 CCWSAVE  DS    0CL8                                                   310.00
                                   28 CCWOP    DS    C                                                      320.00
                                   29 CCWDAD   DS    AL3                                                    330.00
                                   30 CCWFLAGS DS    X                                                      340.00
                                   31 CCWCD    EQU   X'80'                                                  350.00
                                   32 CCWCC    EQU   X'40'                                                  360.00
                                   33 CCWSLI   EQU   X'20'                                                  370.00
                                   34 CCWSKIP  EQU   X'10'                                                  380.00
                                   35 CCWPCI   EQU   X'08'                                                  390.00
                                   36          DS    X                                                      400.00
                                   37 CCWCOUNT DS    H                                                      410.00
                                   38 BINTVL   DS    F                                                      420.00
                                   39 TO       DS    A                  LOCATION DATA GOES TO               430.00
                                   40 FROM     DS    A                  LOCATION DATA COMES FROM            440.00
                                   41 COUNT    DS    H                  COUNT FOR MOVE                      450.00
                                   42 TERMSTAT DS    X                  TERMINAL STATUS BYTE                460.00
                                   43 LOCKED   EQU   X'80'              INDICATES KEYBOARD LOCKED           470.00
                                   44 TERMNO   DS    CL3                EBCDIC TERMINAL NUMBER              480.00
                                   45 INLEFT   DS    H                  NUMBER OF BYTES LEFT TO BE READ     490.00
                                   46 INREAD   DS    H                  NUMBER OF BYTES ALREADY READ        500.00
                                   47 INBUF    DS    CL80                                                   510.00
                                   48 OUTCOUNT DS    H                  CURRENT LENGTH OF OUTPUT            520.00
                                   49 OUTBUF   DS    CL256                                                  530.00
                                   50 PRINT    DS    A                                                      540.00
                                   51 DCBADR   DS    A                                                      550.00
                                   52 DCB      DS    CL96                                                   560.00
```

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LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72
                                  53 TRACEPTR DS    A                                                  570.00
                                  54 TRAREA   DS    CL256                                              580.00
                                  55 AREASIZE EQU   *-AREA                                             590.00
                                  56          MEND                                                     600.00
                                  57          MACRO                                                    610.00
                                  58 &LCC     BUFFERS &N                                               620.00
                                  59          LCLA  &I,&J                                              630.00
                                  60 &J       SETA  &N                                                 640.00
                                  61 &LCC     DS    0F                                                 650.00
                                  62 .LOOP    ANOP                                                     660.00
                                  63          DC    A(*+160)                                           670.00
                                  64          DS    156X                                               680.00
                                  65 &I       SETA  &I+1                                               690.00
                                  66          AIF   (&I LT &J).LOOP                                    700.00
                                  67          DC    A(0)  END OF CHAIN                                 710.00
                                  68          DS    156X                                               720.00
                                  69          MEND                                                     730.00
                                  70          MACRO                                                    740.00
                                  71 &LOC     INVOKAPG &TYPE,&JUMP                                     750.00
                                  72          LCLA  &OFF,&I                                            760.00
                                  73          AIF   ('&TYPE' EQ 'SIO').SIO                             770.00
                                  74          AIF   ('&TYPE' EQ 'PCI').PCI                             780.00
                                  75          AIF   ('&TYPE' EQ 'CEND').CEND                           790.00
                                  76          MNOTE 12,'INVALID APPENDAGE TYPE SPECIFIED'              800.00
                                  77          MEXIT                                                    810.00
                                  78 .CEND    ANOP                                                     820.00
                                  79 &OFF     SETA  &OFF+4                                             830.00
                                  80 .PCI     ANOP                                                     840.00
                                  81 &OFF     SETA  &OFF+4                                             850.00
                                  82 .SIO     ANOP                                                     860.00
                                  83 &OFF     SETA  &OFF+4                                             870.00
                                  84 &LCC     L     15,AVTSAVE+&OFF .       ADR OF APPENDAGE           880.00
                                  85          BALR  14,15                                              890.00
                                  86 .J       ANOP                                                     900.00
                                  87 &I       SETA  &I+1                                               910.00
                                  88          AIF   (&I GT N'&JUMP).GO                                 920.00
                                  89          B     &JUMP(&I)                                          930.00
                                  90          AGO   .J                                                 940.00
                                  91 .GO      ANOP                                                     950.00
                                  92          MEND                                                     960.00
                                  93          MACRO                                                    970.00
                                  94 &LOC     LOADCAW     &ADR                                         980.00
                                  95 &LCC     LA    5,&ADR                                             990.00
                                  96          MVC   CCWSAVE,0(5)                                      1000.00
                                  97.        MEXIT      REMOVE THIS CARD TO TURN ON TRACING           1010.00
                                  98          TRINIT                                                  1020.00
                                  99          ST    5,0(,10)                                          1030.00
                                 100          MVC   0(1,10),UCBUA(7)                                  1040.00
                                 101          MVC   4(8,10),0(5)                                      1050.00
                                 102          LA    10,12(,10)                                        1060.00
                                 103          ST    10,TRACEPTR                                       1070.00
                                 104          MEND                                                    1080.00
                                 105          MACRO                                                   1090.00
```

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LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72
                                   53 TRACEPTR DS    A                                                  570.00
                                   54 TRAREA   DS    CL256                                              580.00
                                   55 AREASIZE EQU   *-AREA                                             590.00
                                   56          MEND                                                    600.00
                                   57          MACRO                                                   610.00
                                   58 &LOC     BUFFERS &N                                              620.00
                                   59          LCLA  &I,&J                                             630.00
                                   60 &J       SETA  &N                                                640.00
                                   61 &LOC     DS    0F                                                650.00
                                   62 .LOOP    ANOP                                                    660.00
                                   63          DC    A(*+160)                                          670.00
                                   64          DS    156X                                              680.00
                                   65 &I       SETA  &I+1                                              690.00
                                   66          AIF   (&I LT &J).LOOP                                   700.00
                                   67          DC    A(0)  END OF CHAIN                                710.00
                                   68          DS    156X                                              720.00
                                   69          MEND                                                    730.00
                                   70          MACRO                                                   740.00
                                   71 &LOC     INVOKAPG &TYPE,&JUMP                                    750.00
                                   72          LCLA  &OFF,&I                                           760.00
                                   73          AIF   ('&TYPE' EQ 'SIO').SIO                            770.00
                                   74          AIF   ('&TYPE' EQ 'PCI').PCI                            780.00
                                   75          AIF   ('&TYPE' EQ 'CEND').CEND                          790.00
                                   76          MNOTE 12,'INVALID APPENDAGE TYPE SPECIFIED'             800.00
                                   77          MEXIT                                                   810.00
                                   78 .CEND    ANOP                                                    820.00
                                   79 &OFF     SETA  &OFF+4                                            830.00
                                   80 .PCI     ANOP                                                    840.00
                                   81 &OFF     SETA  &OFF+4                                            850.00
                                   82 .SIO     ANOP                                                    860.00
                                   83 &OFF     SETA  &OFF+4                                            870.00
                                   84 &LOC     L     15,AVTSAVE+&OFF .       ADR OF APPENDAGE          880.00
                                   85          BALR  14,15                                             890.00
                                   86 .J       ANOP                                                    900.00
                                   87 &I       SETA  &I+1                                              910.00
                                   88          AIF   (&I GT N'&JUMP).GO                                920.00
                                   89          B     &JUMP(&I)                                         930.00
                                   90          AGO   .J                                                940.00
                                   91 .GO      ANOP                                                    950.00
                                   92          MEND                                                    960.00
                                   93          MACRO                                                   970.00
                                   94 &LOC     LOADCAW     &ADR                                        980.00
                                   95 &LOC     LA    5,&ADR                                            990.00
                                   96          MVC   CCWSAVE,0(5)                                     1000.00
                                   97         MEXIT       REMOVE THIS CARD TO TURN ON TRACING         1010.00
                                   98          TRINIT                                                 1020.00
                                   99          ST    5,0(,10)                                         1030.00
                                  100          MVC   0(1,10),UCBUA(7)                                 1040.00
                                  101          MVC   4(8,10),0(5)                                     1050.00
                                  102          LA    10,12(,10)                                       1060.00
                                  103          ST    10,TRACEPTR                                      1070.00
                                  104          MEND                                                   1080.00
                                  105          MACRO                                                  1090.00
```

LOC OBJECT CODE ADDR1 ADDR2 STMT SOURCE STATEMENT F150CT70 3/20/72

```
                    106 &LCC     RESETKEY                                          1100.00
                    107 &LOC     LH    0,=H'-1'                                    1110.00
                    108          SVC   SVCNO                                       1120.00
                    109          MEND                                              1130.00
                    110          MACRO                                             1140.00
                    111 &LOC     TERMSTAT &NEW=,&LOCKED=,&UNLKED=                  1150.00
                    112 &LCC     DS    0H                                          1160.00
                    113          AIF   ('&LOCKED' NE '').LKD                       1170.00
                    114          AIF   ('&UNLKED' NE '').UNL                       1180.00
                    115          AGO   .N                                          1190.00
                    116 .LKD     TM    TERMSTAT,LOCKED                             1200.00
                    117          BO    &LOCKED                                     1210.00
                    118          MEXIT                                             1220.00
                    119 .UNL     TM    TERMSTAT,LOCKED                             1230.00
                    120          BZ    &UNLKED                                     1240.00
                    121          MEXIT                                             1250.00
                    122 .N       AIF   ('&NEW' EQ '').NN                           1260.00
                    123          AIF   ('&NEW' EQ 'LOCKED').LOCK                   1270.00
                    124          NI    TERMSTAT,255-LOCKED                         1280.00
                    125          MEXIT                                             1290.00
                    126 .LOCK    OI    TERMSTAT,LOCKED                             1300.00
                    127 .NN      ANOP                                              1310.00
                    128          MEND                                              1320.00
                    129          MACRO                                             1330.00
                    130 &LOC     TRCHEND &C                                        1340.00
                    131          LCLC  &CC                                         1350.00
                    132 &LCC     DS    0H                                          1360.00
                    133          MEXIT       REMOVE THIS CARD TO TURN ON TRACING   1370.00
                    134 &CC      SETC  '&C'                                        1380.00
                    135          AIF   (T'&C NE 'C').S                             1390.00
                    136 &CC      SETC  'FF'                                        1400.00
                    137 .S       ANOP                                              1410.00
                    138          TRINIT                                            1420.00
                    139          ST    2,0(,10)                                    1430.00
                    140          MVI   0(10),X'&CC'                                1440.00
                    141          MVC   4(36,10),0(2)                               1450.00
                    142          LA    10,40(,10)                                  1460.00
                    143          ST    10,TRACEPTR                                 1470.00
                    144          MEND                                              1480.00
                    145          MACRO                                             1490.00
                    146 &LCC     TRINIT                                            1500.00
                    147          LA    11,TRAREA                                   1510.00
                    148          L     10,TRACEPTR                                 1520.00
                    149          SR    10,11                                       1530.00
                    150          CH    10,=AL2(L'TRAREA-39)                        1540.00
                    151          BL    *+12                                        1550.00
                    152          LA    10,TRAREA                                   1560.00
                    153          ST    10,TRACEPTR                                 1570.00
                    154          L     10,TRACEPTR                                 1580.00
                    155          MEND                                              1590.00
                    156          MACRO                                             1600.00
                    157 &LCC     ZEROKEY                                           1610.00
                    158 &LCC     LA    0,0                                         1620.00
```

```
 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                F15OCT70  3/20/72
                                   159          SVC   SVCNO                        1630.00
                                   160          MEND                               1640.00
                                   161          MACRO                              1650.00
                                   162 &LOC     ZKOFF                              1660.00
                                   163 &LCC     LA    0,1                          1670.00
                                   164          SVC   SVCNO                        1680.00
                                   165          MEND                               1690.00
```

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                        167 *         BEFORE ASSEMBLY, CHANGE '999' ON THE FOLLOWING CARD      1710.00
                        168 *         TO THE NUMBER OF YOUR "ZEROKEY" USER SVC                 1720.00
0003E7                  169 USERSVC   EQU   999                                                1730.00

                        171 *         IF MORE THAN 24 TERMINALS ARE TO BE SIMULATED,           1750.00
                        172 *         SPECIFY THE LARGER NUMBER IN THE FOLLOWING EQU -         1760.00
000018                  173 #TERM     EQU   24      SETS MAXIMUM NUMBER OF TERMINALS           1770.00

                        175 *         IF THE SVC NUMBER 129 CONFLICTS WITH A LOCAL USER SVC,   1790.00
                        176 *         CHANGE THE FOLLOWING EQU TO ANY OTHER UNUSED NUMBER      1800.00
000081                  177 SVCNO     EQU   129       SVC USED TO INVOKE THE SVC FILTER ROUTINE 1810.00
                        178 *                                   TO CHANGE KEY, STATE, & MASK   1820.00
```

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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                F15OCT70  3/20/72
000000                             160 SIM      CSECT                                  1840.00
000004                             161 UCBCHA   EQU   4                                1850.00
000005                             162 UCBUA    EQU   5                                1860.00
000028                             163 PROLDPSW EQU   X'28'                            1870.00
000020                             164 SVOLDPSW EQU   X'20'                            1880.00
000060                             165 SVNEWPSW EQU   X'60'                            1890.00
000030                             166 MCOLDPSW EQU   X'30'                            1900.00
00001C                             167 TCBPKF   EQU   X'1C'                            1910.00
000014                             168 IOBECBPT EQU   X'14'                            1920.00
000020                             169 ICBUCBX  EQU   X'20'                            1930.00
00002C                             170 DCBDEBAD EQU   X'2C'                            1940.00
000020                             171 DEBUCBAD EQU   X'20'                            1950.00
000000 50E0 0028           (0028   172 SIFTSVC  ST    14,PROLDPSW     SAVE R14        1960.00
000004 05E0                        173         BALR  14,0            HANG ON         1970.00
000006                             174         USING *,14                            1980.00
000006 9500 0023     00023         175         CLI   SVOLDPSW+3,0    WAS IT AN EXCP? 1990.00
00000A 4780 E082           (0088   176         BE    CHEKUNIT        YES             2000.00
00000E 9521 0023     00023         177         CLI   SVOLDPSW+3,33   WAS IT IOHALT?  2010.00
000012 4780 E068           (006E   178         BE    CHEKIOH         YES             2020.00
000016 9581 0023     00023         179         CLI   SVOLDPSW+3,SVCNO WAS IT OUR SVC? 2030.00
00001A 47F0 E026           (002C   180         BE    OURSVC          YES             2040.00
00001E D207 0030 E272 00030 (0278   181         MVC   MCOLDPSW(8),OSSVCNEW            2050.00
000024 58E0 0028           (0028   182         L     14,PROLDPSW     RESTORE 14      2060.00
000028 8200 003C     00030         183         LPSW  MCOLDPSW        LET OS HAVE THE SVC 2070.00

00002C 1200                        185 OURSVC   LTR   0,0             R0 HAS THE CODE 2090.00
00002E 4740 E040           (0046   186         BL    RESETKEY        NEG IS RESETKEY 2100.00
000032 4780 E034           (003A   187         BE    ZEROKEY         ZERO GIVES ZEROKEY MASKED ON 2110.00
000036 9200 0020     00020         188         MVI   SVOLDPSW,0      POS GIVES ZEROKEY MASKED OFF 2120.00
00003A 9204 0021     00021         189 ZEROKEY  MVI   SVOLDPSW+1,4    ZERO KEY, SUPV STATE 2130.00
00003E 58E0 0028           (0028   190         L     14,PROLDPSW     RESTORE 14      2140.00
000042 8200 002C     00020         191         LPSW  SVOLDPSW        RESUME          2150.00

000046 50F0 002C           (002C   193 RESETKEY ST    15,PROLDPSW+4   SAVE ANOTHER REG 2170.00
00004A 58F0 0010           (0010   194         L     15,16           --> CVT         2180.00
00004E 58FC F000           (0000   195         L     15,0(,15)       --> TCBS        2190.00
000052 58F0 F004           (0004   196         L     15,4(,15)       CURRENT TCB     2200.00
000056 43F0 F01C           (001C   197         IC    15,TCBPKF(,15)  GET TCB PROTECT KEY 2210.00
00005A 42F0 0021           (0021   198         STC   15,SVOLDPSW+1                   2220.00
00005E 92FF 0020     00020         199         MVI   SVOLDPSW,X'FF'  INSURE MASKED ON 2230.00
000062 9605 0021     00021         200         OI    SVOLDPSW+1,5    MERGE IN PROB-STATE BIT 2240.00
000066 98EF 0028           (0028   201         LM    14,15,PROLDPSW  RESTORE REGS    2250.00
00006A 8200 0020     00020         202         LPSW  SVOLDPSW        RESUME          2260.00

00006E 50F0 002C           (002C   204 CHEKIOH  ST    15,PROLDPSW+4   SAVE ANOTHER REG 2280.00
000072 18F1                        205         LR    15,1            UCB ADR TO 15   2290.00
000074 9500 F004     00004         206         CLI   UCBCHA(15),0    MPX CHANNEL?    2300.00
000078 4770 E0D6           (00DC   207         BNE   GCS             NO, QUIT        2310.00
00007C 9002 E27A           (027C   208         STM   0,2,SVCSAVE     SAVE MORE REGS  2320.00
000080 4120 0000           (0000   209         LA    2,0                             2330.00
000084 47F0 E0B6           (00BC   210         B     CHEK03                          2340.00

000088 50F0 002C           (002C   212 CHEKUNIT ST    15,PROLDPSW+4   SAVE ANOTHER REG 2360.00
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

000088 58F0 1014            00014   233          L     15,IOBDCBPT(,1)          --> DCB          2370.00
00008C 58F0 F02C            0CC2C   234          L     15,DCBDEBAD(,15)         --> DEB          2380.00
000090 58F0 F020            00020   235          L     15,DEBUCBAD(,15)         --> UCB          2390.00
000094 9540 FC12      00012         236          CLI   18(15),X'40'             IS DEVICE CLASS COMM??  2400.00
000098 4770 E0D6            0CCDC   237          BNE   GOS                      NO, QUIT         2410.00
00009C 9002 E27A            00280   238          STM   0,2,SVCSAVE              SAVE MORE REGS   2420.00
0000A0 58F0 1014            00014   239          L     15,IOBDCBPT(,1)          --> DCB          2430.00
0000A4 58F0 F02C            0CC2C   240          L     15,DCBDEBAD(,15)         --> DEB          2440.00
0000A8 4120 0000            00000   241          LA    2,0                      CLEAR FOR IC     2450.00
0000AC 4320 1020            0CC2C   242          IC    2,IOBUCBX(,1)            GET INDEX TO UCBAD  2460.00
0000B0 8920 0002            00002   243          SLL   2,2                      MAKE IT A WORD INDEX  2470.00
0000B4 58F2 FC2C            00020   244          L     15,DEBUCBAD(2,15)        GET PROPER UCB ADR  2480.00
0000B8                              245 CHEK03   EQU   *                                           2490.00
0000B8 CC00 F005 E2B2 00005 00288   246          TRT   UCBLA(1,15),UNITABLE     IS THIS ONE OF THE SIM UNITS?  2500.00
0000BC 472C 0CE4            0CCEA   247          BC    2,OURUNIT                YES, BRANCH      2510.00
0000C0 D207 0030 E272 00030 0C278   248          MVC   MCOLDPSW(8),OSSVCNEW                     2520.00
0000C6 9812 E27E            00284   249          LM    1,2,SVCSAVE+4            RESTORE REGS     2530.00
0000CA 98EF 0028            00028   250          LM    14,15,PROLDPSW           MORE REGS        2540.00
0000CE 8200 0030      C0030         251          LPSW  MCOLDPSW                 LET OS HAVE THE EXCP  2550.00

0000D2 5820 E282            00288   253 IGNORE   L     2,SVCSAVE+8                              2570.00
0000D6 D207 0030 E272 C0030 0C278   254 GOS      MVC   MCOLDPSW(8),OSSVCNEW                     2580.00
0000DC 98EF 0028            00028   255          LM    14,15,PROLDPSW                           2590.00
0000E0 8200 0030      C0030         256          LPSW  MCOLDPSW                 LET OS HAVE IT   2600.00


0000E4                              258 OURUNIT  EQU   *                                           2620.00
0000E4 5810 E27E            00284   259          L     1,SVCSAVE+4              RESTORE IOB PTR  2630.00
0000E8 41F2 E3AE            0C3B4   260          LA    15,WORKTBL(2)                             2640.00
0000EC 95FF F000      00000         261          CLI   0(15),255                IS THE SIMTASK STOPPED?  2650.00
0000F0 4780 ECD2            00DC8   262          BE    IGNORE                   YES - GIVE THIS TO CS  2660.00
0000F4 5012 E3AE            0C3B4   263          ST    1,WORKTBL(2)             LOG WORK TO DO   2670.00
0000F8 43F0 0023            00023   264          IC    15,SVOLDPSW+3            GET SVC NUMBER   2680.00
0000FC 42F2 E3AE            0C3B4   265          STC   15,WORKTBL(2)            STORE WITH IOB ADR  2690.00
000100 41F2 E14E            0C154   266          LA    15,SIMECB(2)             --> TASK'S ECB   2700.00
000104 9180 F000      00000         267          TM    0(15),X'80'              IS SIM WAITING?  2710.00
000108 4710 E118            0011E   268          BC    POSTSIM                  YES, GO POST     2720.00
00010C 5820 E282            0C288   269          L     2,SVCSAVE+8              RESTORE 2        2730.00
000110 98EF 0028            00028   270          LM    14,15,PROLDPSW                            2740.00
000114 8200 0020      C0020         271          LPSW  SVOLDPSW                 RESUME EXECUTION 2750.00

000118 903D E286            0028C   273 POSTSIM  STM   3,13,SVCSAVE+12           SAVE THEM ALL    2770.00
00011C 41A0 0000            00000   274          LA    10,0                     COMPLETION CODE  2780.00
000120 41B2 E14E            0C154   275          LA    11,SIMECB(2)             ECB ADR          2790.00
000124 58C2 E1AE            0C1B4   276          L     12,SIMTCB(2)             TCB ADR          2800.00
000128 58FC CC10            0CC1C   277          L     15,16                    --> CVT          2810.00
00012C 58F0 F098            0C098   278          L     15,152(,15)              POST BRANCH ENTRY ADR  2820.00
                                    279          DROP  14                                       2830.00
000130 05EF                         280          BALR  14,15                    GO TO POST       2840.00
000132                              281          USING *,14                     NEW BASE         2850.00
000132 98CD E148            00280   282          LM    0,13,SVCSAVE             RESTOR REGS      2860.00
000136 98EF 0028            0CC28   283          LM    14,15,PROLDPSW                            2870.00
00013A 8200 0020      00020         284          LPSW  SVOLDPSW                 RESUME EXECUTION 2880.00
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72
                                    285          DROP  14                                            2890.00

000144                              287          USING *,15                                          2910.00
                                    288 STAEX    ZEROKEY                                             2920.00
000144 4100 0000            00000   289+STAEX    LA    0,0
000148 0A81                         290+         SVC   SVCNO
00014A D207 006C F134 0060  00278   291          MVC   SVNEWPSW(8),OSSVCNEW                         2930.00
000150 41F0 0000            00000   292          LA    15,0                                          2940.00
000154 07FE                         293          BR    14                                            2950.00
                                    294          DROP  15                                            2960.00
```

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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72
                                    296            ENTRY WORKTBL,SIMECB,FREEQ,PRTBL,DELAY,STOPFLAG,UNITABLE   2980.00
000150                              297            DS    0F                                            2990.00
000154                              298 SIMECB     EQU   *-4                                          3000.00
000158 00000000000C0000             299            DC    (#TERM)F'0'       ECB'S FOR SIM TASKS         3010.00
000184                              300 SIMTCB     EQU   *-4                                          3020.00
000188                              301            DS    (#TERM)F          TCB ADDRESSES OF SIM TASKS  3030.00
000214                              302 PRTBL      EQU   *-4                                          3040.00
000218 0000000000000000             303            DC    (#TERM)A(0)       POINTERS TO PRINT QUEUES    3050.00
000274                              304 ENDPRTBL   EQU   *-4                                          3060.00
000278 0000000000000000             305 OSSVCNEW   DC    D'0'              OS SVC NEW PSW SAVED HERE   3070.00
000280 0000000000000000             306 SVCSAVE    DC    14F'0'            SAVE REGS HERE              3080.00
000288 0000000000000000             307 UNITABLE   DC    64F'0'            FILLED IN AT INITIALIZATION 3090.00
000384                              308 WORKTBL    EQU   *-4               DUMMY ORIGIN                3100.00
000388 0000000000000000             309            DC    (#TERM)F'0'       WORKTBL SPACE               3110.00
000414                              310 ENDWORK    EQU   *-4                                          3120.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72
000008                            349 TIC      EQU   08                                                3350.00
000002                            350 READBIT  EQU   02                                                3360.00
000001                            351 WRITEBIT EQU   01                                                3370.00
000006                            352 PREP     EQU   06                                                3380.00
                                  353          AREADEF                                               3390.00
000000                            354+AREA     DSECT
000000                            355+SAVE     DS    18F
000048                            356+DECWK    DS    D
000050                            357+WORKSLOT DS    A --> OUR SLOT IN WORKTBL
000054                            358+ECBADR   DS    A --> OUR ECB
00005E                            359+RCE      DS    0F
000058                            360+RQEUCB   DS    F
00005C                            361+RQEIOB   DS    F
000060                            362+RCEDEB   DS    F
000064                            363+CCWSAVE  DS    0CL8
000064                            364+CCWOP    DS    C
000065                            365+CCWDAD   DS    AL3
000068                            366+CCWFLAGS DS    X
000080                            367+CCWCD    EQU   X'80'
000040                            368+CCWCC    EQU   X'40'
000020                            369+CCWSLI   EQU   X'20'
00001C                            370+CCWSKIP  EQU   X'10'
000008                            371+CCWPCI   EQU   X'08'
000069                            372+         DS    X
00006A                            373+CCWCOUNT DS    H
00006C                            374+BINTVL   DS    F
000070                            375+TO       DS    A LOCATION DATA GOES TO
000074                            376+FROM     DS    A LOCATION DATA COMES FROM
000078                            377+COUNT    DS    H COUNT FOR MOVE
00007A                            378+TERMSTAT DS    X TERMINAL STATUS BYTE
000080                            379+LOCKED   EQU   X'80' INDICATES KEYBOARD LOCKED
000078                            380+TERMNO   DS    CL3 EBCDIC TERMINAL NUMBER
00007E                            381+INLEFT   DS    H NUMBER OF BYTES LEFT TO BE READ
000080                            382+INREAD   DS    H NUMBER OF BYTES ALREADY READ
000082                            383+INBUF    DS    CL80
0000D2                            384+OUTCOUNT DS    H CURRENT LENGTH OF OUTPUT
0000D4                            385+OUTBUF   DS    CL256
0001D4                            386+PRINT    DS    A
0001D8                            387+DCBADR   DS    A
0001DC                            388+DCB      DS    CL96
00023C                            389+TRACEPTR DS    A
000240                            390+TRAREA   DS    CL256
000340                            391+AREASIZE EQU   *-AREA
000000                            392 SIM      CSECT                                             3400.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72
000498                              394          USING *,15                                              3420.00
                                    395 SIMGO    SAVE  (14,12),,*                                        3430.00
000498 47F0 F00A            000CA   396+SIMGO    B     10(0,15) BRANCH AROUND ID
00049C 05                           397+         DC    AL1(5)
00049D E2C9D4C7D6                   398+         DC    CL5'SIMGO' IDENTIFIER
0004A2 90EC D00C            000CC   399+         STM   14,12,12(13) SAVE REGISTERS
0004A6 188D                         400          LR    11,13                                             3440.00
0004A8 41D0 F2B8            00750   401          LA    13,SAVEAREA                                       3450.00
0004AC 50DC BC08            000C8   402          ST    13,8(,11)                                         3460.00
0004B0 5080 D004            00004   403          ST    11,4(,13)                                         3470.00
0004B4 58E0 F528            004CC   404          L     6,=A(SIMECB)                                      3480.00
                                    405          DROP  15                                                3490.00
000154                              406          USING SIMECB,6                                          3500.00
0004B8 581C 1000            000C0   407          L     1,0(,1)          --> PARM LENGTH                3510.00
0004BC 4820 1000            000C0   408          LH    2,0(,1)          GET PARM LENGTH                3520.00
0004C0 1222                         409          LTR   2,2              ANY PARM?                      3530.00
0004C2 4780 63E6            004EA   410          BZ    NOPARM           NO                             3540.00
0004C6 4130 63C7            00518   411          LA    3,PARM+3                                          3550.00
0004CA 1B32                         412          SR    3,2              RIGHT-JUSTIFY                  3560.00
0004CC 0620                         413          BCTR  2,0              360 LENGTH                     3570.00
0004CE 4420 63BE            00512   414          EX    2,MVPARM         MVC   0(0,3),2(1)              3580.00
000278                              415 DWORD    EQU   OSSVCNEW                                          3590.00
0004D2 D704 6124 6124 00278 00278   416          XC    DWORD(5),DWORD                                    3600.00
0004D8 F224 6129 63C4 0027D 00518   417          PACK  DWORD+5(3),PARM(5)                                3610.00
0004DE 4F10 6124            00278   418          CVB   1,DWORD                                           3620.00
0004E2 5820 6880            004D4   419          L     2,=V(DELAY)                                       3630.00
0004E6 501C 2000            00000   420          ST    1,0(,2)          STORE THINK TIME               3640.00
0004EA                              421 NOPARM   EQU   *                                                 3650.00
                                    422          IDENTIFY EP=OPCOM,ENTRY=OPCOM                           3660.00
0004EA 4500 63A2            004F6   423+         BAL   0,*+12 LOAD EP SYMBOL ADDR
0004EE D6D7C3D6D4404040             424+         DC    CL8'OPCOM' EP SYMBOL
0004F6 4110 6204            00418   425+         LA    1,OPCOM LOAD PARAMETER REG 1
0004FA CA29                         426+         SVC   41 ISSUE IDENTIFY SVC
0004FC 12FF                         427          LTR   15,15                                             3670.00
0004FE 4780 63CA            0051E   428          BZ    IDOK                                              3680.00
                                    429          ABEND 111,DUMP                                          3690.00
000502                              430+         DS    0H
000502 0700                         431+         CNOP  0,4
000504 47F0 63B8            004CC   432+         B     **+8 BRANCH AROUND CONSTANT
000508 80                           433+         DC    AL1(128) DUMP/STEP CODE
000509 000006F                      434+         DC    AL3(111) COMPLETION CODE
00050C 5810 63B4            004C8   435+         L     1,*-4 LOAD CODES INTO REG 1
000510 0A0D                         436+         SVC   13 LINK TO ABEND ROUTINE
000512 D200 3000 1002 00000 00002   437 MVPARM   MVC   0(0,3),2(1)                                       3700.00
000518 F0F0F0F0F0                   438 PARM     DC    CL5'00000'                                        3710.00
                                    439 IDOK     ATTACH EP=OPCOM                                         3720.00
00051E                              440+IDOK     DS    0H
00051E 41F0 63D4            004E8   441+         LA    15,IHB0012 LOAD 15 WITH LIST ADDR
000522 47F0 F034            00034   442+         B     52(0,15) .AROUND LIST.          20021
000528                              443+IHB0012  DS    0F SUP. PARAM. LIST
000528 00000544                     444+         DC    A(*+28) ADDRESS OF SYMB NAME
00052C CC                           445+         DC    AL1(0) NO HIARCHY                    LCS1
00052D 000000                       446+         DC    AL3(0) DCB ADDRESS                LCS1
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                    F150CT70  3/20/72
000530 00000000                     447+         DC    A(0) ECB ADDRESS
000534 CCCCCCCC                     448+         DC    A(0) GSPV VALUE OR GSPL ADR
000538 00000000                     449+         DC    A(0) SHSPL OR SHSPV
00053C 02                           450+         DC    AL1(2) SET ROLLOUT BITS  RORI
00053D CC0000                       451+         DC    AL3(0) ETXR ROUT. ADDRESS   RORI
000540 0000                         452+         DC    AL2(0) DPMOD VALUE
000542 CC                           453+         DC    AL1(0) LPMOD VALUE
000543 C0                           454+         DC    AL1(0)
000544 D6D7C3D6D4404040             455+         DC    CL8'OPCOM' EP SYMBOL
00054C CCCCCCCC                     456+         DC    A(0) ADDRESS OF JSCB                  1270
000550 0000000000CC0000             457+         DC    A(0,0) .NO STAI PARM LIST OR EXIT ADDR.   20021
000558 00000000                     458+         DC    A(0) .NO TASKLIB.                         20021
00055C CA2A                         459+         SVC   42 ISSUE ATTACH SVC
                                    46C          STAE  STAEX                                              3730.00
00055E 0700                         461+         CNOP  0,4 .                  ESTAB. FULL WD. BOUND. ALIGN.
000560 4510 6418            00056C  462+         BAL   1,*+12 . PUT LIST ADDR IN REG1 AND BR AROUND
000564                              463+IHB0013  EQU   *
000564 00                           464+         DC    AL1(0) .          FLAGS FOR TCB,
                                    465+*                                    PURGE AND ASYNCH
000565 000144                       466+         DC    AL3(STAEX) .           STAE EXIT ROUTINE ADDR.
000568 CCCCC000                     467+         DC    A(0) .                 SPACE FOR PARM LIST ADDR
00056C 1800                         468+         SR    0,0 .                  INDICATE CREATE OPTION
00056E 4111 0000            000000  469+         LA    1,0(1) .                MAKE REG1 POS.  XCTL=NO
000572 CA3C                         47C+         SVC   60 .                   ISSUE STAE SVC

                                    472 *        INVOKE INSTALLATION-SUPPLIED SVC TO OBTAIN ZERO PROTECT KEY   3750.00

000574 4100 0000            000000  474          LA    0,0                    REMOVE THESE TWO CARDS            3770.00
000578 C000                         475          SVC   USERSVC                IF RUNNING AS A SYSTEM TASK       3780.00
       *** ERROR ***

00057A D207 6124 0060 C0278 000060  477          MVC   OSSVCNEW(8),SVNEWPSW                                    3800.00
000580 D207 0060 6594 C0060 006E8   478          MVC   SVNEWPSW(8),PSW                                        3810.00
000074                              479 TCBTCB   EQU   116                                                    3820.00
CCCCCC                              480 TCBTIO   EQU   12                                                     3830.00
000022                              481 TCBLMP   EQU   34                                                     3840.00
000084                              482 TCBOTC   EQU   132                                                    3850.00
CCCCAC                              483 CVTHEAD  EQU   160                                                    3860.00
000586 8000 6884        00908       484          SSM   =A(0)                MASK I/O OFF WHILE WE CHANGE PRTY  3870.00
00058A 5810 0010                000010  485      L     1,16                                                   3880.00
00058E 5810 1000                000CCC  486      L     1,0(,1)                --> NEXT & CURRENT              3890.00
000592 5810 1004                000004  487      L     1,4(,1)                OUR TCB ADR                     3900.00
000596 0201 1022 6858 00022 009EC   488          MVC   TCBLMP(2,1),=X'FFFF'   CHANGE LIMIT &,DISP PRTY        3910.00
00059C 5820 1084                000084  489      L     2,TCBOTC(,1)           GET OUR INIT'S TCB              3920.00
0005A0 5830 2074                000074  490 TLOOP  L     3,TCBTCB(,2)           GET NEXT TCB                    3930.00
0005A4 1913                         491          CR    1,3                    IS IT OURS?                     3940.00
0005   4780 645C                000C5BC 492          BE    TFOUND                 YES - R2 IS PREDECESSOR         3950.00
0005 A 1823                         493          LR    2,3                                                    3960.00
0005AC 47F0 644C                000C5AC 494          B     TLOOP                                                3970.00
0005B0 D203 2074 1074 00074 000074  495 TFOUND  MVC   TCBTCB(4,2),TCBTCB(1)   UN-HOOK OUR TCB FROM CHAIN       3980.00
0005B6 582C 0010                000010  496      L     2,16                   LOOK FOR SPOT TO INSERT OUR TCB 3990.00
0005BA 5820 20AC                000CAC  497      L     2,CVTHEAD(,2)          START WITH TOP TCB              4000.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72

0005BE 47F0 6480             C05D4   498          B     TNEXT                                          4010.00
0005C2 5840 2CCC             C000C   499 SLOOP    L     4,TCBTIOT(,2)      --> TIOT                    4020.00
0005C6 1244                          500          LTR   4,4                ANY TIOT?                   4030.00
0005C8 4780 6480             C05C4   501          BZ    TNEXT              NO, SKIP AHEAD              4040.00
0005CC 9504 4000       00000         502          CLI   0(4),C'M'          MASTER SCHEDULER?           4050.00
0005D0 4770 648A             C05DE   503          BNE   SFOUND             NO - FOUND SPOT             4060.00
0005D4 1832                          504 TNEXT    LR    3,2                SAVE TCB ADR                4070.00
0005D6 5820 2074             C0074   505          L     2,TCBTCB(,2)       CHAIN TO NEXT TCB           4080.00
0005DA 47F0 646E             C05C2   506          B     SLOOP                                          4090.00
0005DE                               507 SFOUND   EQU   *                  TCB(R3) --> TCB(R2)         4100.00
0005DE 5010 3074             C0074   508          ST    1,TCBTCB(,3)       WE ARE NEW SUCESSOR TO TCB(R3) 4110.00
0005E2 5020 1074             C0074   509          ST    2,TCBTCB(,1)       OUR SUCESSOR IS TCB(R2)     4120.00
                                     510          RESETKEY                 BACK TO PROBLEM STATE       4130.00
0005E6 4800 689A             C09EE   511+         LH    0,=H'-1'
0005EA 0A81                          512+         SVC   SVCNO
0005EC 5810 6888             C09DC   513          L     1,=V(SIMTASK)                                  4140.00
                                     514          IDENTIFY EP=SIMTASK,ENTRY=(1)                        4150.00
0005F0 4500 64A8             C05FC   515+         BAL   0,*+12 LOAD EP SYMBOL ADDR
0005F4 E2C9D4E3C1E2D24C              516+         DC    CL8'SIMTASK' EP SYMBOL
0005FC 0A29                          517+         SVC   41 ISSUE IDENTIFY SVC
                                     518          OPEN  (SYSIN)                                        4160.00
0005FE C700                          519+         CNOP  0,4
000600 4510 64B4             00608   520+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
000604 EC                            521+         DC    AL1(128) OPTION BYTE
000605 000BF0                        522+         DC    AL3(SYSIN) DCB ADDRESS
000608 0A13                          523+         SVC   19 ISSUE OPEN SVC
00060A 911C 65CC       C072C         524          TM    SYSIN+48,X'10'     OPEN OK?                    4170.00
00060E 4710 64CE             C0622   525          BO    INOK                                           4180.00
                                     526          ABEND 213,DUMP                                       4190.00
000612                               527+         DS    0H
000612 0700                          528+         CNOP  0,4
000614 47F0 64C8             C061C   529+         B     *+8 BRANCH AROUND CONSTANT
000618 8C                            530+         DC    AL1(128) DUMP/STEP CODE
000619 0000D5                        531+         DC    AL3(213) COMPLETION CODE
00061C 5810 64E4             E0618   532          L     1,*+4 LOAD CODES INTO REG 1
000620 0A0D                          533+         SVC   13 LINK TO ABEND ROUTINE
000622                               534 INOK     EQU   *                                              4200.00
000622 588C 688C             C09E0   535          L     8,=V(AVTSAVE)                                  4210.00
000626 4120 6164             C0288   536          LA    2,UNITABLE                                     4220.00
00062A 4130 0004             C0004   537          LA    3,4                                            4230.00
00062E 4140 C000             CCCCC   538          LA    4,0                                            4240.00
                                     539 READCTL  GET   SYSIN                                          4250.00
000632 4110 659C             C06F0   540+READCTL  LA    1,SYSIN LOAD PARAMETER REG 1
000636 58F0 1030             C0030   541+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
00063A 05EF                          542+         BALR  14,15 LINK TO GET ROUTINE
00063C DC4A 1CCC 689E C0000 009F2    543          OC    0(75,1),=75X'E0'                               4260.00
000642 DC4A 1CC0 6564 C0000 C0688    544          TR    0(75,1),TRTAB                                  4270.00
000648 1851                          545          LR    5,1                                            4280.00
00064A F212 6592 5C0C 006E6 00000    546 LOOP     PACK  UNIT(2),0(3,5)                                 4290.00
000650 4340 6592             C06E6   547          IC    4,UNIT                                         4300.00
000654 1244                          548          LTR   4,4                                            4310.00
000656 47E0 640E             00632   549          BZ    READCTL            GO READ NEXT CARD           4320.00
00065A 4234 2000             CCCCC   550          STC   3,0(4,2)                                       4330.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

00065E 4114 2000             00000  551          LA    1,0(4,2)          PASS TERM INDEX AS PARAM      4340.00
                                    552          ATTACH EP=SIMTASK                                       4350.00
000662 41F0 6518             0C66C  553+         LA    15,IHB0021 LOAD 15 WITH LIST ADDR
000666 47F0 F034             00034  554+         B     52(0,15) .AROUND LIST.                20021
00066C                              555+IHB0021  DS    OF SUP. PARAM. LIST
00066C 00000688                     556+         DC    A(*+28) ADDRESS OF SYMB NAME
000670 CC                           557+         DC    AL1(0) NO HIARCHY                     LCS1
000671 CC0CC0                       558+         DC    AL3(0) DCB ADDRESS                LCS1'
000674 00000000                     559+         DC    A(0) ECB ADDRESS
000678 CCCCC000                     560+         DC    A(0) GSPV VALUE OR GSPL ADR
00067C 00000000                     561+         DC    A(0) SHSPL OR SHSPV
000680 02                           562+         DC    AL1(2) SET ROLLOUT BITS  RORI
000681 CC0CC0                       563+         DC    AL3(0) ETXR ROUT. ADDRESS   RORI
000684 0000                         564+         DC    AL2(0) DPMOD VALUE
000686 CC                           565+         DC    AL1(0) LPMOD VALUE
000687 00                           566+         DC    AL1(0)
000688 E2C9D4E3C1E2C240             567+         DC    CL8'SIMTASK' EP SYMBOL
000690 CCCCCCC0                     568+         DC    A(0) ADDRESS OF JSCB                  1270
000694 CCCCCCC0CCCCCCC0             569+         DC    A(0,0) .NO STAI PARM LIST OR EXIT ADDR.   20021
00069C 00000000                     570+         DC    A(0) .NO TASKLIB.                     20021
0006A0 CA2A                         571+         SVC   42 ISSUE ATTACH SVC
0006A2 5013 6060             001B4  572          ST    1,SIMTCB(3)          SAVE TCB ADR             4360.00
0006A6 4130 3004             00004  573          LA    3,4(,3)                                       4370.00
0006AA 415C 5CC3             0CCC3  574          LA    5,3(,5)                                       4380.00
0006AE D503 6884 8000 009D8  0CCCC  575          CLC   =A(0),0(8)           AVT SAVED YET?           4390.00
0006B4 4770 64F6             0064A  576          BNE   LOOP                 YES - SKIP               4400.00
0006B8 1814                         577          LR    1,4                  DEVICE ADR TO R1         4410.00
                                    578          CALL  UCBLOOK              LOCKUP UCB ADR           4420.00
0006BA 0700                         579+         CNOP  0,4
0006BC 47F0 6570             0C6C4  580+         B     *+8 BRANCH AROUND VCON
0006C0 00000000                     581+IHB0022B DC    V(UCBLOOK) ENTRY POINT ADDRESS
0006C4 58F0 656C             006C0  582+         L     15,IHB0022B LOAD 15 WITH ENTRY ADR
0006C8 05EF                         583+         BALR  14,15 BRANCH TO ENTRY POINT
0006CA 4810 1014             00014  584          LH    1,20(,1)             GET RQE ADR FROM UCB     4430.00
0006CE 1211                         585          LTR   1,1                  ANY RQE?                 4440.00
0006D0 4780 64F6             0C64A  586          BZ    LOOP                 NO - SKIP                4450.00
0006D4 581C 10C8             00008  587          L     1,8(,1)              GET DEB ADR FROM RQE     4460.00
0006D8 5810 101C             00C1C  588          L     1,28(,1)             --> APPENDAGE VECTOR TABLE 4470.00
0006DC D213 8000 1000 00000  00000  589          MVC   0(20,8),0(1)         SAVE THE REAL A V T      4480.00
0006E2 47F0 64F6             0064A  590          B     LOOP                                          4490.00
0006E6 CC00                         591 UNIT     DC    X'0000'                                       4500.00


0006E8                              593 PSW      DC    0D'0'                                         4520.00
0006E8 CCC40000                     594          CC    X'00040000'                                   4530.00
0006EC 00000000                     595          DC    A(SIFTSVC)                                    4540.00
                                    596 SYSIN    DCB   DDNAME=SYSIN,DSORG=PS,MACRF=(GL),LRECL=80,ECDAD=UNITDONE 4550.00


                                    598+*                    DATA CONTROL BLOCK
                                    599+*
0006FC                              600+SYSIN    CC    0F'0' ORIGIN ON WORD BOUNDARY
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                                602+**                  DIRECT ACCESS DEVICE INTERFACE
0006F0 0000000000000000         604+          DC    BL16'0' FDAD,DVTBL
0007CC CCCCC000                 605+          DC    A(0) KEYLE,DEVT,TRBAL

                                607+**                  COMMON ACCESS METHOD INTERFACE
0007C4 00                       609+          DC    AL1(0) BUFNO
0007C5 CC0001                   610+          DC    AL3(1) BUFCB
0007C8 0000                     611+          DC    AL2(0) BUFL
0007CA 4000                     612+          DC    BL2'0100000000000000' DSORG
0007CC 00000001                 613+          DC    A(1) IOBAD

                                615+**                  FOUNDATION EXTENSION
0007D0 00                       617+          DC    BL1'00000000' BFTEK,BFLN,HIARCHY
0007D1 C007B8                   618+          DC    AL3(UNITDONE) EODAD
0007D4 00                       619+          DC    BL1'00000000' RECFM
0007D5 CCC0C0                   620+          DC    AL3(0) EXLST

                                622+**                  FOUNDATION BLOCK
0007D8 E2E8E2C9D5404040         624+          DC    CL8'SYSIN' DDNAME
0007E0 02                       625+          DC    BL1'00000010' OFLGS
0007E1 00                       626+          DC    BL1'0000000C' IFLG
0007E2 4800                     627+          DC    BL2'0100100000000000' MACR

                                629+**                  BSAM-BPAM-QSAM INTERFACE
0007E4 00                       631+          DC    BL1'00000000' RER1
0007E5 CC0CC1                   632+          DC    AL3(1) CHECK, GERR, PERR
0007E8 00000001                 633+          DC    A(1) SYNAD
0007EC 0000                     634+          DC    H'0' CIND1, CIND2
0007EE CC00                     635+          DC    AL2(0) BLKSIZE
0007F0 00000000                 636+          DC    F'0' WCPO, WCPL, OFFSR, OFFSW
0007F4 CCCCCCC1                 637+          DC    A(1) IOBA
0007F8 CC                       638+          DC    AL1(0) NCP
0007F9 000001                   639+          DC    AL3(1) EOBR, EOBAD

                                641+**                  QSAM INTERFACE
0007FC CC000001                 643+          DC    A(1) RECAD
000800 0000                     644+          DC    H'0' QSWS
000802 CC50                     645+          DC    AL2(80) LRECL
000804 00                       646+          DC    BL1'00000000' EROPT
000805 C00001                   647+          DC    AL3(1) CNTRL
000808 CCCCC0C0                 648+          DC    F'0' PRECL
00080C 00000001                 649+          DC    A(1) EOB
000810                          650 SAVEAREA  DS    18F                                4560.00
000858                          651 TRTAB     EQU   *-X'E0'                            4570.00
000798 00FAFBFCFDFEFF00         652           DC    X'00FAFBFCFDFEFF0000000000000000000' 4580.00
0007A8 F0F1F2F3F4F5F6F7         653           DC    X'F0F1F2F3F4F5F6F7F8F900000000000'   4590.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72

000788                             655 UNITDONE EQU   *                                                4610.00
                                   656          CLOSE SYSIN                                         4620.00
000788                             657+         CNOP  0,4
000788 4510 666C           007CC   658+         BAL   1,*+8 BRANCH AROUND LIST
00078C 80                          659+         DC    AL1(128) OPTION BYTE
00078D 0006F0                      660+         DC    AL3(SYSIN) DCB ADDRESS
000790 0A14                        661+         SVC   20 ISSUE CLOSE SVC
                                   662          OPEN  (SYSPRINT,(OUTPUT))                           4630.00
000792 0700                        663+         CNOP  0,4
000794 4510 6678           007CC   664+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
000798 8F                          665+         DC    AL1(143) OPTION BYTE
000799 000B8C                      666+         DC    AL3(SYSPRINT) DCB ADDRESS
00079C 0A13                        667+         SVC   19 ISSUE OPEN SVC
00079E 911C 6768      00B8C        668          TM    SYSPRINT+48,X'10'     OPEN OK?              4640.00
0007A2 4710 6692           007E6   669          BO    PROK                  YES                   4650.00
                                   670          ABEND 313,DUMP                                      4660.00
0007A6                             671+         DS    0H
0007A6 0700                        672+         CNOP  0,4
0007A8 47FC 668C           007E0   673+         B     *+8 BRANCH AROUND CONSTANT
0007AC 80                          674+         DC    AL1(128) DUMP/STEP CODE
0007AD 000139                      675+         DC    AL3(313) COMPLETION CODE
0007B0 5810 6688           007DC   676+         L     1,*-4 LOAD CODES INTO REG 1
0007B4 CA0D                        677+         SVC   13 LINK TO ABEND ROUTINE
0007B6                             678 PROK     EQU   *                                             4670.00
0007B6 5890 6890           009E4   679          L     9,=V(FREEQ)                                   4680.00
0007BA 4140 0004           00004   680          LA    4,4                   INCREMENT               4690.00
0007BE 4150 6120           00274   681          LA    5,ENDPRTBL            COMPARAND               4700.00
                                   682 PRPR     STIMER WAIT,BINTVL=TENSEC                           4710.00
0007C2 4110 6734           00888   683+PRPR     LA    1,TENSEC LOAD PARAMETER REG 1
0007C6 4100 0011           00011   684+         LA    0,17(0,0) LOAD FLAG BYTE
0007CA 8900 0018           00018   685+         SLL   0,24(0) SHIFT TO HI-ORDER BYTE
0007CE 0A2F                        686+         SVC   47 ISSUE STIMER SVC
0007D0 92FF 673C           00884   687          MVI   DONEFLAG,255          INITIALIZE TO 'ALL DONE'  4720.00
0007D4 4130 60C4           00218   688          LA    3,PRTBL+4             INDEX                     4730.00
0007D8 5870 1000           00000   689 SCANPR   L     7,0(,3)               GET PRTBL ENTRY           4740.00
0007DC 1277                        690          LTR   7,7                   ANY POINTER?              4750.00
0007DE 4780 6704           00858   691          BZ    CHEKSTOP              NO - NO MORE TERMINALS    4760.00
0007E2 1887                        692          LR    8,7                   SAVE ADR OF PRINT Q BASE  4770.00
0007E4 95FF 31A0           01A0    693          CLI   WORKTBL-PRTBL(3),255  IS THE SIMTASK STOPPED?   4780.00
0007E8 4780 6700           00854   694          BE    NXTENTRY              YES - DON'T TRY TO PRINT  4790.00
0007EC 9200 6730           00884   695          MVI   DONEFLAG,0            NOT DONE YET              4800.00
0007F0 587C 7000           00000   696          L     7,0(,7)               GET PRINT QUEUE           4810.00
0007F4 1277                        697          LTR   7,7                   ANY WORK?                 4820.00
0007F6 4780 6700           00854   698          BZ    NXTENTRY              NO                        4830.00
0007FA 41F0 0000           00000   699          LA    15,0                                            4840.00
0007FE 50F0 8000           00000   700          ST    15,0(,8)               UN-HOOK THE QUEUE        4850.00
                                   701 PR       PUT   SYSPRINT,4(7)                                   4860.00
000802 4110 6738           00B8C   702+PR       LA    1,SYSPRINT LOAD PARAMETER REG 1
000806 4107 0004           00004   703+         LA    0,4(7) LOAD PARAMETER REG 0
00080A 58F0 1C30           00C30   704+         L     15,48(0,1) LOAD PUT ROUTINE ADDR.
00080E 05EF                        705+         BALR  14,15 LINK TO PUT ROUTINE
000810 5886 7000           00000   706          L     8,0(,7)               NEXT PREC                 4870.00
000814 0203 7000 9000 00000 00000  707          MVC   0(4,7),0(9)           HOOK FREEQ TO THIS PREC   4880.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72
00084A 5070 9000            00000  708          ST    7,0(,9)          HOOK THIS PREC TO FREEQ          4890.00
000E4E 1278                        709          LTR   7,8              ANY NEXT?                        4900.00
000850 4770 66DE            00B32  710          BNZ   PR               YES                              4910.00
000854 8734 6684            00808  711 NXTENTRY BXLE  3,4,SCANPR                                        4920.00
000858 5830 6670            009C4  712 CHEKSTOP L     3,=V(STOPFLAG)                                   4930.00
00085C 9500 3000      C0000        713          CLI   0(3),0           ARE WE STOPPING?                 4940.00
000860 4780 669E            007F2  714          BE    PRPR             NO                               4950.00
000864 9511 3CCC      C000C        715          CLI   0(3),X'11'       ARE WE DUMPING?                  4960.00
000868 4780 6720            00874  716          BE    KILL             YES                              4970.00
00086C 9500 673C      C0884        717          CLI   DONEFLAG,0       IS ANY TASK STILL RUNNING?       4980.00
000870 4780 669E            007F2  718          BE    PRPR             YES                              4990.00
                                   719 KILL     CLOSE (SYSPRINT)                                       5000.00
000874                             720+         CNOP  0,4
000874 4510 6728            00880  721+KILL     BAL   1,*+8 BRANCH AROUND LIST
000878 80                          722+         DC    AL1(128) OPTION BYTE
000879 00088C                      723+         DC    AL3(SYSPRINT) DCB ADDRESS
00087C 0A14                        724+         SVC   20 ISSUE CLOSE SVC
                                   725          ABEND 0                                                5010.00
00087E                             726+         DS    0H
00087E 4110 0000            00000  727+         LA    1,0 LOAD PARAMETER REG 1
000882 CA00                        728+         SVC   13 LINK TO ABEND ROUTINE
000884 0000                        729 DONEFLAG DC    H'0'                                             5020.00
000886 0000
000888 0000003E8                   730 TENSEC   DC    F'1000'                                          5030.00
                                   731 SYSPRINT DCB   DDNAME=SYSPRINT,DSORG=PS,MACRF=(PM),RECFM=FB,LRECL=132  5040.00


                                   733+*                    DATA CONTROL BLOCK
                                   734+*
00088C                             735+SYSPRINT DC    0F'0' ORIGIN ON WORD BOUNDARY

                                   737+*                    DIRECT ACCESS DEVICE INTERFACE

000B8C 0000000000000000            739+         DC    BL16'0' READ,DVTBL
000B9C 00000000                    740+         DC    A(0),KEYLE,DEVT,TRBAL

                                   742+*                    COMMON ACCESS METHOD INTERFACE

000BA0 0C                          744+         DC    AL1(0) BUFNO
000BA1 000001                      745+         DC    AL3(1) BUFCB
000BA4 0000                        746+         DC    AL2(0) BUFL
000BA6 4000                        747+         DC    BL2'0100000000000000' DSORG
000BA8 00000001                    748+         DC    A(1) IOBAD

                                   750+*                    FOUNDATION EXTENSION

       00                          752+         DC    BL1'00000000' BFTEK,BFLN,HIARCHY
        00001                      753+         DC    AL3(1) EODAD
                                   754+         DC    BL1'10010000' RECFM
            0                      755+         DC    AL3(0) EXLST

                                   757+*                    FOUNDATION BLOCK
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                    F15OCT70  3/20/72

0008B4 E2E8E2D7D9C9D5E3            759+         DC    CL8'SYSPRINT' DDNAME
0008BC 02                          760+         DC    BL1'00000010' OFLGS
0008BD CC                          761+         DC    BL1'00000000' IFLG
0008BE 0050                        762+         DC    BL2'0000000001010000' MACR

                                   764+*                BSAM-BPAM-QSAM INTERFACE

0008C0 00                          766+         DC    BL1'00000000' KER1
0008C1 000001                      767+         DC    AL3(1) CHECK, GERR, PERR
0008C4 00000001                    768+         DC    A(1) SYNAD
0008C8 0000                        769+         DC    H'0' CIND1, CIND2
0008CA 0000                        770+         DC    AL2(0) BLKSIZE
0008CC 00000000                    771+         DC    F'0' WCPO, WCPL, OFFSR, OFFSW
0008D0 00000001                    772+         DC    A(1) IOBA
0008D4 00                          773+         DC    AL1(0) NCP
0008D5 000001                      774+         DC    AL3(1) EOBR, EOBAD

                                   776+*                QSAM INTERFACE

0008D8 00000001                    778+         DC    A(1) RECAD
0008DC 0000                        779+         DC    H'0' QSWS
0008DE 0084                        780+         DC    AL2(132) LRECL
0008E0 00                          781+         DC    BL1'00000000' EROPT
0008E1 000001                      782+         DC    AL3(1) CNTRL
0008E4 00000000                    783+         DC    F'0' PRECL
0008E8 00000001                    784+         DC    A(1) EOB
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 LOC  OBJECT CODE    ADDR1 / ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72

                                    786 ABENDX  SAVE  (14,8),,*                                          5060.00
0008EC 47FC F00C            0000C   787+ABENDX  B     12(0,15) BRANCH AROUND ID
0008F0 06                           788+        DC    AL1(6)
0008F1 C1C2C5D5C4E7                 789+        DC    CL6'ABENDX' IDENTIFIER
0008F7 CC
0008F8 90E8 D00C            0CCCC   790+        STM   14,8,12(13) SAVE REGISTERS
0008FC 0580                         791         BALR  6,0                                              5070.00
0008FE                              792         USING *,6                                              5080.00
0008FE 5880 1000            00000   793         L     8,00(,1)          GET BASE FOR AREA            5090.00
000902                              794         USING AREA,8                                           5100.00
000902 49C0 6CF2            0C9FC   795         CH    0,=H'12'          IS THE PARM AREA THERE?      5110.00
000906 4770 600E            0090C   796         BNE   STOROK           YES                           5120.00
00090A 1882                         797         LR    8,2               PARM LIST ADR IN 2 IF NO STORAGE 5130.00
00090C                              798 STOROK  EQU   *                                                5140.00
00090C 5820 8050            00050   799         L     2,WORKSLOT        --> WORKTBL SLOT             5150.00
000910 92FF 200C        00000       800         MVI   0(2),255          INDICATE TASK STOPPED        5160.00
000914 5830 8060            0C06C   801         L     3,RQEDEB                                       5170.00
000918 1233                         802         LTR   3,3               ANY DEB POINTER?             5180.00
00091A 4780 6044            0C942   803         BZ    NOREST            NO                           5190.00
00091E 5840 301C            00C1C   804         L     4,28(,3)          --> APPENDAGE VECTOR TABLE   5200.00
000922 D503 6CDA FCCC 00908 00000   805         CLC   =A(0),0(15)       IS AVTSAVE GOOD?             5210.00
000928 47E0 6C44            0C942   806         BE    NOREST            NO                           5220.00
00092C 58F0 60E2            0C9E0   807         L     15,=V(AVTSAVE)                                 5230.00
                                    808         ZEROKEY                                              5240.00
000930 4100 0CC0            00CCC   809+        LA    0,0
000934 0A81                         810+        SVC   SVCNO
000936 D213 4CCC FCCC 00000 00CCC   811         MVC   0(20,4),0(15)     RESTORE THE A.V.T.           5250.00
                                    812         RESETKEY                                             5260.00
00093C 4800 60F0            0C9EE   813+        LH    0,=H'-1'
000940 0A81                         814+        SVC   SVCNO
000942 D23E 8004 6072 00004 0C97C   815 NOREST  MVC   OUTBUF(63),OPMSG                                 5270.00
000948 D202 8CF2 8C78 000F2 00078   816         MVC   OUTBUF+30(3),TERMNO     PUT TERMINAL # IN MSG  5280.00
00094E F384 8108 1004 00108 00004   817         UNPK  OUTBUF+55(9),4(5,1)     COMPL CODE             5290.00
000954 5820 60EA            0C9E8   818         L     2,=A(HEXTAB)                                   5300.00
000958 9607 8108 2000 00108 00000   819         OI    OUTBUF+55(8),0(2)       TRANSLATE TO HEX       5310.00
                                    820         WTO   ,MF=(E,OUTBUF)                                 5320.00
00095E 4110 8004            00004   821+        LA    1,OUTBUF LOAD PARAMETER REG 1
000962 0A23                         822+        SVC   35 ISSUE SVC
                                    823         RETURN (14,8),RC=0      NO RETRY                     5330.00
000964 98E8 D00C            0000C   824+        LM    14,8,12(13) RESTORE THE REGISTERS
000968 41F0 0000            00000   825+        LA    15,0(0,0) LOAD RETURN CODE
00096C 07FE                         826+        BR    14 RETURN
                                    827 OPMSG WTO 'SIM0001 TASK FOR TERMINAL XXX ABENDED - COMPL CODE XXXXXXXX'+ 5340.00
                                                ,MF=L                                                5350.00
000970                              828+OPMSG   DS    0F
000970 003F                         829+        DC    AL2(IHB00043-*) MESSAGE LENGTH
000972 0000                         830+        DC    B'0000000000000000' MCSFLAGS FIELD
                                    831+        DC    C'SIM0001 TASK FOR TERMINAL XXX ABENDED - COMPL CODE XXXX
000974 E2C9D4F0F0F1C9404                        +     XXXXX' MESSAGE
0009AF                              832+IHB00043 EQU   *
0009AF                              833         DS    X                 SLOP                         5360.00
000EC0                              834 HEXTAB  EQU   *-X'F0'                                          5370.00
0009B0 F0F1F2F3F4F5F6F7             835         DC    C'0123456789ABCDEF'                            5380.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                F150CT70  3/20/72
                                                                                    5390.00
0009C0                             836          LTORG
0009C0 00000154                    837                =A(SIMECB)
0009C4 00000000                    838                =V(STOPFLAG)
0009C8 404040C4                    839                =CL4' '
0009CC E2E3D6D7                    840                =C'STOP'
0009D0 C4E4D4D7                    841                =C'DUMP'
0009D4 00000000                    842                =V(DELAY)
0009D8 00000000                    843                =A(0)
0009DC 00000000                    844                =V(SIMTASK)
0009E0 00000000                    845                =V(AVTSAVE)
0009E4 00000000                    846                =V(FREEQ)
0009E8 000008C0                    847                =A(NEXTAB)
0009EC FFFF                        848                =X'FFFF'
0009EE FFFF                        849                =H'-1'
0009F0 000C                        850                =H'12'
0009F2 E0E0E0E0E0E0E0E0E0          851                =75X'E0'
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                          F150CT70  3/20/72
000A40                           853 SIMTASK  CSECT                                          5410.00
                                 854          SAVE  (14,12)                                   5420.00
000A40                           855+         DS    0H
000A40 90EC D00C           000C  856+         STM   14,12,12(13) SAVE REGISTERS
000A44 0560                      857          BALR  6,0                                       5430.00
000A46                           858          USING *,6                                       5440.00
                                 859          GETMAIN R,LV=AREASIZE                           5450.00
000A46 0700                      860+         CNOP  0,4
000A48 451C 60CA           00A50 861+         BAL   1,*+8 BRANCH AROUND LENGTH
000A4C 00000340                  862+         DC    A(AREASIZE) LENGTH
000A50 5801 0000           0000  863+         L     0,0(1,0) LOAD LENGTH
000A54 CACA                      864+         SVC   10 ISSUE GETMAIN SVC
000A56 1881                      865          LR    8,1                                       5460.00
000A58 18BD                      866          LR    11,13                                     5470.00
000A5A 41D0 8000           000C  867          LA    13,SAVE                                   5480.00
000A5E 50D0 B008           0008  868          ST    13,8(,11)                                 5490.00
000A62 50B0 8004           0004  869          ST    11,SAVE+4                                 5500.00
000A66 411C 0000           0000  870          LA    1,0                                       5510.00
000A6A 5820 B018           0018  871          L     2,24(,11)          RESTORE ENTRY REG 1    5520.00
000A6E 431C 2000           0000  872          IC    1,0(,2)            GET THE TERMINAL INDEX 5530.00
000A72 5820 6B52           15D8  873          L     2,=V(WORKTBL)                             5540.00
000A76 4121 2000           0000  874          LA    2,0(1,2)           --> WORKTBL SLCT        5550.00
000A7A 5020 BC5C           0050  875          ST    2,WORKSLOT                                5560.00
000A7E 5820 6B96           15DC  876          L     2,=V(SIMECB)                              5570.00
000A82 4121 2000           0000  877          LA    2,0(1,2)           --> OUR ECB            5580.00
000A86 5020 BC54           0C54  878          ST    2,ECBADR                                  5590.00
000A8A 4130 B1D4           0ID4  879          LA    3,PRINT                                   5600.00
000A8E 5820 6B9A           15E0  880          L     2,=V(PRTBL)                               5610.00
000A92 5031 2000           0000  881          ST    3,0(1,2)           PUT PTR TO PRINT Q IN PRTBL 5620.00
000A96 9200 B07A      0007A      882          MVI   TERMSTAT,0         INITIALIZE TERMSTAT BYTE 5630.00
000A9A 4120 0000           0000  883          LA    2,0                                       5640.00
000A9E 5020 B1D4           0ID4  884          ST    2,PRINT                                   5650.00
000AA2 5020 B060           0060  885          ST    2,RQEDEB                                  5660.00
000AA6 4120 B24C           024C  886          LA    2,TRAREA                                  5670.00
000AAA 5020 B23C           023C  887          ST    2,TRACEPTR                                5680.00
000AAE 4120 0000           0000  888          LA    2,0                                       5690.00
000AB2 4C20 BC8C           0C8C  889          STH   2,INREAD                                  5700.00
000AB6 4020 B07E           007E  890          STH   2,INLEFT                                  5710.00
000ABA 4020 B0C2           00C2  891          STH   2,OUTCOUNT                                5720.00
000ABE D25F B1DC 6782 0C1DC 11C8 892          MVC   DCB,PROTDCB                             5730.00
000AC4 5830 B018           0018  893          L     3,24(,11)          RESTORE ENTRY REG 1    5740.00
000AC8 5820 6B9E           15E4  894          L     2,=V(UNITABLE)                            5750.00
000ACC 1832                      895          SR    3,2                OFFSET IN UNITABLE IS DEVICE ADR 5760.00
000ACE 8810 0002           0002  896          SRL   1,2   CONVERT TERMINAL INDEX TO TERMINAL NUMBER 5770.00
000AD2 4E10 BC48           0C4E  897          CVD   1,DECWK                                   5780.00
000AD6 960F B04F      0004F      898          OI    DECWK+7,X'0F'                             5790.00
000ADA F321 B07B B04E 00078 0004E 899          UNPK  TERMNO,DECWK+6(2)  TERMINAL NUMBER IN CHAR FORM 5800.00
000AE0 D202 B206 EC7B CC206 0C07B 900          MVC   DCB+42(3),TERMNO   SUFFIX TERM NO TO DDNAME 5810.00
000AE6 1813                      901          LR    1,3                DEVICE ADR TO R1        5820.00
000AE8 41F0 673A           1180  902          LA    15,UCBLOOK                                5830.00
000AEC 45E0 673A           11EC  903          BAL   14,UCBLOOK         GET UCB ADR             5840.00
000AF0 5010 B058           0058  904          ST    1,RQEUCB           SAVE FOR LATER          5850.00
000AF4 4120 B1DC           01DC  905          LA    2,DCB                                     5860.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

000AF8 5C20 81D8           01D8    906          ST    2,DCBADR                                          5870.00
000AFC 9280 81D8      001C8        907          MVI   DCBADR,X'80'          END OF LIST INDICATOR       5880.00
000B00 D208 8240 67F6 02240 0123C  908          MVC   TRAREA(12),STAELIST    MOVE IN STAE PARM LIST   5890.00
                                   909          STAE  ,PARAM=(8),MF=(E,TRAREA)                         5900.00
000B06 4110 8240           00240   910+         LA    1,TRAREA LOAD PARAMETER REG 1
000B0A 5081 0004           02004   911+         ST    (8),4(1) .          MODIFY LIST - PARAM ADDR
000B0E 1800                        912+         SR    0,0 .                  INDICATE CREATE OPTION
000B10 0A3C                        913+         SVC   60 .                   ISSUE STAE SVC
                                   914          OPEN  ,MF=(E,DCBADR)                                   5910.00
000B12 4110 81D8           01D8    915+         LA    1,DCBADR LOAD PARAMETER REG 1
000B16 0A13                        916+         SVC   19 ISSUE OPEN SVC
000B18 9110 820C      0020C        917          TM    DCB+48,X'10'           OPEN OK?                  5920.00
000B1C 4710 60E2           00B28   918          BO    OPOK                                              5930.00
000B20 4110 6414           02E5A   919          LA    1,FAKEGET                                         5940.00
000B24 5010 820C           0020C   920          ST    1,DCB+48               SUBSTITUTE GET RTNE ADR    5950.00
000B28                             921 CPCK     EQU   *                                                 5960.00
000B28 5820 8058           02058   922          L     2,RQEUCB                                          5970.00
000B2C 4830 2014           02014   923          LH    3,20(,2)               GET RQE ADR FROM UCB       5980.00
000B30 1233                        924          LTR   3,3                    ANY RQE?                   5990.00
000B32 4780 616A           0216A   925          BZ    GOTOWORK               NO - CAN'T FIND DEB        6000.00
000B36 4920 3002           00002   926          CH    2,2(,3)                DOES RQE --> UCB?          6010.00
000B3A 4770 616A           0216A   927          BNE   GOTOWORK               NO - BAD RQE               6020.00
000B3E 58F0 3004           02004   928          L     15,4(,3)               GET IOB ADR FROM RQE       6030.00
000B42 50F0 805C           0205C   929          ST    15,RQEIOB              SAVE FOR LATER             6040.00
000B46 5840 30C8           020C8   930          L     4,8(,3)                GET DEB ADR FROM RQE       6050.00
000B4A 5850 401C           0201C   931          L     5,28(,4)               --> A V T                  6060.00
                                   932          ZEROKEY                                                6070.00
000B4E 4100 0000           02000   933+         LA    0,0
000B52 0A61                        934+         SVC   SVCNO
000B54 D213 500C 6816 00000 0125C  935          MVC   0(20,5),SIMAVT         MAKE APPENDAGES DUMMY      6080.00
000B5A 5880 8004           02004   936          L     11,SAVE+4                                         6090.00
000B5E 5840 B018           02018   937          L     4,24(,11)              GET ENTRY REG 1            6100.00
000B62 435C 4000           02000   938          IC    5,0(,4)                SAVE                       6110.00
000B66 9200 400D      00000        939          MVI   0(4),0                 CLEAR BYTE IN UNITABLE     6120.00
                                   940          IOHALT (2)                   SO WE CAN HALT THE I/O     6130.00
000B6A 1812                        941+         LR    1,2 LOAD PARAMETER REG 1
000B6C 0A21                        942+         SVC   33 20002
                                   943          STIMER WAIT,BINTVL=TWOSEC    WAIT FOR HALT              6140.00
000B6E 4110 615E           02BA4   944+         LA    1,TWOSEC LOAD PARAMETER REG 1
000B72 4100 0011           02011   945+         LA    0,17(0,0) LOAD FLAG BYTE
000B76 8900 0018           02018   946+         SLL   0,24(0) SHIFT TO HI-ORDER BYTE
000B7A 0A2F                        947+         SVC   47 ISSUE STIMER SVC
000B7C 5820 805C           0205C   948          L     2,RQEIOB               GET IOB ADR                6150.00
000B80 5830 2010           02010   949          L     11,16(,2)              SAVE CH PROG PTR           6160.00
000B84 41F0 6162           02BA8   950          LA    15,DISABLE             --> DISABLE COMMAND        6170.00
000B88 50F0 2010           02010   951          ST    15,16(,2)              PUT PTR IN IOB             6180.00
                                   952          EXCP  (2)                    DISABLE THE LINE           6190.00
000B8C 1812                        953+         LR    1,2 LOAD PARAMETER REG 1
000B8E 0A00                        954+         SVC   0 ISSUE SVC FOR EXCP
000B90 425C 4000           02000   955          STC   5,0(,4)                RESTORE                    6200.00
000B94 5080 2010           02010   956          ST    11,16(,2)              RESTORE CH PROG PTR        6210.00
                                   957          RESETKEY                                               6220.00
000B98 4600 6BAE           02BF4   958+         LH    0,=H'-1'
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000B9C 0A81                          959+          SVC   SVCNO
000B9E 47F0 619E            000BE4   960           B     DOIT                    6230.00
000BA2 0000
000BA4 000000C8                      961 TWOSEC    DC    F'200'                  6240.00
000BA8                               962           DS    0D                      6250.00
000BA8 2F00000000000000              963 DISABLE   DC    X'2F',7X'00'            6260.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

000BB0 5830 805C             0CC5C   965 GOTOWORK L     3,WORKSLOT                                  6280.00
000BB4 5820 3000             00000   966          L     2,0(,3)          PICK UP THE ENTRY          6290.00
000BB8 1222                          967          LTR   2,2             ANYTHING THERE?            6300.00
000BBA 4770 61BE             0CB04   968          BNZ   FOUNDWK         YES                        6310.00
000BBE 5810 8054             00054   969          L     1,ECBADR                                    6320.00
000BC2 5020 1000             0C000   970          ST    2,0(,1)          CLEAR THE ECB              6330.00
                                     971          WAIT  1,ECB=(1)        WAIT FOR WORK              6340.00
000BC6 411C 1CCC             00000   972+         LA    1,0(0,1) CLEAR HIGH BYTE OF REG
000BCA 4100 0CC1             0C0C1   973+         LA    0,1 LOAD PARAMETER REG 0
000BCE 0A01                          974+         SVC   1 LINK TO WAIT ROUTINE
000BD0 5820 3000             00000   975          L     2,0(,3)          WORK TO DO - GET THE ENTRY 6350.00
000BD4 9500 3000       C0000         976 FOUNDWK  CLI   0(3),0           WAS IT AN EXCP?            6360.00
000BD8 4770 6234             0DC7A   977          BNE   NOTEXCP          NO                         6370.00
000BDC 414C 0CCC             0000C   978          LA    4,0                                         6380.00
000BE0 5040 3000             0CCCC   979          ST    4,0(,3)          CLEAR WORKTBL SLOT         6390.00
000BE4 5840 2014             00014   980 DOIT     L     4,IOBDCBPT(,2)   DCB ADR                    6400.00
000BE8 5830 402C             0CC2C   981          L     3,DCBDEBAD(,4)   DEB ADR                    6410.00
000BEC 4170 0000             0CC0C   982          LA    7,0              CLEAR FOR IC               6420.00
000BF0 4370 2C2C             00020   983          IC    7,IOBUCBX(,2)    GET UCB INDEX FROM IOB     6430.00
000BF4 8970 0CC2             00C02   984          SLL   7,2              MAKE IT A WORD INDEX       6440.00
000BF8 5877 3020             00020   985          L     7,DEBUCBAD(7,3)   UCB ADR                   6450.00
000BFC 414C 4000             00000   986          LA    4,0(,4)                                     6460.00
000C00 4130 3000             0CC0C   987          LA    3,0(,3)                                     6470.00
000C04 4170 7000             00000   988          LA    7,0(,7)                                     6480.00
000C08 507C 8C5E             0CC5E   989          ST    7,RQE              BUILD RQE                6490.00
000C0C 5020 805C             0CC5C   990          ST    2,RQE+4                                     6500.00
000C10 5030 8060             00060   991          ST    3,RQE+8                                     6510.00
000C14                               992 STARTCP  EQU   *                                           6520.00
000C14 5850 2010             0CC1C   993          L     5,16(,2)         GET START OF CP            6530.00
                                     994          LOADCAW 0(,5)          SET CAW                    6540.00
000C18 415C 5CCC             0CCCC   995+         LA    5,0(,5)
000C1C D207 8064 5000 00064 C0000    996+         MVC   CCWSAVE,0(5)
                                     997          ZKOFF                                             6550.00
000C22 4100 0CC1             0CCC1   998+         LA    0,1
000C26 0A61                          999+         SVC   SVCNO
000C28 947F 2CC1       00001         1000         NI    1(2),X'7F'       CLEAR "HIO ISSUED" FLAG    6560.00
000C2C 9200 2010       00010         1CC1         MVI   16(2),0          CLEAR SIO CONDITION CODE   6570.00
                                     1002         INVOKAPG SIO,(DECODE,CENDSKIP)                    6580.00
000C30 58F0 68C6             0124C   1003+        L     15,AVTSAVE+4 .       ADR OF APPENDAGE
000C34 05EF                          1004+        BALR  14,15
000C36 47F0 61F8             0CC3E   1005+        B     DECODE
000C3A 47F0 6728             0116E   1006+        B     CENDSKIP
000C3E 4120 0000             C0000   1007 DECODE  LA    2,0              CLEAR 2 FOR TRT            6590.00
000C42 DD00 8C64 6838 00064 C1281    1008         TRT   CCWOP(1),CCOPTBL   DECODE THE CCW             6600.00
000C48 4780 6232             0CC78   1009         BZ    BADCCW                                      6610.00
000C4C 47F2 6206             C0C4C   1010         B     *(2)                                        6620.00
000C50 47F0 62E2             0CC28   1011         B     WASREAD  4                                  6630.00
000C54 47F0 6306             0CE1C   1012         B     WASWRITE 8                                  6640.00
000C58 47F0 62C4             C0C0A   1013         B     WASPREP  C                                  6650.00
000C5C 47F0 63CA             0CE1C   1014         B     WASENABL 10                                 6660.00
000C60 47F0 63CA             0CE1C   1015         B     WASDISAB 14                                 6670.00
000C64 47F0 620C             00C16   1016         B     WASTIC   18                                 6680.00
000C68 47F0 63EE             CCE34   1017         B     WASSENSE 1C                                 6690.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72
000C6C 47F0 63CA            0E10  1018          B     WASNOP  20                                    6700.00
000C70 47F0 63CA            0E10  1019          B     WASSAD  24                                    6710.00
000C74 47F0 62A6            0CCEC 1020          B     WASBREAK 17                                   6720.00

000C78 0000                       1022 BADCCW   DC    H'0'                                          6740.00

000C7A 9521 3000      0CCCC       1024 NOTEXCP  CLI   0(3),33         WAS IT IOHALT?               6760.00
000C7E 4780 627C            0CCC2 1025          BE    IOHALT          YES                          6770.00
000C82 95FF 3000      C0000       1026          CLI   0(3),255        WAS IT A 'STOP'              6780.00
000C86 4780 6254            0CC9A 1027          BE    QUIT                                         6790.00
                                  1028          ABEND 123,DUMP                                     6800.00
000C8A                            1029+         DS    0H
000C8A 0700                       1030+         CNOP  0,4
000C8C 47F0 624E            00C94 1031+         B     *+8 BRANCH AROUND CONSTANT
000C90 8C                         1032+         DC    AL1(128) DUMP/STEP CODE
000C91 00007B                     1033+         DC    AL3(123) COMPLETION CODE
000C94 5810 624A            00C90 1034+         L     1,*-4 LOAD CODES INTO REG 1
000C98 0A0D                       1035+         SVC   13 LINK TO ABEND ROUTINE
000C9A                            1036 QUIT     EQU   *                                            6810.00
                                  1037 *        ABEND 256,DUMP                                     6820.00
                                  1038          CLOSE ,MF=(E,DCBADR)                               6830.00
000C9A 4110 8108            00108 1039+         LA    1,DCBADR LOAD PARAMETER REG 1
000C9E CA14                       1040+         SVC   20 ISSUE CLOSE SVC
000CA0 58DC 8004            0CCC4 1041          L     13,SAVE+4                                    6840.00
                                  1042          FREEMAIN R,LV=AREASIZE,A=(8)                       6850.00
000CA4                            1043+         CNOP  0,4
000CA4 47F0 6266            0CCAC 1044+         B     *+8 BRANCH AROUND LENGTH
000CA8 00000340                   1045+         DC    A(AREASIZE) LENGTH
000CAC 5800 6262            0CCA8 1046+         L     0,*-4 LOAD LENGTH
000CB0 1818                       1047+         LR    1,8 LOAD AREA ADDRESS
000CB2 4111 0CC0            C0000 1048+         LA    1,0(1) CLEAR THE HIGH ORDER BYTE
000CB6 0A0A                       1049+         SVC   10 ISSUE FREEMAIN SVC
                                  1050          RETURN (14,12),RC=0                                6860.00
000CB8 98EC D00C            0000C 1051+         LM    14,12,12(13) RESTORE THE REGISTERS
000CBC 41F0 0000            CCCCC 1052+         LA    15,0(0,0) LOAD RETURN CODE
000CC0 07FE                       1053+         BR    14 RETURN

000CC2 4110 8C58            00C5E 1055 IOHALT   LA    1,RQE                                        6880.00
000CC6 4120 0000            CCCCC 1056          LA    2,0                                          6890.00
000CCA 5020 3C00            C0000 1057          ST    2,0(,3)         CLEAR WORKTBL SLOT           6900.00
000CCE 5820 805C            00C5C 1058          L     2,RQE108                                     6910.00
000CD2 5830 8060            C006C 1059          L     3,RQEDEB                                     6920.00
                                  1060          ZKOFF       GET ZERO KEY SO WE CAN                 6930.00
000CD6 4100 0001            CCCC1 1061+         LA    0,1
000CDA 0A81                       1062+         SVC   SVCNO
000CDC 968C 2001      00001       1063          OI    1(2),X'80'      INDICATE HIO ISSUED IN IOBFLAG2 6940.00
000CE0 9601 200C      000CC       1064          OI    12(2),X'01'     SET UNIT EXCEPTION IN CSW    6950.00
000CE4 9248 2004      00004       1065          MVI   4(2),X'48'      SET COMPL CODE FOR HALTED I/O 6960.00
000CE8 47F0 C6D8            C111E 1066          B     DOCEND          GO DO THE CH END APG         6970.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                          F15OCT70  3/20/72

000CEC                            1068 WASBREAK EQU   *      HANDLE WRITE BREAK SEPARATELY          6990.00
000CEC 4110 8058            00058 1069         LA    1,RQE                RESTORE REGS 1 & 2       7000.00
000CF0 5820 805C            00C5C 107C         L     2,RQE+4                                       7010.00
000CF4 9140 8068      00068       1071         TM    CCWFLAGS,CCWCC       IF COMMAND CHAINING IS SPECIFIED 7020.00
000CF8 4710 659e            00FDC 1072         BO    CCYES                THEN GO ON TO NEXT CCW   7030.00
                                  1073         ABEND 111,DUMP             OTHERWISE QUIT           7040.00
000CFC                            1074+        DS    0H
000CFC                            1075+        CNOP  0,4
000CFC 47F0 62BE            00DC4 1076+        B     *+8 BRANCH AROUND CONSTANT
000D00 80                         1077+        DC    AL1(128) DUMP/STEP CODE
000D01 00006F                     1078+        DC    AL3(111) COMPLETION CODE
000D04 5810 62BA            00DCC 1079+        L     1,*-4 LOAD CODES INTO REG 1
000D08 CACD                       1080+        SVC   13 LINK TO ABEND ROUTINE


                                  1082 WASPREP TERMSTAT UNLKED=WASREAD                             7060.00
000D0A                            1083+WASPREP DS    0H
000D0A 9180 807A      0007A       1084+        TM    TERMSTAT,LOCKED
000D0E 4780 62E2            00D28 1085+        BZ    WASREAD
000D12 47F0 63CA            00E10 1086         B     WASSAD                                       7070.00


000D16 5850 5CC0            00C0C 1088 WASTIC  L     5,0(,5)              EXECUTE THE TIC          7090.00
                                  1089         LOADCAW 0(,5)                                      7100.00
000D1A 415C 5CCC            00000 1090+        LA    5,0(,5)
000D1E D207 8064 500C 00C64 00C0C 1091+        MVC   CCWSAVE,0(5)
000D24 47F0 61F8            00C3E 1092         B     DECODE                                       7110.00


000D28                            1094 WASREAD EQU   *                                            7130.00
000D28 48F0 807E            00C7E 1095         LH    15,INLEFT            COUNT OF INBUF           7140.00
000D2C 12FF                       1096         LTR   15,15                ANY LEFT?                7150.00
000D2E 4720 63B2            00DF8 1097         BP    NOGET                YES, SKIP GET            7160.00
000D32 5820 6632            01278 1098         L     2,FREEQ              GET A FREE BUFFER        7170.00
000D36 D203 6812 2000 01276 00000 1099         MVC   FREEQ,0(2)           UN-HOOK IT               7180.00
000D3C                            1100         USING PREC,2                                       7190.00
                                  1101         RESETKEY                                           7200.00
000D3C 4E00 68AE            015F4 1102+        LH    0,=H'-1'
000D40 0A81                       1103+        SVC   SVCNO
000D42 4100 8000            00000 1104         LA    13,SAVE                                      7210.00
                                  1105         TIME  DEC                                          7220.00
000D46 4110 0002            00CC2 1106+        LA    1,2(0,0) LOAD 1 TO SPECIFY UNIT
000D4A 0A08                       1107+        SVC   11 ISSUE TIME SVC
000D4C 5000 6048            00C48 1108         ST    0,DECWK                                      7230.00
000D50 D208 2007 68B4 00007 01FFA 1109         MVC   PRTIME,=X'40212C7A2020TA2020'                7240.00
000D56 DE08 2007 8048 00007 00048 1110         ED    PRTIME,DECWK                                 7250.00
000D5C D202 2004 807B 00004 00C7B 1111         MVC   PRTERM,TERMNO                                7260.00
000D62 9240 2010      00010       1112         MVI   PRFILL,C' '          BLANK THE BUFFER         7270.00
000D66 D276 2011 201C 00011 00010 1113         MVC   PRBUF,PRFILL                                 7280.00
000D6C 5EC0 81D8            00DD8 1114         L     12,DCBADR                                    7290.00
                                  1115         GET   (12)                                         7300.00
000D70 181C                       1116+        LR    1,12 LOAD PARAMETER REG 1
000D72 58F0 1030            00C3C 1117+        L     15,48(0,1) LOAD GET ROUTINE ADDR.
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                    F15OCT70  3/20/72
000D76 05EF                      1118+          BALR  14,15 LINK TO GET ROUTINE
000D78 9180 8200       00200     1119 GETBACK   TM    DCB+36,X'80'          RECFM FIXED OR UNDEF?      7310.00
000D7C 4710 6346             0CD8C 1120          BO    FIXED                 YES                        7320.00
000D80 48E0 1000             00000 1121          LH    14,0(,1)              GET LENGTH OF RECORD       7330.00
000D84 4110 1004             0CC04 1122          LA    1,4(,1)               POINT TO DATA              7340.00
000D88 47F0 635C             00DA2 1123          B     LAST  SKIP AHEAD                                 7350.00
000D8C 41F0 1C4F             0004F 1124 FIXED    LA    15,79(,1)             --> END OF INPUT RECORD    7360.00
000D90 41E0 0C50             0CC5C 1125          LA    14,80                 COUNTER                    7370.00
000D94 9540 F000       00000     1126 MEASURE   CLI   0(15),C' '                                        7380.00
000D98 477C 635C             00DA2 1127          BNE   LAST                                           7390.00
000D9C 06F0                      1128          BCTR  15,0                  BACK POINTER               7400.00
000D9E 46E0 634E             00D94 1129          BCT   14,MEASURE            DECREASE COUNT & LOOP      7410.00
000DA2 12EE                      1130 LAST      LTR   14,14                 ZERO LENGTH RECORD?        7420.00
000DA4 4780 6370             00DB6 1131          BZ    NOMOVE                YES                        7430.00
000DA8 06EC                      1132          BCTR  14,0                  360 LENGTH                 7440.00
000DAA 44E0 641A             00E60 1133          EX    14,MOVEIN             MVC   INBUF+1(*),0(1)      7450.00
000DAE 44E0 6420             00E66 1134          EX    14,MOVEPR             MVC   PRBUF(*),0(1)        7460.00
000DB2 41E0 EC01             00001 1135          LA    14,1(,14)             BACK TO REAL LENGTH        7470.00
000DB6 41F0 E003             0CCC3 1136 NOMOVE   LA    15,3(,14)             BUMP LENGTH FOR CTL CHARS  7480.00
000DBA 40F0 807E             00C7E 1137          STH   15,INLEFT             RECORD LENGTH OF INPUT     7490.00
000DBE 41FE 8C83             0CC83 1138          LA    15,INBUF+1(14)                                   7500.00
000DC2 D201 F000 6880 00000 015F6 1139          MVC   0(2,15),=X'FEFF'      POTENTIAL CR, CIRCLE-C     7510.00
000DC8 92FD 8082       00082     1140          MVI   INBUF,X'FD'           POTENTIAL CIRCLE-D         7520.00
000DCC 41E0 E002             00002 1141          LA    14,2(,14)             360 LENGTH FOR TRANSLATE   7530.00
000DD0 44E0 642E             00E6C 1142          EX    14,XLATE              TR    INBUF(*),XLTAB       7540.00
000DD4 41F0 B1D4             00ID4 1143          LA    15,PRINT                                         7550.00
000DD8 58E0 81D4             0C1D4 1144          L     14,PRINT              HOOK BUFFER TO PRINT QUEUE 7560.00
000DDC 12EE                      1145 FLOOP     LTR   14,14                 END OF Q?                  7570.00
000DDE 4780 63AC             00EEC 1146          BZ    FEND                  YES                        7580.00
000DE2 18FE                      1147          LR    15,14                                            7590.00
000DE4 58E0 E000             00000 1148          L     14,0(,14)                                        7600.00
000DE8 47F0 6396             00EDC 1149          B     FLOOP                                            7610.00
000DEC 50E0 2000             0CCCC 1150 FEND     ST    14,0(,2)              MARK END OF QUEUE          7620.00
000DF0 5020 FCCC             0FFFC 1151          ST    2,0(,15)              HOOK BUFFER TO QUEUE       7630.00
000DF4 40E0 8080             0CC8C 1152          STH   14,INREAD             CLEAR COUNT OF CHARS READ  7640.00
000DF8                           1153 NUGET     EQU   *                                                7650.00
000DF8 5810 5000             00000 1154          L     1,0(,5)               GET CCW DATA ADR           7660.00
000DFC 4110 1CCC             0CCCC 1155          LA    1,0(,1)               CLEAR HIGH BYTE            7670.00
000E00 5010 8070             00070 1156          ST    1,TO                                             7680.00
000EC4 48F0 8C80             00080 1157          LH    15,INREAD             GET NUMBER ALREADY READ    7690.00
000E08 411F 80B2             0CC82 1158          LA    1,INBUF(15)                                      7700.00
000ECC 5010 8074             00074 1159          ST    1,FROM                                           7710.00
000E10                           1160 WASSAC    EQU   *                                                7720.00
000E10                           1161 WASENABL  EQU   *                                                7730.00
000E10                           1162 WASCISAB  EQU   *                                                7740.00
000E10                           1163 WASNOP    EQU   *                                                7750.00
000E10 5820 805C             0CC5C 1164          L     2,RQE+4               RESTORE IOB POINTER        7760.00
000E14 4110 8C58             00058 1165          LA    1,RQE                 AND RQE ADR                7770.00
000E18 47F0 6476             0CEBC 1166          B     SETCOUNT              GO EXECUTE THE CCW         7780.00

000E1C 4810 80D2             00002 1168 WASWRITE LH    1,OUTCOUNT            GET CURRENT OUTPUT COUNT   7800.00
000E20 4111 8CD4             00CD4 1169          LA    1,OUTBUF(1)                                      7810.00
000E24 5010 8070             0CC7C 1170          ST    1,TC                                             7820.00
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                    F15OCT70  3/20/72
000E28 5810 5000          00000  1171           L     1,0(,5)      CCW DATA ADR          7830.00
000E2C 5C10 8074          0CC74  1172           ST    1,FROM                             7840.00
000E30 47F0 63CA          0CE1C  1173           B     WASNOP                             7850.CC

000E34 58FC 5000          00000  1175 WASSENSE  L     15,0(,5)     GET CCW DATA ADR      7870.00
                                 1176           ZKOFF              GET ZERO KEY          7880.00
000E38 4100 0001          00001  1177+          LA    0,1
000E3C 0A81                      1178+          SVC   SVCNO
000E3E 9200 F000          00000  1179           MVI   0(15),0      SEND A ZERO SENSE BYTE 7890.00
000E42 47F0 63CA          0CE10  1180           B     WASNOP                             7900.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

000E46 41F0 6414             00E5A  1182 EOF      LA    15,FAKEGET                                    7920.00
000E4A 43EC 820C             0020C  1183          IC    14,DCB+48          SAVE FLAGS                 7930.00
000E4E 50F0 820C             0020C  1184          ST    15,DCB+48          REPLACE GET_RTNE_ADR       7940.00
000E52 42E0 820C             0020C  1185          STC   14,DCB+48          RESTORE                    7950.00
000E56 41E0 6332             00D78  1186          LA    14,GETBACK                                    7960.00
000E5A 4110 6642             01588  1187 FAKEGET  LA    1,=CL80'SEND ''SCRIPT COMPLETE'''             7970.00
000E5E 07FE                         1188          BR    14                                            7980.00

000E60 D200 8083 1000 00083 00000 1190 MOVEIN   MVC   INBUF+1(0),0(1)                                 8000.00
000E66 D200 2011 1000 00011 00000 1191 MOVEPR   MVC   PRBUF(0),0(1)                                   8010.00
000E6C DC00 8082 693B 00082 13B1  1192 XLATE    TR    INBUF(0),XLUTAB                               8020.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                    F15OCT70  3/20/72
000E72 9508 8064       00064        1194 EXCCW    CLI   CCWOP,TIC          IS CURRENT CCW A TIC?          8040.00
000E76 4770 6442             00E88  1195          BNE   NOTTIC             NO                             8050.00
000E7A 5850 5000             00000  1196          L     5,0(,5)            EXECUTE THE TIC                8060.00
                                    1197          LOADCAW 0(,5)                                             8070.00
000E7E 4150 5000             00000  1198+         LA    5,0(,5)
000E82 D207 8064 5000 00064 00000  1199+         MVC   CCWSAVE,0(5)
000E88 58F0 8C7C             00C7C  1200 NOTTIC   L     15,TO              UPDATE TO                      8080.00
000E8C 4AF0 8078             00C78  1201          AH    15,COUNT                                          8090.00
000E90 50F0 8070             00070  1202          ST    15,TO                                             8100.00
000E94 58F0 8074             00C74  1203          L     15,FROM            AND FROM POINTERS              8110.00
000E98 4AF0 8078             00C78  1204          AH    15,COUNT                                          8120.00
000E9C 50F0 8074             00074  1205          ST    15,FROM                                           8130.00
000EA0 58F0 5000             00C00  1206          L     15,0(,5)           CCW DATA ADR                   8140.00
000EA4 41F0 F000             00000  1207          LA    15,0(,15)                                         8150.00
000EA8 9102 8064       00064        1208          TM    CCWOP,READBIT                                     8160.00
000EAC 4710 6472             00E88  1209          BO    RESETTO                                           8170.00
000EB0 50F0 8074             00C74  1210          ST    15,FROM            FOR WRITE, FROM=CCWCAD         8180.00
000EB4 47F0 6476             00EBC  1211          B     SETCOUNT                                          8190.00
000EB8 50F0 8070             00C7C  1212 RESETTO  ST    15,TO              FOR READ, TO=CCWDAD            8200.00
000EBC D201 8078 806A 00078 00C6A  1213 SETCOUNT MVC   COUNT,CCWCOUNT      SET COUNT FOR MOVE             8210.00
                                    1214          ZKOFF                                                     8220.00
000EC2 4100 0001             00C01  1215+         LA    0,1
000EC6 0A81                         1216+         SVC   SVCNO
000EC8 50F0 2C0C             00C0C  1217          ST    15,12(,2)          SET SECOND HALF OF CSW         8230.00
000ECC 43F0 2008             00008  1218          IC    15,8(,2)           SAVE IOBFLAG3                  8240.00
000ED0 41E0 5008             00008  1219          LA    14,8(,5)           UPDATE COMMAND ADR             8250.00
000ED4 50E0 2008             00C08  1220          ST    14,8(,2)           FOR FIRST HALF OF CSW          8260.00
000ED8 42F0 2008             00008  1221          STC   15,8(,2)           RESTORE                        8270.00
000EDC 9108 8C68       00068        1222          TM    CCWFLAGS,CCWPCI    IS PCI BIT IN CCW ON?          8280.00
000EE0 4780 64AE             00EF4  1223          BZ    XFER               NO, SKIP PCI APG               8290.00
000EE4 9280 2000       00000        1224          MVI   13(2),X'80'         SET PCI FLAG IN CSW            8300.00
000EE8 D206 0041 2009 00041 00C09  1225          MVC   65(7),9(2)         COPY CSW TO LOW CORE           8310.00
                                    1226          INVOKAPG PCI                                              8320.00
000EEE 58F0 68CA             01250  1227+         L     15,AVTSAVE+8 ,       ADR OF APPENDAGE
000EF2 05FF                         1228+         BALR  14,15
000EF4 9506 8064       00064        1229 XFER     CLI   CCWOP,PREP           WAS CCW A PREPARE?             8330.00
000EF8 4780 64CA             00F10  1230          BE    TESTPREP             YES                            8340.00
000EFC 9103 8064       00064        1231          TM    CCWOP,READBIT+WRITEBIT  WAS CCW READ OR WRITE?      8350.00
000F00 4740 64DC             00F22  1232          BM    ROR                  YES                            8360.00
000F04 41FC CCCC             00C0C  1233          LA    15,0                                              8370.00
000F08 40F0 200E             00C0E  1234          STH   15,14(,2)            CLEAR CSW COUNT               8380.00
000F0C 47F0 658E             00FC4  1235          B     TESTCC               OTHERWISE DONE WITH THIS ONE   8390.00
                                    1236 TESTPREP TERMSTAT UNLKED=ROR                                       8400.00
000F10                              1237+TESTPREP DS    0H
000F1C 9180 8C7A       0007A        1238+         TM    TERMSTAT,LOCKED
000F14 4780 64DC             00F22  1239+         BZ    ROR
                                    1240          RESETKEY                                                  8410.00
000F18 4ECC 68AE             01EF4  1241+         LH    0,=H'-1'
000F1C 0A81                         1242+         SVC   SVCNO
000F1E 47F0 616A             00B80  1243          B     GOTOWORK                                          8420.00

000F22 58F0 8C7C             00C7C  1245 ROR      L     15,TO                                             8440.00
000F26 58E0 8074             00C74  1246          L     14,FROM                                           8450.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

000F2A 4800 8078             C0078  1247           LH    13,COUNT                                    8460.00
000F2E 0600                         1248           BCTR  13,0                                        8470.00
000F30 9501 8064       00064        1249           CLI   CCWOP,01      IS COMMAND A WRITE?           8480.00
000F34 4780 6502             C0F48  1250           BE    MOVEIT        YES - CAN'T SUPPRESS          8490.00
000F38 9110 8068       00068        1251           TM    CCWFLAGS,CCWSKIP  DOES CCW SAY "SUPPRESS XFER"? 8500.00
000F3C 4710 6506             C0F4C  1252           BO    NOXFER        YES                           8510.00
000F40 9506 8064       00064        1253           CLI   CCWOP,PREP    FOR PREPARE                   8520.00
000F44 4780 6506             C0F4C  1254           BE    NOXFER        SKIP TRANSFER                 8530.00
000F48 4400 67EE             01234  1255 MOVEIT    EX    13,XFERI      MVC   0(**,15),0(14)          8540.00
000F4C 9101 80C4       00C64        1256 NOXFER    TM    CCWOP,WRITE8IT  IF COMMAND WAS WRITE         8550.00
000F50 4710 655C             C0FA2  1257           BO    WRITE#        THEN SKIP AHEAD               8560.00
000F54 48F0 8C7E             C007E  1258           LH    15,INLEFT     LENGTH OF INPUT MESSAGE       8570.00
000F58 50F0 200C             C0C0C  1259           ST    15,12(,2)     SAVE IN CSW                   8580.00
000F5C 4BF0 8078             C0078  1260           SH    15,COUNT      MINUS AMOUNT FOR THIS MOVE    8590.00
000F60 40F0 807E             C007E  1261           STH   15,INLEFT                                   8600.00
000F64 4700 657C             C0FC2  1262           BNP   EOT           RAN OUT OF INPUT              8610.00
000F68 48F0 8080             C0080  1263           LH    15,INREAD     COUNT OF CHARACTERS READ      8620.00
000F6C 4AF0 8C78             C0078  1264           AH    15,COUNT      PLUS NUMBER READ THIS TIME    8630.00
000F70 40F0 8080             C0C8C  1265           STH   15,INREAD     IS UPDATED COUNT              8640.00
000F74 41F0 0000             C0000  1266 CKCHAINY   LA    15,0          CLEAR                         8650.00
000F78 50F0 200C             C0C0C  1267           ST    15,12(,2)     CSW COUNT                     8660.00
000F7C 9590 8068       00068        1268           CLI   CCWFLAGS,X'90'    IS THIS A WRITE-TIC LOOP? 8670.00
000F80 4780 65A4             C0FEA  1269           BE    DELAYIT       YES - GO DELAY FOR AT LEAST .1 8680.00
000F84 95A8 8068       00068        1270           CLI   CCWFLAGS,X'A8'    IS THIS A LONG I/O?       8690.00
000F88 4780 65A4             C0FEA  1271           BE    DELAYIT       YES - DELAY THIS ALSO         8700.00
000F8C 9180 8068       00068        1272 CKCHAIN   TM    CCWFLAGS,CCWCD  CHAIN DATA?                 8710.00
000F90 4780 658E             C0FD4  1273           BZ    TESTCC        NO                            8720.00
                                    1274 NEXTCCW   LOADCAW 8(,5)       BUMP TO NEXT CCW              8730.00
000F94 4150 5008             C0008  1275+NEXTCCW   LA    5,8(,5)
000F98 0207 8064 5000 00064  C0C0C  1276+          MVC   CCWSAVE,0(5)
000F9E 47F0 642C             C0E72  1277           B     EXCCW         GO EXECUTE IT                 8740.00

000FA2 48F0 80D2             C00D2  1279 WRITE#     LH    15,OUTCOUNT   INCREMENT                     8760.00
000FA6 4AF0 8078             C0078  1280           AH    15,COUNT      OUTBUF                        8770.00
000FAA 40F0 80D2             C00D2  1281           STH   15,OUTCOUNT   COUNTER                       8780.00
000FAE 41FF 80D3             C00D3  1282           LA    15,OUTBUF-1(15)  POINT TO LAST CHAR SENT      8790.00
000FB2 951F F000       00000        1283           CLI   0(15),X'1F'     WAS IT CIRCLE-C?              8800.00
000FB6 4770 652E             C0F74  1284           BNE   CKCHAINY      NOPE                          8810.00
                                    1285           TERMSTAT NEW=UNLKED  RECORD UNLOCKED STATUS         8820.00
000FBA                              1286+          DS    0H
000FBA 947F 8C7A       C007A        1287+          NI    TERMSTAT,255-LOCKED
000FBE 47F0 652E             C0F74  1288           B     CKCHAINY                                    8830.00

000FC2 48F0 806A             C006A  1290 ECT       LH    15,CCWCOUNT   CCW COUNT                     8850.00
000FC6 56DC 200C             C000C  1291           L     13,12(,2)     LENGTH READ                   8860.00
000FCA 1BFD                         1292           SR    15,13         DIFFERENCE                    8870.00
000FCC 50FC 200C             C000C  1293           ST    15,12(,2)     IS RESIDUAL COUNT FOR CSW     8880.00
                                    1294           TERMSTAT NEW=LOCKED                               8890.00
000FD0                              1295+          DS    0H
000FD0 9680 8C7A       C007A        1296+          OI    TERMSTAT,LOCKED
                                    1297 *         MVI   12(2),X'01'     PUT "UNIT EXCEPTION" IN CSW 8900.00
000FD4 9140 8068       00068        1298 TESTCC    TM    CCWFLAGS,CCWCC  CHAIN COMMAND?                8910.00
000FD8 4780 65D8             01D1E  1299           BZ    QCEND         NO                            8920.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72

                                    1300 CCYES  LOADCAW 8(,5)          TO NEXT CCW          8930.00
000FDC 415C 5008                    00008 1301+CCYES  LA     5,8(,5)
000FE0 D207 8064 5000 00064 00000 1302+       MVC    CCWSAVE,0(5)
000FE6 47F0 61F8                    00C3E 1303        B      DECODE    GO DECODE CHAINED COMMAND  8940.00
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72

000FEA 41F0 000A           000A  1305 DELAYIT  LA    15,10                BASIC DELAY IS 0.1 SEC      8960.00
000FEE 9101 8064     00064       1306          TM    CCWOP,WRITEBIT                                   8970.00
000FF2 4780 656A           0FCCC 1307          BZ    DELSKIP              SKIP ADDITIONAL DELAY IF NOT WR 8980.00
000FF6 48E0 806A           006A  1308          LH    14,CCWCOUNT                                      8990.00
000FFA 8DE0 0003           00C03 1309          SLL   14,3                 LENGTH OF OUTPUT TIMES 8    9000.00
000FFE 1AFE                      1310          AR    15,14                IS ADDINIONAL DELAY         9010.00
001000 50F0 806C           006C  1311 DELSKIP  ST    15,BINTVL                                        9020.00
001004 4100 6000           0C000 1312          LA    13,SAVE                                          9030.00
                                 1313          STIMER WAIT,BINTVL=BINTVL                              9040.00
001008 4110 806C           006C  1314+         LA    1,BINTVL LOAD PARAMETER REG 1
00100C 4100 0011           0CC11 1315+         LA    0,17(0,0) LOAD FLAG BYTE
001010 8900 0018           00018 1316+         SLL   0,24(0) SHIFT TO HI-ORDER BYTE
001014 CA2F                      1317+         SVC   47 ISSUE STIMER SVC
001018 4110 8058           005E  1318          LA    1,RQE                                            9050.00
00101A 47F0 654E           0F94  1319          B     NEXTCCW                                          9060.00
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  LOC  OBJECT CODE     ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72
001018                            1321 QCEND   EQU   *                                                 9080.00
00101E 43F0 2008              0000E 1322         IC    15,8(,2)          SAVE IOBFLAG3               9090.00
001022 41E0 5008              0CCC8 1323         LA    14,8(,5)          BUMP COMMAND ADR            9100.00
001026 50E0 2008              00008 1324         ST    14,8(,2)          FOR CSW                     9110.00
00102A 42F0 2008              0CCC6 1325         STC   15,8(,2)          RESTORE                     9120.00
00102E 927F 2004       00004  1326               MVI   4(2),X'7F'        COMPL CODE FOR IOB          9130.00
001032 9103 8004       00064  1327               TM    CCWOP,READBIT+WRITEBIT  IS IT AN "IMMEDIATE"  9140.00
001036 4710 6EEC              01132 1328         BO    CENDNOW           YES - DO CH END NOW         9150.00
                              1329               RESETKEY                                            9160.00
00103A 4E00 6BAE              015F4 1330+        LH    0,=F'-1'
00103E 0A81                   1331+              SVC   SVCNO
001040 D501 6EB2 80E2 015F8 00002 1332           CLC   =AL2(0),OUTCOUNT  DID ANYTHING GET IN THE BUFFER?  9170.00
001046 4760 6668              0106E 1333         BNL   NOPUT             NO                          9180.00
00104A 5820 6832              01278 1334         L     2,FREEQ                                       9190.00
00104E D203 6832 2000 01278 00000 1335           MVC   FREEQ,0(2)                                     9200.00
                              1336               TIME  DEC                                           9210.00
001054 4110 0002              00CC2 1337+        LA    1,2(0,0) LOAD 1 TO SPECIFY UNIT
001058 0A0B                   1338+              SVC   11 ISSUE TIME SVC
00105A 5C00 6048              00C48 1339         ST    0,DECWK                                       9220.00
00105E D203 2007 6BBD 00007 01EC3 1340           MVC   PRTIME,=X'6C21207A20207A2020'                 9230.00
001064 DEC8 2007 8048 00007 00048 1341           EC    PRTIME,DECWK                                  9240.00
00106A D202 2004 8078 00CC4 00C7B 1342           MVC   PRTERM,TERMNO                                 9250.00
001070 9240 2010       00010  1343               MVI   PRFILL,C' '                                   9260.00
001074 D276 2011 201C 00011 00010 1344           MVC   PRBUF,PRFILL                                  9270.00
00107A 48F0 80D2              00CD2 1345         LH    15,OUTCOUNT                                   9280.00
00107E 06F0                   1346               BCTR  15,0                                          9290.00
001080 44F0 67E2              01228 1347         EX    15,MOVOUT         MVC   PRBUF(0),OUTBUF       9300.00
001084 44F0 67EB              0122E 1348         EX    15,XLO            TR    PRBUF(0),XLTAB        9310.00
001088 D201 80D2 6BE2 00CD2 01FF8 1349           MVC   OUTCOUNT,=AL2(0)                              9320.00
00108E 41F0 8104              00104 1350         LA    15,PRINT                                      9330.00
001092 58E0 8104              00104 1351         L     14,PRINT          HOOK BUFFER TO PRINT QUEUE  9340.00
001096 12EE                   1352 FLOPP   LTR   14,14                 END OF Q?                   9350.00
001098 4780 666C              01CAE 1353         BZ    FEOD              YES                         9360.00
00109C 16FE                   1354               LR    15,14                                         9370.00
00109E 98E0 E000              00000 1355         LM    14,0(,14)                                     9380.00
0010A2 47F0 6650              01C9E 1356         B     FLOPP                                         9390.00
0010A6 50E0 2000              00000 1357 FEOD    ST    14,0(,2)          MARK END OF QUEUE           9400.00
001CAA 5020 FCDD              FCCCC 1358         ST    2,0(,15)          HOOK BUFFER TO QUEUE        9410.00
0010AE 9102 8064       00064  1359 NOPUT   TM    CCWOP,READBIT                                       9420.00
0010B2 4710 6688              010CE 1360         BO    REALLY                                        9430.00
0010B6 4810 80EA              00EEA 1361         LH    1,CCWCOUNT                                    9440.00
0010BA 8910 0003              00CD3 1362         SLL   1,3                                           9450.00
0010BE 4110 100A              0000A 1363         LA    1,10(,1)                                      9460.00
0010C2 5010 8C6C              00C6C 1364         ST    1,BINTVL                                      9470.00
0010C6 4110 806C              00C6C 1365         LA    1,BINTVL                                      9480.00
0010CA 47FC 6E9C              01CDE 1366         B     CENDWAIT                                      9490.00
0010CE 4110 6836              0127C 1367 READLY  LA    1,DELAY                                       9500.00
0010D2 41D0 8000              00000 1368         LA    13,SAVE                                       9510.00
                              1369 CENDWAIT STIMER WAIT,BINTVL=(1)                                  9520.00
0010D6                        137C+CENDWAIT DS    0H
0010D6 4100 0011              00011 1371+        LA    0,17(0,0) LOAD FLAG BYTE
0010DA 8900 0018              00018 1372+        SLL   0,24(0) SHIFT TO HI-ORDER BYTE
0010DE 0A2F                   1373+              SVC   47 ISSUE STIMER SVC
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 LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72
00010E0 4110 8058           00058  1374          LA    1,RQE                                          9530.00
0010E4 5820 805C            00C5C  1375          L     2,RQEIOB                                       9540.00
                                   1376          ZKOFF ,                  GET ZERO KEY, MASKED OFF      9550.00
00010E8 4100 0001           00001  1377+         LA    0,1
0010EC 0A81                        1378+         SVC   SVCNO
00010EE 9500 683A      01280       1379          CLI   STOPFLAG,0         ARE WE STOPPING?              9560.00
0010F2 4760 66D8           0111E   1380          BE    NOSTOP             NO                            9570.00
0010F6 9603 200C      0000C        1381          OI    12(2),X'03'        SET UNIT CHECK + UNIT EXCEP   9580.00
00010FA 9640 2002     00002        1382          OI    2(2),X'40'         AND INTV REQ IN SENSE BYTE    9590.00
0010FE 9241 2004      00004        1383          MVI   4(2),X'41'         SET COMPL CODE                9600.00
00110Z 58F0 8050           00050   1384          L     15,WORKSLOT        --> OUR WORKTBL SLOT          9610.00
00110E 92FF F000      00000        1385          MVI   0(15),255          SET STOPPED FLAG              9620.00
001110A 58F0 301C          001C    1386          L     15,28(,3)          GET AVT POINTER FROM DEB      9630.00
00110E D503 68A2 6802 015E8 01248  1387          CLC   =A(0),AVTSAVE      IS AVTSAVE GOOD?              9640.00
00114 4760 66D8            0111E   1388          BE    NOGOOD             NO                            9650.00
001118 D213 F000 68C2 00000 01248  1389          MVC   0(20,15),AVTSAVE   RESTORE THE APPENDAGE VECTOR TBL 9660.00
00111E                             1390 NOGOOD   EQU   *                                              9670.00
00111E                             1391 NOSTOP   EQU   *                                              9680.00
00111E 9505 8064      00064        1392 DOCEND   CLI   CCWOP,PREP          WAS IT A PREPARE?             9690.00
001122 4780 66EC           01132   1393          BE    SLI                YES - SKIP SLI TEST           9700.00
001126 9120 8068      00068        1394          TM    CCWFLAGS,X'20'       IS SLI BIT SET?             9710.00
00112A 4710 66EC           01132   1395          BO    SLI                YES - SKIP                    9720.00
00112E 9640 200D      00000        1396          OI    13(2),X'40'        SET INCORRECT LENGTH BIT      9730.00
001132                             1397 SLI      EQU   *                                              9740.00
001132                             1398 CENDNOW  EQU   *                                              9750.00
001132 4190 0000           00000   1399          LA    9,0                                            9760.00
001136 960C 200C      0000C        1400          OI    12(2),X'0C'        PUT CH END, DEV END IN CSW    9770.00
                                   1401          TRCHEND                                              9780.00
00113A                             1402+         DS    0H
                                   1403          INVOKAPG CEND,(CENDONE,CENDSKIP,DOAGAIN,BYPASS)      9790.00
00113A 58FC 680E           01254   1404+         L     15,AVTSAVE+12 .      ADR OF APPENDAGE
00113E 05EF                        1405+         BALR  14,15
001140 47F0 670A           01150   1406+         B     CENDONE
001144 47F0 6728           0116E   1407+         B     CENDSKIP
001148 47F0 6736           0117E   1408+         B     DOAGAIN
00114C 47F0 672C           01172   1409+         B     BYPASS
001150                             1410 CENDONE  EQU   *                                              9800.00
                                   1411          TRCHEND F0                                           9810.00
001150                             1412+         DS    0H
001150 41A0 007F           0007F   1413          LA    10,X'7F'           SET UP FOR BRANCH TO POST     9820.00
001154 89A0 0018           00018   1414          SLL   10,24              COMPLETION CODE               9830.00
001158 5880 2004           00004   1415          L     11,4(,2)           ECB ADR FROM IOB              9840.00
00115C 58C0 3000           00000   1416          L     12,0(,3)           TCB ADR FROM DEB              9850.00
001160 58F0 0010           00010   1417          L     15,16                                            9860.00
001164 58FC FC98           00C98   1418          L     15,152(,15)        POST ADR FROM CVT             9870.00
001168 05EF                        1419          BALR  14,15              GO POST THE ECB               9880.00
   16A 47F0 672C           01172   1420          B     AROUND                                         9890.00
    6E                             1421 CENDSKIP EQU   *                                              9900.00
                                   1422          TRCHEND F4                                           9910.00
                                   1423+         DS    0H
       F0 672C             01172   1424          B     AROUND                                         9920.00
                                   1425 BYPASS   EQU   *                                              9930.00
                                   1426          TRCHEND FC                                           9940.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72
001172                           1427+          DS    0H
001172                           1428 ARCUND    EQU   *                                              9950.00
                                 1429           RESETKEY                                             9960.00
001172 4800 68AE          015F4  1430+          LH    0,=H'-1'
001176 0A81                      1431+          SVC   SVCND
001178 47F0 616A          0CEBC  1432           B     GOTOWORK          BACK TO CHECK QUEUE          9970.00

                                 1434 DOAGAIN   TRCHEND F8                                           9990.00
00117C                           1435+DOAGAIN   DS    0H
00117C 47F0 61CE          0CC14  1436           B     STARTCP                                        10000.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                  F15OCT70  3/20/72

000024                           1438 CVTILK1  EQU   X'24'                                          10020.00
000028                           1439 CVTILK2  EQU   X'28'                                          10030.00
                                 1440          ENTRY UCBLOOK                                       10040.00
001180                           1441          USING *,15                                          10050.00
001180 5BC0 0010        (0010    1442 UCBLOOK  L     12,16          --> CVT                        10060.00
001184 58B0 CC24        (0024    1443          L     11,CVTILK1(,12) --> UCB LOOKUP TABLE          10070.00
001188 9500 3007  00007           1444          CLI   7(11),0        HALFWORD OR BYTE TABLE?       10080.00
00118C 4780 F018        (1198    1445          BE    BYTE                                          10090.00
001190 9248 FC32  01182           1446          MVI   ICINST,X'48'   CHANGE IC TO LH               10100.00
001194 9203 F031  01181           1447          MVI   SRLINST+3,3    CHANGE SRL 12,4 TO SRL 12,3   10110.00
001198 41A0 0000        (0000    1448 BYTE     LA    10,0           CLEAR FOR IC                  10120.00
00119C 43A0 B000        (0000    1449          IC    10,0(,11)      GET K                         10130.00
0011A0 41AA B000        (0000    1450          LA    10,0(10,11)    --> CONTROLLER PART OF TABLE  10140.00
0011A4 5890 CC28        (0028    1451          L     9,CVTILK2(,12) --> UCB ADR TABLE             10150.00
0011A8 18C1                      1452          LR    12,1                                          10160.00
0011AA 54C0 F46C        (15EC    1453          N     12,=A(X'F0')   CONTROLLER NUMBER             10170.00
0011AE 88C0 CCC4        (0004    1454 SRLINST  SRL   12,4                                          10180.00
0011B2 43CC A000        (CCCC    1455 ICINST   IC    12,0(12,10)    GET L                         10190.00
0011B6 5410 F470        (15F0    1456          N     1,=A(15)       DEVICE NUMBER                 10200.00
0011BA 1AC1                      1457          AR    12,1                                          10210.00
0011BC 89C0 0001        (CCC1    1458          SLL   12,1                                          10220.00
0011C0 48C0 9CC0        (0000    1459          LH    1,0(12,9)      UCB ADR                       10230.00
0011C4 07FE                      1460          BR    14                                          10240.00
                                 1461          DROP  15                                          10250.00
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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72
                                   1463 PRETDCB  DCB   DDNAME=IN000,DSORG=PS,MACRF=(GL),EODAD=EOF          10270,00


                                   1465+*                    DATA CONTROL BLOCK
                                   1466+*
001106 0000
001108                             1467+PROTDCB  DC    OF'0' ORIGIN ON WORD BOUNDARY

                                   1469+*                    DIRECT ACCESS DEVICE INTERFACE

001108 0000000000000000            1471+         DC    BL16'0' FOAD,DVTBL
001118 CCCCCCCC                    1472+         DC    A(0) KEYLE,DEVT,TRBAL

                                   1474+*                    COMMON ACCESS METHOD INTERFACE

001120 00                          1476+         DC    AL1(0) BUFNO
001121 CC00C1                      1477+         DC    AL3(1) BUFCB
001124 0000                        1478+         DC    AL2(0) BUFL
001126 4000                        1479+         DC    BL2'0100000000000000' DSORG
001128 CC00C0C1                    1480+         DC    A(1) IOBAD

                                   1482+*                    FOUNDATION EXTENSION

00112C 00                          1484+         DC    BL1'00000000' BFTEK,BFLN,HIARCHY
00112D 000E46                      1485+         DC    AL3(EOF) EODAD
001130 00                          1486+         DC    BL1'00000000' RECFM
001131 CC00CC                      1487+         DC    AL3(0) EXLST

                                   1489+*                    FOUNDATION BLOCK

001134 C9D5F0F0F0404040            1491+         DC    CL8'IN000' DDNAME
00113C C2                          1492+         DC    BL1'00000010' OFLGS
00113D 00                          1493+         DC    BL1'00000000' IFLG
00113E 4800                        1494+         DC    BL2'0100100000000000' MACR

                                   1496+*                    BSAM-BPAM-QSAM INTERFACE

001140 00                          1498+         DC    BL1'00000000' RERI
001141 CC00C1                      1499+         DC    AL3(1) CHECK, GERR, PERR
001200 00000001                    1500+         DC    A(1) SYNAD
001204 0000                        1501+         DC    H'0' CIND1, CIND2
001206 CC00                        1502+         DC    AL2(0) BLKSIZE
001208 00000000                    1503+         DC    F'0' NCPC, NCPL, OFFSR, OFFSW
00120C 00000001                    1504+         DC    A(1) IOBA
001210 00                          1505+         DC    AL1(0) NCP
001211 000001                      1506+         DC    AL3(1) EOBR, EOBAD

                                   1508+*                        QSAM INTERFACE

001214 CC00C001                    1510+         DC    A(1) RECAD
001218 0000                        1511+         DC    H'0' QSWS
00121A CCC0                        1512+         DC    AL2(0) LRECL
00121C 00                          1513+         DC    BL1'00000000' EROPT
```

```
  LOC  OBJECT CODE    ADDR1 / ADDR2  STMT   SOURCE STATEMENT                                F150CT70  3/20/72

001210 C00001                      1514+          DC    AL3(1) CNTRL
001220 CC00CCC0                    1515+          DC    F'0' PRECL
001224 00000001                    1516+          DC    A(1) EOB
001228 D200 2011 80D4 00011 000C4  1517 MOVOUT    MVC   PRBUF(0),OUTBUF                                  10280.00
00122E DC00 2011 6A3B 00011 01481  1518 XLC       TR    PRBUF(0),XLTAB                                   10290.00
001234 D200 F000 E000 00000 00000  1519 XFERI     MVC   0(0,15),0(14)                                    10300.00
                                   1520 STAELIST  STAE  ABENDX,MF=L                                      10310.00
00123C                             1521+          DS    0F
00123C 00                          1522+STAELIST  DC    AL1(0) .       FLAGS FOR TCB,
                                   1523+*                                PURGE AND ASYNCH
001230 0008EC                      1524+          DC    AL3(ABENDX) .   STAE EXIT ROUTINE ADDR.
001240 00000000                    1525+          DC    A(0) .            PARM. LIST ADDR. NOT SPECIFIED
001244 CC00C000                    1526+          DC    A(0) .          TCB NOT SPECIFIED
                                   1527           ENTRY AVTSAVE                                         10320.00
001248 0C0CCCCCC0C00000            1528 AVTSAVE   DC    5A(0)                                            10330.00
00125C CC0C127C00001272            1529 SIMAVT    DC    A(BR14,BOFF4,BR14,BOFF4,BCFF4)                   10340.00
001270 07FE                        1530 BR14      BR    14                                               10350.00
001272 47FC EC04          (0004    1531 BCFF4     B     4(,14)                                           10360.00
001276 0000
001278 00000000                    1532 FREEQ     DC    V(BUFPOOL)                                       10370.00
00127C 0C0CC4BC                    1533 DELAY     DC    F'1200'          DEFAULT THINK TIME IS 12 SEC    10380.00
001280 00                          1534 STOPFLAG  DC    X'0'                                             10390.00
                                   1535 *           0 1 2 3 4 5 6 7 8 9 A B C D E F                    10400.00
001281 CC08042C1CCCCCCC            1536 CCCPTBL   DC    X'00080420 1C000C00 18000400 00280000'           10410.00
001291 0000C02400000024            1537           DC    X'CC000024CC000C24000000240000 0024'             10420.00
0012A1 CCCCCCCCCCCCC010            1538           DC    X'0000000CCC0000100C000C0C00000014'              10430.00
001281 0CCCCCCCCCCCCCCC            1539           DC    208X'00'                                         10440.00
001381                             1540 XLOTAB    EQU   *                                                10450.00
001381 C1013A01C17AC15E            1541           CC    X'01013A01017A015E0101010101580101'  00-0F       10460.00
                                   1542 *           BKCRLFTB                                           10470.00
001391 0101010101010001            1543           DC    X'0101010101010D0010101C1010101010101'  10 - 1F  10480.00
                                   1544 *           01=SPACE                                           10490.00
0013A1 0101010101C1C101            1545           DC  16X'01'                                 20-2F    10500.00
0013B1 C101010101010101            1546           DC   8X'01'                                   30-37    10510.00
001389 38                          1547           DC   X'38'          BYPASS                    38       10520.00
00138A 0101010101010101            1548           DC   7X'01'                                   39-3F    10530.00
0013C1 8101C1C101C1C101            1549           DC   X'810101010101010101010A0768493E187'  40-4F      10540.00
                                   1550 *           SP                  .$ .LT ( +OR                     10550.00
0013D1 6101010101010101            1551           DC   X'6101010101010101580107579095 87F6'  50-5F      10560.00
                                   1552 *           LA                  EX $ * ISCLN                     10570.00
0013E1 4023010101C10101            1553           DC   X'4023010101010101010101013788C08EA3'  60-6F     10580.00
                                   1554 *           - /                 ,PCUSGT ?                        10590.00
0013F1 C101C1C101C1C1C1            1555           DC   X'0101010101010101010101881820 8D8296'  70-7F   10600.00
                                   1556 *                               CLLBATQT =QT                     10610.00
001401 0162646766866C6E            1557           DC   X'0162646766866D6E7C73C10101C101C1'  80-8F      10620.00
                                   1558 *             A B C D E F G H I                                  10630.00
001411 0143454649 4A4C4F           1559           DC   X'0143454649 4A4C4F5152010101010101'  90-9F      10640.00
                                   1560 *               J K L M N O P Q R                              10650.00
001421 C1012526292A2C2F            1561           DC   X'01012526292A2C2F3132010101010101'  A0-AF      10660.00
                                   1562 *                 S T U V W X Y Z                              10670.00
001431 C1C1C1C1C1C1C1C1            1563           DC  16X'01'                                 B0-BF    10680.00
001441 01E2E4E7E8EBEDEF            1564           DC   X'01E2E4E7E8EBEDEF0F3010101010101'  C0-CF      10690.00
                                   1565 *               A B C D E F G H I                              10700.00
```

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  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                F15OCT70  3/20/72

001451 01C3C5C6C9CACCCF            1566          DC    X'01C3C5C6C9CACCCFD1D2010101D00101'  D0-DF **DD**  PIB  10710.00
                                   1567 *                  J K L M N O P Q R      BS                  PIB  10720.00
001461 C101A5A6A9AAACAF            1568          DC    X'0101A5A6A9AAACAFB1B2C1010101010101'  E0-EF            10730.00
                                   1569 *                    S T U V W X Y Z                           10740.00
001471 15020407080B0D0E            1570          DC    X'15020407C80B0D0E1013010101165B1F'  F0-FF            10750.00
                                   1571 *                  0 1 2 3 4 5 6 7 8 9                        10760.00
001481                             1572 XLTAB    EQU   *                                                  10770.00
001481 4B40F14BF24B4BF3            1573          DC    X'4B40F14BF24B4BF3F44B4BF54BF6F74B'  00-0F            10780.00
001491 F84B4BF94BF07B4B            1574          DC    X'F84B4BF94BF07B4B4B484B4B4B484B5E'  10-1F            10790.00
0014A1 7C4B4B614BA2A34B            1575          DC    X'7C4B4B614BA2A34B4BA4A54BA64B4BA7'  20-2F            10800.00
0014B1 4BA8A94B4B4B4B6B            1576          DC    X'4BA8A94B4B4B4B6B4B4B4B4B4C4B4B'  30-3F            10810.00
0014C1 6C4B4B914B929B4B            1577          DC    X'6C4B4B914B92934B4B949B4B964B4B97'  40-4F            10820.00
0014D1 4B9B994B4B4B4B5B            1578          DC    X'4B9B994B4B4B4B5B4B4B4B4C4B4C7C4B'  50-5F            10830.00
0014E1 4B5C814BB24B4B83            1579          DC    X'4B5C814BB24B4B83844B4B854B868B4B'  60-6F            10840.00
0014F1 884B4B894B4B4B4B            1580          DC    X'884B4B894B4B4B4B4B4B5F4B4B4B4B4B'  70-7F            10850.00
001501 4B407E4B4C4B4B5E            1581          DC    X'4B407E4B4C4B4B5E7A4B4B6C4B7D6E4B'  80-8F            10860.00
001511 5C4B4B4D4B5D7F4B            1582          DC    X'5C4B4B4D4B5D7F4B4B4B4B4B4B4B4B6C'  90-9F            10870.00
001521 4A4B4B6F4BE2E34B            1583          DC    X'4A4B4B6F4BE2E34B4BE4E54BE64B4BE7'  A0-AF            10880.00
001531 4BE8E94B4B4B4B4F            1584          DC    X'4BE8E94B4B4B4B4F4B4B4B4B4B4C4B4B'  B0-BF            10890.00
001541 6D4B4BD14BD2D34B            1585          DC    X'6D4B4BD14BD2D34B4BD4D54BD64B4BD7'  C0-CF            10900.00
001551 4BD8D94B4B4B4B5A            1586          DC    X'4BD8D94B4B4B4B5A4B4B4B4C4B4C4B4B'  D0-DF            10910.00
001561 4B4EC14BC24B4BC3            1587          DC    X'4B4EC14BC24B4BC3C44B4BC54BC6C74B'  E0-EF            10920.00
001571 C84B4BC94B4B5F4B            1588          DC    X'C84B4BC94B4B5F4B4B4B5F4B4B4B4B4B'  F0-FF            10930.00
                                   1589 *                  0 1 2 3 4 5 6 7 8 9 A B C D E F            10940.00
0015E4                             1590          LTORG                                                    10950.00
001588 E2C5D5C4407DE2C3            1591                =CL60'SEND ''SCRIPT COMPLETE'''
0015D8 00000000                    1592                =V(WORKTBL)
0015DC 0000C000                    1593                =V(SIMECB)
0015E0 00000000                    1594                =V(PRTBL)
0015E4 CCCCCCCC                    1595                =V(UNITABLE)
0015E8 C0000000                    1596                =A(0)
0015EC 000000F0                    1597                =A(X'F0')
0015FC CCCCCCCF                    1598                =A(15)
0015F4 FFFF                        1599                =H'-1'
0015F8 FFFF                        1600                =X'FFFF'
0015F8 CCCC                        1601                =AL2(0)
0015FA 4021207A20207A20            1602                =X'4021207A20207A2020'
001603 6021207A20207A20            1603                =X'6021207A20207A2020'
000000                             1604 PREC     DSECT                                                    10960.00
000000                             1605 PRCHAIN  DS    A                                                  10970.00
000004                             1606 PRTERM   DS    CL3                                                10980.00
000007                             1607 PRTIME   DS    CL9                                                10990.00
000010                             1608 PRFILL   DS    C                                                  11000.00
000011                             1609 PRBUF    DS    CL119                                              11010.00
001610                             1610 BUFPOOL  CSECT                                                    11020.00
                                   1611          PRINT NOGEN                                              11030.00
                                   1612          BUFFERS 120                                              11040.00
000498                             1856          END   SIMGO                                              11050.00
```

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POS.ID	REL.ID	FLAGS	ADDRESS
02	02	08	000425
02	02	CC	C0C42E
02	02	0C	C0C52E
02	02	08	000565
02	02	C8	C0C6C5
02	02	CC	C0C66C
02	02	0C	0C06EC
02	02	C8	C0C711
02	02	C8	C0C7BD
02	02	08	0C07C9
02	02	C8	C0C879
02	02	CC	C0C9CC
02	02	0C	0009E8
02	03	1C	C0C6CC
02	04	1C	C0C9C4
02	05	1C	0009D4
02	06	1C	C0C9DC
02	07	1C	0009E0
02	C8	1C	0009E4
09	02	C8	001230
09	09	08	0C11E9
09	09	0C	0012BC
09	09	CC	C012eC
09	09	0C	0C1264
09	09	CC	0C1268
09	09	0C	C012eC
09	0A	1C	0C1278
09	0B	1C	0C15D8
09	0C	1C	0C15DC
09	0D	1C	0C15E0
09	0E	1C	0C15E4
0F	0F	CC	CC1E1C
0F	0F	0C	0C16BC
0F	0F	CC	CC175C
0F	0F	CC	CC17FC
0F	0F	0C	0C1690
0F	0F	CC	CC193C
0F	0F	0C	CC19DC
0F	0F	0C	0C1A70
0F	0F	CC	CC1B1C
0F	0F	0C	0C1bB0
0F	0F	0C	0C1C50
0F	0F	CC	CC1CFC
0F	0F	0C	0C1D90
0F	0F	0C	0C1E30
0F	0F	0C	CC1EDC
0F	0F	0C	0C1F7C
0F	0F	0C	C02C1C
0F	0F	0C	C02CBC
0F	0F	0C	0C215C
0F	0F	CC	CC21FC
0F	0F	0C	0C229C
0F	0F	0C	0C233C

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POS.ID	REL.ID	FLAGS	ADDRESS
0F	0F	0C	0023D0
0F	0F	0C	002470
0F	0F	0C	002510
0F	0F	0C	0025B0
0F	0F	0C	002650
0F	0F	0C	0026F0
0F	0F	0C	0027S0
0F	0F	0C	002830
0F	0F	0C	0028D0
0F	0F	0C	002970
0F	0F	0C	002A10
0F	0F	0C	002AB0
0F	0F	0C	002B50
0F	0F	0C	002BF0
0F	0F	0C	002C90
0F	0F	0C	002D30
0F	0F	0C	002DD0
0F	0F	0C	002E70
0F	0F	0C	002F10
0F	0F	0C	002FB0
0F	0F	0C	003050
0F	0F	0C	0030F0
0F	0F	0C	003190
0F	0F	0C	003230
0F	0F	0C	0032D0
0F	0F	0C	003370
0F	0F	0C	003410
0F	0F	0C	0034B0
0F	0F	0C	003550
0F	0F	0C	0035F0
0F	0F	0C	003690
0F	0F	0C	003730
0F	0F	0C	0037D0
0F	0F	0C	003870
0F	0F	0C	003910
0F	0F	0C	0039B0
0F	0F	0C	003A50
0F	0F	0C	003AF0
0F	0F	0C	003B90
0F	0F	0C	003C30
0F	0F	0C	003CD0
0F	0F	0C	003D70
0F	0F	0C	003E10
0F	0F	0C	003EB0
0F	0F	0C	003F50
0F	0F	0C	003FF0
0F	0F	0C	004090
0F	0F	0C	004130
0F	0F	0C	0041D0
0F	0F	0C	004270
0F	0F	0C	004310
0F	0F	0C	0043B0
0F	0F	0C	004450

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POS.ID	REL.ID	FLAGS	ADDRESS
0F	0F	0C	0044F0
0F	0F	0C	00459C
0F	0F	0C	004630
0F	0F	0C	0046D0
0F	0F	0C	00477C
0F	0F	0C	004810
0F	0F	0C	0048BC
0F	0F	0C	00495C
0F	0F	0C	0049F0
0F	0F	0C	004A9C
0F	0F	0C	004B3C
0F	0F	0C	004BD0
0F	0F	0C	004C7C
0F	0F	0C	004D10
0F	0F	0C	004DB0
0F	0F	0C	004E5C
0F	0F	0C	004EF0
0F	0F	0C	004F90
0F	0F	0C	005C3C
0F	0F	0C	0050D0
0F	0F	0C	005170
0F	0F	0C	005210
0F	0F	0C	0052B0
0F	0F	0C	00535C
0F	0F	0C	0053FC
0F	0F	0C	005490
0F	0F	0C	00553C
0F	0F	0C	0055DC
0F	0F	0C	005670
0F	0F	0C	00571C
0F	0F	0C	0057B0
0F	0F	0C	005850
0F	0F	0C	0058FC
0F	0F	0C	005990
0F	0F	0C	005A30
0F	0F	0C	005ADC
0F	0F	0C	005B70
0F	0F	0C	005C10
0F	0F	0C	005CBC
0F	0F	0C	005D50
0F	0F	0C	005DFC
0F	0F	0C	005E9C
0F	0F	0C	005F30
0F	0F	0C	005FDC
0F	0F	0C	006C70

SYMBOL LEN VALUE DEFN REFERENCES 3/20/72

```
#TERM    00001 000018 00173   0299  0301  0303  0309
ABENDX   00004 0008EC 00787   1524
AREA     00001 000000 00354   0391  0794
AREASIZE 00001 000340 00351   0862  1045
AROUND   00001 001172 01428   1420  1424
AVTSAVE  00004 001248 01528   1003  1227  1387  1389  1404  1527
BADCCW   00002 000C78 01022   1009
BINTVL   00004 00006C 00374   1311  1314  1364  1365
BCEF4    00004 001272 01531   1529  1529  1529
BR14     00002 001270 01530   1529  1529
BUFPOOL  00001 001610 01610
BYPASS   00001 001172 01425   1409
BYTE     00004 001198 01448   1445
CCOPTBL  00016 001281 01536   1008
CCHOO    00001 000040 00368   1071  1298
CCWCD    00001 000080 00367   1272
CCWCOUNT 00002 00006A 00373   1213  1290  1308  1361
CCWOAD   00003 000065 00365
CCWFLAGS 00001 000068 00366   1071  1222  1251  1268  1270  1272  1298  1394
CCWOP    00001 000064 00364   1008  1194  1208  1229  1231  1249  1253  1256  1306  1327  1359  1392
CCWPCI   00001 000008 00371   1222
CCWSAVE  00008 000064 00363   0996  1091  1199  1276  1302
CCWSKIP  00001 000010 00370   1251
CCWSLI   00001 000020 00369
CCYES    00004 000FDC 01301   1072
CENDNOW  00001 001132 01398   1328
CENDONE  00001 001150 01410   1406
CENOSKIP 00001 00116E 01421   1006  1407
CENOWAIT 00002 001000 01370   1366
CHEKIOP  00004 000066 00224   0158
CHEKSTOP 00004 000858 00712   0691
CHEKUNIT 00004 000088 00232   0156
CHEKOJ   00001 0000EC 00245   0230
CKCHAIN  00004 000F8C 01272
CLEARIOQ 00004 000F74 01266   1284  1288
COUNT    00002 000078 00377   1201  1204  1213  1247  1260  1264  1280
CVTHEAD  00001 000CA0 00483   0497
CVTILK1  00001 000024 01438   1443
CVTILK2  00001 000028 01439   1451
DCB      00096 000100 00388   0892  0900  0905  0917  0920  1119  1183  1184  1185
DCBADR   00004 000108 00387   0908  0907  0915  1039  1114
DCBEEBAD 00001 00002C 00190   0234  0240  0981
DEBUGBAD 00001 000020 00191   0235  0244  0985
DECODE   00004 000038 01007   1005  1092  1303
DECWK    00008 000048 00356   0897  0898  0899  1108  1110  1339  1341
DELAY    00004 001270 01533   0296  1367
DELAYIT  00004 000FEA 01305   1265  1271
DELSKIP  00004 001000 01311   1307
DISABLE  00001 000BAE 00963   0950
DOAGAIN  00002 001170 01435   1408
DOEND    00004 001110 01392   1066
DOIT     00004 000BE4 00980   0960
DONEFLAG 00002 000B54 00729   0687  0695  0717
```

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SYMBOL	LEN	VALUE	DEFN	REFERENCES					
DWORD	00008	000278	00415	0416	0416	0417	0418		
ECBADR	00004	000054	00358	0878	0969				
ENDPRTBL	00001	000274	00304	0681					
ENDWORK	00001	000414	00310						
EOF	00004	000E46	01182	1485					
ECT	00004	000FC2	01290	1262					
EXCCW	00008	000E72	01194	1277					
FAKEGET	00004	000E5A	01187	0919	1182				
FEDD	00004	001046	01357	1353					
FEND	00004	000DEC	01150	1146					
FIXED	00004	000D8C	01124	1120					
FLOCP	00002	000DEC	01145	1149					
FLOPP	00002	001096	01352	1356					
FLUNDWK	00004	000BD4	00976	0968					
FREEC	00004	001278	01532	0296	1098	1099	1334	1335	
FROM	00004	000074	00376	1159	1172	1203	1205	1210	1246
GETBACK	00004	000D78	01119	1186					
GOS	00006	000DEC	00254	0227	0237				
GOTOWORK	00004	000B80	00965	0925	0927	1243	1432		
HEXTAB	00001	0006C0	00834	0818	0847				
IGINST	00004	001182	01455	1446					
IGOK	00002	00051E	00440	0428					
IGNORE	00004	0000D8	00253	0262					
IHB0CC3A	00002	000448	00329	0321					
IHB0004	00001	00044E	00328	0325					
IHB0012	00004	000528	00443	0441					
IHB0013	00001	000564	00463						
IHB0021	00004	00066C	00555	0553					
IHB0022B	00004	000600	00581	0582					
IHB0043	00001	0009AF	00832	0829					
INBUF	00080	000082	00383	1138	1140	1158	1190	1192	
INLEFT	00002	00007E	00381	0890	1095	1137	1258	1261	
INOK	00001	000622	00534	0525					
IOREAD	00002	000080	00382	0889	1152	1157	1263	1265	
IOSDCBPT	00001	000014	00168	0233	0239	0980			
IOBUCBX	00001	000020	00189	0242	0983				
ICHALT	00004	000CC2	01055	1025					
KILL	00004	000874	00721	0716					
LAST	00002	000DA2	01130	1123	1127				
LOCKED	00001	000080	00379	1044	1238	1287	1296		
LOOP	00006	00064A	00546	0576	0586	0590			
MCOLDPSW	00001	000030	00186	0201	0203	0248	0251	0254	0256
MEASURE	00004	000D94	01126	1129					
MOVEIN	00006	000E6C	01190	1133					
MOVEIT	00004	000F48	01255	1250					
MOVEPR	00006	000E66	01191	1134					
MOVOUT	00006	001228	01517	1347					
MVPA	00006	000512	00437	0414					
NEXTCW	00004	000F54	01276	1319					
NOGET	00001	000058	01153	1057					
NOTUSED	00001	001118	01390	1388					
NUMOVE	00004	000086	01136	1131					
NUPARM	00001	0004EA	00421	0410					

SYMBOL	LEN	VALUE	DEFN	REFERENCES									
NCPUT	00004	0010AE	01359	1333									
NOREST	00006	000942	00815	0803	0806								
NCSTOP	00001	00111E	01391	1380									
NCTEXCP	00004	000C7A	01024	0977									
NOTTIC	00004	000E88	01200	1155									
NCXFER	00004	000F4C	01256	1252	1254								
NXTENTRY	00004	000854	00711	0694	0698								
OPCOM	00002	000418	00314	0425									
OPMSG	00004	000970	00828	0815									
OPOK	00001	000B2E	00921	0918									
OSSVCNEW	00008	000278	00305	0201	0248	0254	0291	0415	0477				
OURSVC	00002	000020	00205	0200									
OURUNIT	00001	0000EA	00258	0247									
OUTBUF	00256	0000D4	00385	0815	0816	0817	0819	0821	1169	1282	1517		
OUTCOUNT	00002	000002	00384	0891	1168	1279	1281	1332	1345	1349			
PARM	00005	000518	00438	0411	0417								
PCSTSIM	00004	00011E	00273	0258									
PR	00004	000832	00702	0710									
PRBUF	00119	000011	01209	1113	1191	1344	1517	1518					
PRCHAIN	00004	000000	01605										
PREC	00001	000000	01604	1100									
PREP	00001	000006	00352	1229	1253	1392							
PREFILL	00001	000010	01608	1112	1113	1343	1344						
PRINT	00004	0001D4	00386	0879	0884	1143	1144	1350	1351				
PROK	00001	0007E6	00678	0669									
PROLDPSW	00001	000028	00183	0192	02C2	0210	0213	0221	0224	0232	0250	0255	0270	0283
PROTECB	00004	0011C8	01467	0892									
PRPR	00004	0007F2	00683	0714	0718								
PRTBL	00001	000214	00302	0296	0688	0693							
PRTERM	00003	000004	01606	1111	1342								
PRTIME	00005	000007	01607	1109	1110	1340	1341						
PSW	00008	000688	00593	0478									
QCLEAR	00001	00101E	01321	1295									
QUIT	00001	0009A	01036	1027									
READBIT	00001	000002	00350	1208	1231	1327	1359						
READCTL	00004	000632	00540	0549									
READY	00004	001CCC	01367	1360									
REPLY	00004	00048E	00346	0323	0337	0338	0340						
RESETKEY	00004	000046	00213	0206									
RESETTO	00004	000EB8	01212	1209									
RCR	00004	000F22	01245	1232	1235								
RQE	00004	000058	00359	0985	0990	0991	1055	1069	1070	1164	1165	1318	1374
RQEDEB	00004	000060	00362	0801	0885	1059							
RQ B	00004	00005C	00361	0925	0948	1058	1375						
	00004	000058	00360	0904	0922								
	00004	000000	00355	0867	0869	0936	1041	1104	1312	1368			
	0004	000750	00650	0401									
	004	000808	00649	0711									
		000EBC	01213	1186	1211								
		0005EE	00507	0503									
		0000	00192	0595									
		000	00180	0352									
			01529	0936									

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SYMBOL	LEN	VALUE	DEFN	REFERENCES
SIMECB	00001	000154	00298	0266 0275 0296 0316 0318 0404 0406 0837
SIMGO	00004	000498	00396	1856
SIMTASK	00001	000A40	00853	
SIMTCB	00001	000164	00300	0276 0572
SLI	00001	001132	01397	1393 1395
SLOOP	00004	0005C2	00499	0506
SRLINST	00004	0011AE	01454	1447
STAELIST	00001	00123C	01522	0508
STAEX	00004	000144	00289	0466
STARTOP	00001	000C14	00992	1436
STOPFLAG	00001	001260	01534	0296 1379
STOPIT	00004	000486	00344	0339
STOROK	00001	00090C	00798	0796
SVCNO	00001	000081	00177	0199 0290 0512 0810 0814 0934 0959 0999 1062 1103 1178 1216 1242 1331 1378 1431
SVCSAVE	00004	000280	00306	0228 0238 0245 0253 0259 0269 0273 0282
SVNEWPSW	00001	000060	00185	0291 0477 0478
SVOLDPSW	00001	000020	00184	0195 0197 0199 0208 0209 0211 0218 0219 0220 0222 0264 0271 0284
SYSIN	00004	0006F0	00600	0522 0524 0540 0660
SYSPRINT	00004	000880	00735	0666 0668 0702 0723
TCBLMP	00001	000022	00481	0488
TCBCTC	00001	000084	00482	0489
TCBPKF	00001	000110	00187	0217
TCBTOP	00001	000074	00479	0490 0495 0495 0505 0508 0509
TCBTIC	00001	00000C	00480	0499
TENSEC	00004	000688	00750	0683
TERMNO	00003	000078	00380	0816 0899 0900 1111 1342
TERMSTAT	00001	00007A	00378	0882 1084 1238 1287 1296
TESTCC	00004	000FD4	01298	1235 1273
TESTPREP	00002	000F10	01237	1230
TFOUND	00006	000580	00495	0492
TIC	00001	000008	00349	1194
TLOOP	00004	0005A0	00490	0494
TNEXT	00002	000504	00504	0496 0501
TO	00004	000D70	00375	1156 1170 1200 1202 1212 1245
TRACEPTR	00004	000230	00389	0887
TRAREA	00256	000240	00390	0886 0908 0910
TRTAB	00001	000688	00651	0544
TWOSEC	00004	000BA4	00961	0944
UCBCHA	00001	000004	00181	0226
UCBLOCK	00004	001180	01442	0902 0903 1440
UCBUA	00001	000005	00182	0246
UNIT	00002	0006E6	00591	0546 0547
UNITABLE	00004	000288	00307	0246 0256 0536
UNITCONE	00001	000788	00655	0618
USERSVC	00001	000367	00169	0475
WASBREAK	00001	000CEC	01068	1020
WASDISAB	00001	000E10	01162	1015
WASENABL	00001	000E10	01161	1014
WASNOP	00001	000E10	01163	1018 1173 1180
WASPREP	00002	000D0A	01083	1013
WASREAD	00001	000D28	01094	1011 1085
WASSAB	00001	000E10	01160	1019 1086

SYMBOL	LEN	VALUE	DEFN	REFERENCES				
WASSENSE	00004	000E34	01175	1017				
WASTIC	00004	000D1C	01088	1016				
WASWRITE	00004	000E1C	01168	1012				
WORKSLOT	00004	000050	00357	0799	0875	0965	1384	
WORKTBL	00001	000384	00308	0260	0263	0265	0256	0693
WRITE#	00004	000FA2	01279	1257				
WRITEBIT	00001	000001	00351	1231	1256	1306	1327	
WTUR	00004	000420	00321	0341	0343	0345		
WTURECB	00004	000494	00347	0324	0331	0331	0333	
XFER	00004	000EF4	01229	1223				
XFERI	00006	001234	01519	1255				
XLATE	00006	000E6C	01192	1142				
XLO	00006	001226	01518	1346				
XLOTAB	00001	001381	01540	1192				
XLTAB	00001	001481	01572	1518				
ZEROKEY	00004	00003A	00209	0207				

STMT ERROR CODE MESSAGE 3/20/72

475 IEU020 NEAR OPERAND COLUMN 8--INVALID IMMEDIATE FIELD

1 STATEMENT FLAGGED IN THIS ASSEMBLY
8 WAS HIGHEST SEVERITY CODE
STATISTICS SOURCE RECORDS (SYSIN) = 1101 SOURCE RECORDS (SYSLIB) = 4825
OPTIONS IN EFFECT LIST, NODECK, NOLOAD, NORENT, XREF, NOTEST, ALGN, OS, NOTERM, LINECNT = 53
2050 PRINTED LINES