

**PUBLICATIONS
UPDATE**

Operating System/4 (OS/4)

Job Accounting System

Programmer Reference

UP-8292 Rev. 1-A

This Library Memo announces the release and availability of Updating Package A to "SPERRY UNIVAC Operating System/4 (OS/4) Job Accounting System Programmer Reference", UP-8292 Rev. 1.

This update provides minor changes to the standard area and the fixed-length area of a record in the job accounting auxiliary file (Section 4).

Copies of Updating Package A are now available for requisitioning. Either the updating package alone, or the complete manual with the updating package may be requisitioned by your local Sperry Univac Representative. To receive the updating package alone, order UP-8292 Rev. 1-A. To receive the complete manual, order UP-8292 Rev. 1.

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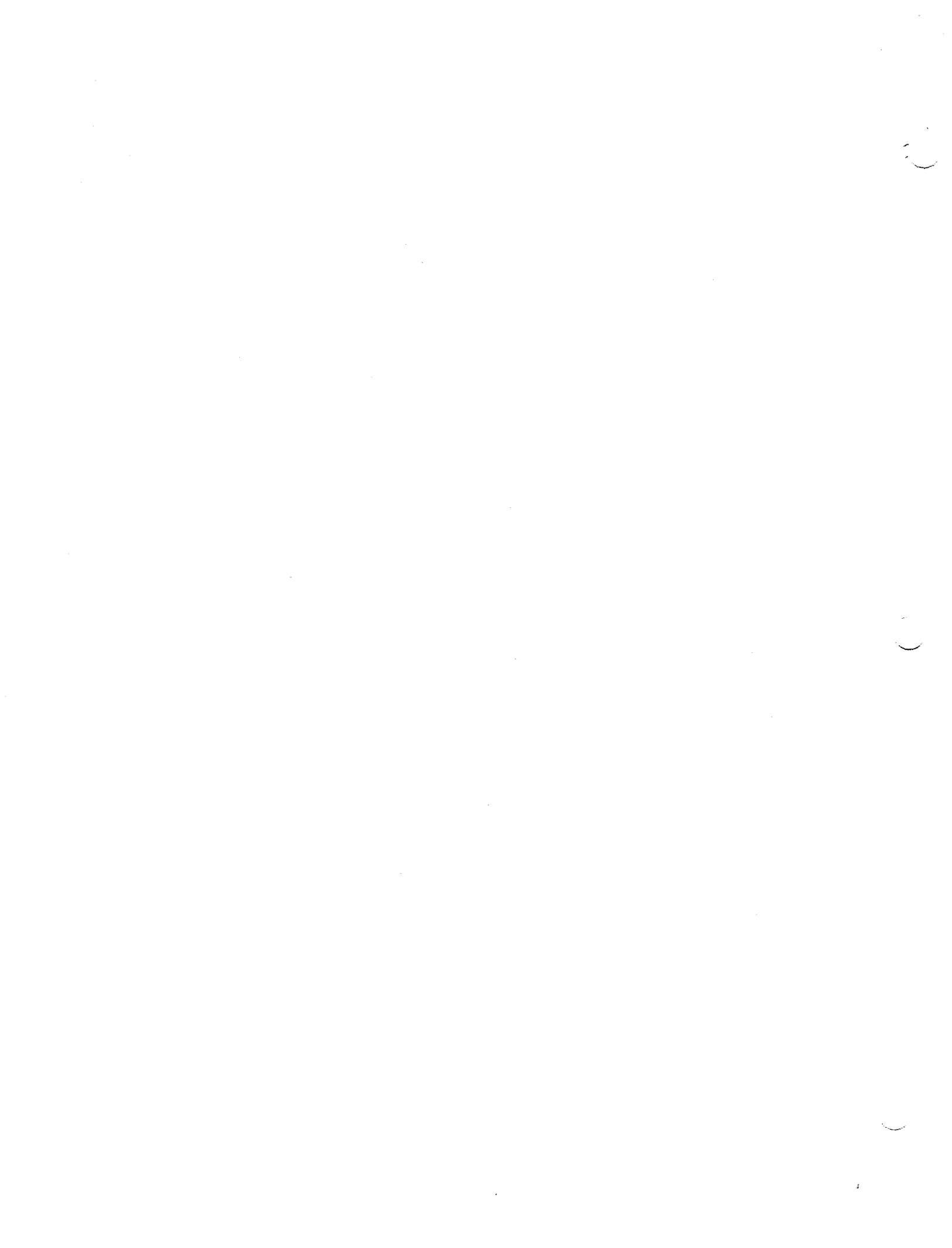
This SPERRY UNIVAC® Operating System/4 (OS/4) Library Memo announces the release and availability of "SPERRY UNIVAC Operating System/4 (OS/4) Job Accounting System Programmer Reference", UP-8292 Rev. 1. This is a Standard Library Item (SLI).

This revision provides improvements in the job control stream examples and the text throughout the manual.

Destruction Notice: This revision supersedes and replaces "SPERRY UNIVAC Operating System/4 (OS/4) Job Accounting System Programmer Reference" UP-8292, released on Library Memo dated February 1976 and also UP-8292-A released on Library Memo dated May 1976. Please destroy all copies of UP-8292 and UP-8292-A and their library memos.

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Mailing Lists 217, 630 and 692	Mailing Lists 60, 61, 65 and 66 (Cover and 45 pages)	Library Memo for UP-8292 Rev. 1
		RELEASE DATE: January, 1977



**PUBLICATIONS
UPDATE**

Operating System/4 (OS/4)

Job Accounting System

Programmer Reference

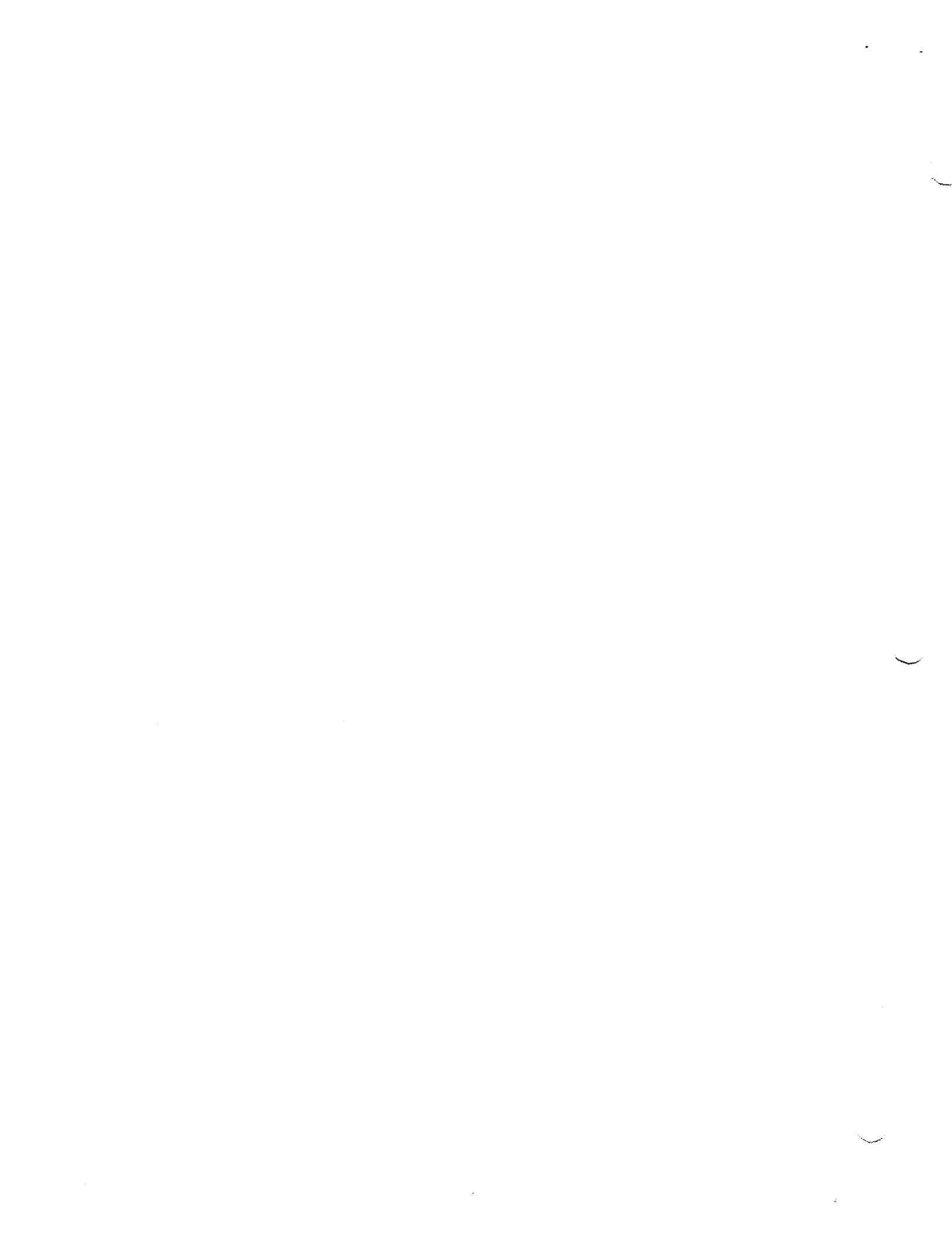
UP-8292-A

This Library Memo announces the release and availability of Updating Package A to "SPERRY UNIVAC Operating System/4 (OS/4) Job Accounting System Programmer Reference", UP-8292.

This update corrects an omission on page 2 of the contents in the original manual.

Copies of Updating Package A are now available for requisitioning. Either the updating package alone, or the complete manual with the updating package may be requisitioned by your local Sperry Univac Representative. To receive the updating package alone, order UP-8292-A. To receive the complete manual, order UP-8292.

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Mailing Lists 217, 630, and 692	Mailing Lists 60, 61, 65, and 66 (Package A to UP-8292, 6 pages plus Memo)	Library Memo for UP-8292-A RELEASE DATE: March, 1976



**PUBLICATIONS
RELEASE**

Operating System/4 (OS/4)

Job Accounting System

Programmer Reference

UP-8292

This SPERRY UNIVAC® Operating System/4 (OS/4) Library Memo announces the release and availability of "SPERRY UNIVAC Operating System/4 (OS/4) Job Accounting System Programmer Reference", UP-8292. This is a Standard Library Item (SLI).

This manual provides the information required to use the job accounting system with the SPERRY UNIVAC Operating System/4 (OS/4). The job accounting system provides the user with management information for computer center operation.

Additional copies may be ordered by your local Sperry Univac Representative.

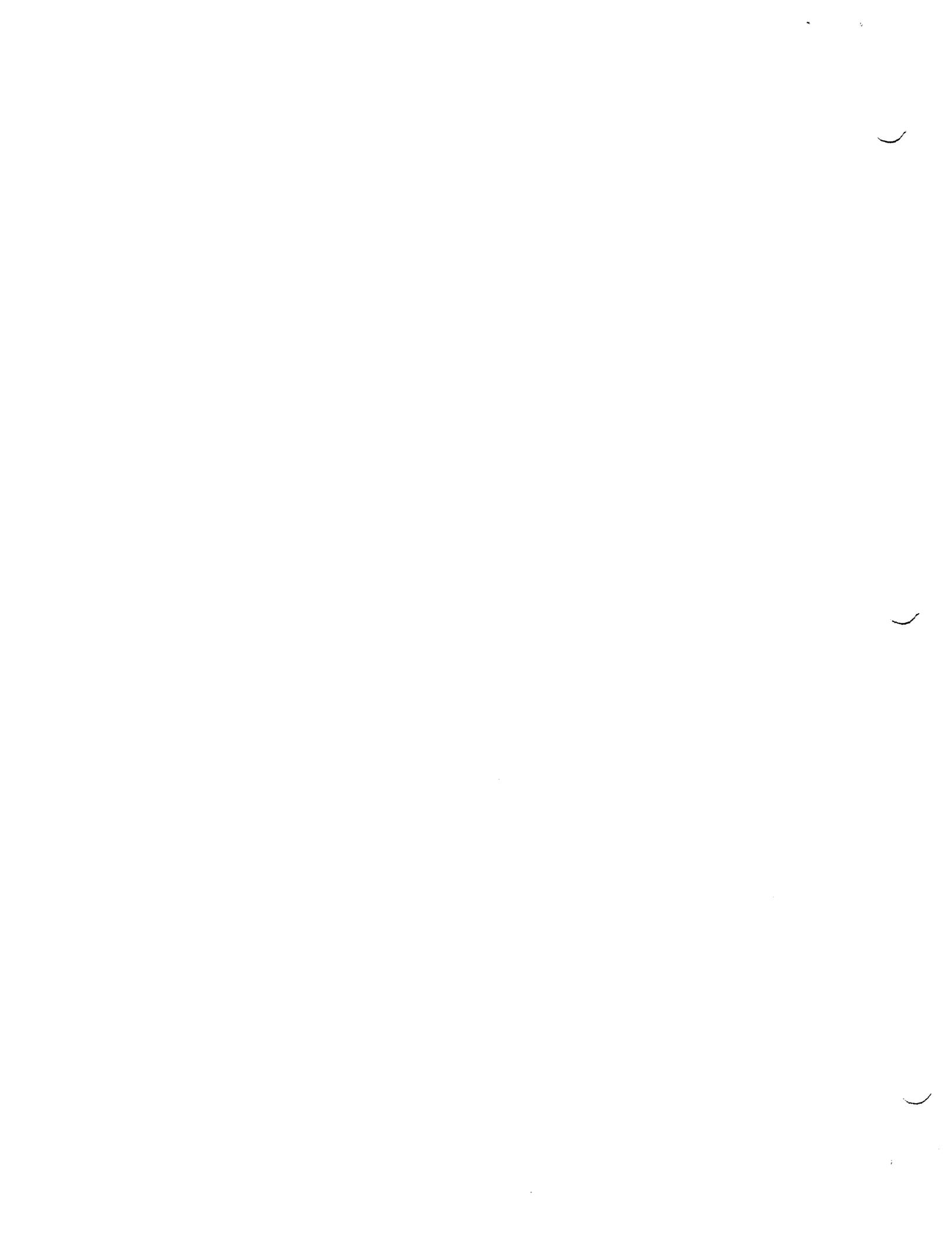
**Mailing Lists
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**Mailing Lists 60, 61, 65 and 66
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**Library Memo for
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February, 1976



SPERRY UNIVAC
Operating System/4 (OS/4)

Job Accounting System

Programmer Reference

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SPERRY UNIVAC

Operating System/4 (OS/4)

Job Accounting System

Programmer Reference

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1. Introduction

1.1. GENERAL

This manual describes the job accounting system used with the SPERRY UNIVAC Operating System/4 (OS/4). The job accounting system provides the user with management information for computer center operation. Information is provided on the basis of the individual job steps, with a summary printed for the entire job. This information includes items such as CPU time, size of the job's main storage partition, elapsed time, and counts of EXCP macros issued to I/O devices.

Use of this manual assumes knowledge of the OS/4 job control programmer reference, UP-7793 (current version), the OS/4 supervisor programmer reference, UP-7689 (current version), the OS/4 system generation programmer reference, UP-8213 (current version), and either the 9400/9480 systems OS/4 operations handbook, UP-7871 (current version), or the 90/60,70 systems operations handbook, UP-7937 (current version).

The job accounting system is composed of two parts. The first part involves interfaces for supervisor counting and job control logging routines, which together capture the job accounting information in a SYSRES disc file. The second part is a utility routine (UTJAS) that can transfer the gathered information from the disc file to a printer or auxiliary disc or tape file.

1.2. STATEMENT CONVENTIONS

The conventions used to illustrate the control statements in this manual are:

- Capital letters and punctuation marks (except braces, brackets, and ellipses) are information that must be coded exactly as shown.
- Lowercase letters and terms represent information that must be supplied by the programmer.
- Information contained within braces represents necessary entries of which one must be chosen.
- Information contained within brackets represents optional entries that are included or omitted depending upon program requirements; braces within brackets signify that one of the entries must be chosen if that positional parameter is included.
- An ellipsis (a series of three periods) indicates the omission of a variable number of entries.
- Commas are required when positional parameters are omitted, except for trailing parameters.
- Underscoring indicates the characters that may be typed in to abbreviate a command or command parameter; for example, AC ON may be typed in as the abbreviation of ACCOUNT ON. AC and ON are underscored to indicate this fact.



2. Generation Procedures

2.1. GENERAL

Each customer installation requires its own version of OS/4, whether a SPERRY UNIVAC 9400/9480 System or SPERRY UNIVAC 90/60,70 System. The process of tailoring and installing the operating system software is called system generation (SYSGEN). This includes tailoring the supervisor to reflect both the hardware and software features required by the installation. The job accounting system (JAS) is a software feature that may or may not be used at the installation. The OS/4 job accounting system can be made available by using the following procedures. At supervisor generation time, the job accounting system, with or without communications accounting, can be incorporated by specifying the JAS or JASM parameter on the SYSTEM macro instruction (2.2.1). The counting facilities of the supervisor may be further tailored by means of the ACCT macro instruction. In addition, a job accounting system file is created and initialized on the system resident disc (SYSRES).

2.2. SUPERVISOR GENERATION

Supervisor generation is the process of assembling a resident supervisor control routine. A series of required and optional macro instructions tailors the supervisor to the user's own specific requirements. These macro instructions are described in the OS/4 system generation programmer reference, UP-8213 (current version).

2.2.1. SYSTEM Macro Instruction

The SYSTEM macro instruction is required for supervisor generation. The operand consists of a series of parameters that specify which features and options are to be included. Job accounting system is one of these optional features and is included by specifying either JAS or JASM as a parameter on the SYSTEM macro call. The format that follows shows only JAS and JASM. For the complete SYSTEM macro format, see the OS/4 system generation reference, UP-8213 (current version).

Format:

LABEL	△ OPERATION △	OPERAND
blank	SYSTEM	... [{ JAS } , { JASM }] ...

Parameters:

JAS

Indicates that job accounting capability is to be included in the system.

JASM

Indicates that job accounting plus communications accounting capabilities are to be included in the system.

2.2.2. Job Accounting (ACCT) Macro Instruction

The ACCT macro instruction is optional and may be supplied when the JAS or the JASM parameter is specified on the SYSTEM macro instruction at supervisor generation time. The ACCT macro instruction must follow the JOBS macro instruction in the supervisor generation source code.

Format:

LABEL	△ OPERATION △	OPERAND
blank	ACCT	[{ TRM=k } { LNE=m }] [,IOC=n]

Keyword Parameters:

TRM=k

Specifies the maximum number of line/terminal counters reserved in the resident supervisor. This operand is permitted only when the JASM parameter is specified on the SYSTEM macro instruction. The value for k must be greater than zero.

LNE=m

Specifies the maximum number of line counters reserved in the resident supervisor; accounting is to be performed by line only. This operand is permitted only when the JASM parameter is specified on the SYSTEM macro instruction. The value for m must be greater than zero.

NOTE:

If insufficient space is specified for JASM, some job accounting data may be lost. Line/terminal (L/T) counters are dynamically assigned and released as jobs acquire and release lines. Because the default value may not be adequate for most users, it is recommended that the LNE=m or TRM=k parameter be specified to tailor the number of L/T counters to the particular configuration and job mix.

IOC=n

Specifies the maximum number of I/O counters reserved in the resident supervisor.

If both k and m are omitted, and the JASM parameter is specified on the SYSTEM macro instruction, m is assumed to be 4 (LNE=4) and job accounting is performed by line only. If n is omitted, IOC=n is computed by the job accounting system based on the number of physical unit blocks (PUBs) and the number of user jobs.

2.2.2.1. Line/Terminal Counters

If the TRM=k parameter is specified, the necessary accounting is performed by line and terminal. In this case, the value of k is the maximum number of lines and terminals that may be used by all jobs in the system during any one job step.

Example:

If there are two 1-step jobs running and three lines (each with three terminals) are used between the two jobs, TRM=24 should be specified.

If the LNE=m parameter is specified, the necessary accounting is performed by line only. In this case, the value of m is the maximum number of lines that may be used by all jobs in the system during any one job step.

Example:

If there are two 1-step jobs running and three lines are used between the two jobs, LNE=6 should be specified.

If there are not enough L/T counters for accounting a communications job, a flag is set in the job counter. This flag is later passed to the \$Y\$JACNT record and finally to the auxiliary records for the job. The job accounting system utility routine (UTJAS) recognizes this condition and prints an L in the flag column to indicate incomplete L/T accounting data for that job step. To provide additional L/T accounting, the user must reassemble the supervisor.

2.2.2.2. Manual Computation of I/O Counters

The number of I/O counters required may be computed by determining the maximum number of devices that can be allocated to all problem programs running concurrently in the system. One I/O counter must be included for each device used except for the console and incremental printer (90/60,70 systems only), SYSRES disc, and any handler device. One counter must be added for each instance that a sharable device is allocated to a second or subsequent job. Another counter must be added for each printer in the system. The formula for computing the IOC parameter value is:

$$IOC=(p - h - 1) + e + \sum_{i=1}^s (x_i - 1)$$

where:

p

Is the number of PUBs in the system, excluding the console and incremental printer (90/60,70 systems only).

h

Is the number of 1004/1005 or 9200/9300 handlers:

- 0 No handler in the system.
- 1 One handler.
- 2 Dual handler.

s

Is the maximum number of devices which can be shared at one time (excluding SYSRES).

x

Is the number of jobs that may allocate the particular device concurrently.

e

Is the number of printers in the system.

Example:

For a system with 16 PUBs (15 + 1 console) including 2 printers, no handler, and 6 discs with only 2 discs being shared by any one of the 5 user jobs:

$$\begin{aligned} \text{IOC} &= (15 - 0 - 1) + 2 + \sum_{i=1}^2 (5 - 1) \\ &= (15 - 0 - 1) + 2 + (4 + 4) \\ &= 14 + 2 + 8 = 24 \end{aligned}$$

2.2.2.3. System Computation of I/O Counters

If the IOC parameter is omitted, the number of I/O counters is automatically computed by the job accounting system, based on the assumptions that:

1. only discs are sharable, and
2. all discs are sharable at all times by all user jobs.

With these assumptions, the formula for computing the IOC parameter value n becomes:

$$\text{IOC} = (p - h - 1) + e + ((j - 1) * (d - 1))$$

where:

p

Is the number of PUBs in the system, excluding the console and incremental printer (90/60,70 systems only).

h

Is the number of 1004/1005 or 9200/9300 handlers:

- 0 No handler in the system.
- 1 One handler.
- 2 Dual handler.

j

Is the number of user jobs specified as parameter 2 on the JOBS macro instruction.

d

Is the number of disc PUBs in the system.

e

Is the number of printer PUBs in the system.

Example:

For a system with 16 PUBs (15 + 1 console) including 6 discs, 2 printers, no handler, and 5 user jobs:

$$IOC = (15 - 0 - 1) + 2 + ((5 - 1) * (6 - 1)) = 36$$

I/O counters are dynamically assigned and released as job control allocates and releases devices. The value computed automatically is general and thus is artificially high for most users. Therefore, it is best to specify the IOC=n parameter on the ACCT macro instruction so that the I/O counter assignment is tailored to the particular configuration and job mix.

If there are not enough I/O counters for a specific job step at execution time, a flag is set in the job counter. This flag is later passed on to the \$Y\$JACNT record and finally to the auxiliary record for the step. UTJAS recognizes this condition and prints an I in the flag to indicate incomplete I/O accounting data for that step. The user can then choose either to rerun the job when additional I/O counters are available, perhaps in a different job mix, or to reassemble the supervisor, providing additional I/O counters.

2.2.2.4. Associated Options and Restrictions

- When either JAS or JASM parameter is specified, the SIMDAY parameter must also be specified on the SYSTEM macro instruction.
- When the JASM parameter is specified without specifying the MCP parameter, the JAS parameter is assumed. Therefore, since the system will have no communications capability, no accounting for communications will be generated.
- If both JASM and JAS parameters are specified, the JAS parameter is assumed.
- The JAS and JASM parameters are incompatible with the MINS or MINIO parameters on the SYSTEM macro instruction. If a combination of both parameters is specified, JAS and JASM are ignored and no job accounting is performed (9400/9480 systems only).
- The MMCP and the JASM parameters on the SYSTEM macro instruction are incompatible. When both are specified, the JAS parameter is assumed and the system will have no accounting capability for communications activity.
- A supervisor generation specifying the MCP and JAS parameters is possible. However, MCP message data will not be accounted.

2.3. JOB ACCOUNTING FILE GENERATION

The job accounting system writes the job accounting information to the system file on the SYSRES disc volume. The file name must be \$Y\$JACNT, and the file must begin and end on a cylinder boundary on SYSRES.

Disc space for the \$Y\$JACNT file may be allocated by the disc space management utility routine (UTDSM), or by job control with a set of device assignment statements in a control stream. This is done by using either a JAS supervisor with the accounting mode inactive or a supervisor with no JAS included. The file must be initialized with the INIT response to the SV30 message (3.1.1) when booting the JAS supervisor, or initialized with the UTJAS utility routine (Section 4).

Following is an example of a job control stream that might be used to generate the \$Y\$JACNT file.

1	LABEL	△OPERATION△	OPERAND	△
		10	16	
//	JOB	CREATE		
//	DVIC	80	// VOL DSPxxx	
//	EXT	C1,CYL,4		
//	LBL	\$Y\$JACNT,DSPxxx,1,77001,76001		Required file-id
//	LFD	\$Y\$JACNT,SQL,NEW		
//	EXEC	PROGNAME,LOAD\$LIB,REL		
/&				

The job accounting system outputs the accounting information to the \$Y\$JACNT file as one record or as several records per job step, depending on the number of I/O and L/T counters assigned. One record is output if the job step uses no more than 29 counters (I/O counters and L/T counters). If from 30 through 77 counters are used, two \$Y\$JACNT records per job step are output. Thereafter, each additional 46 counters results in an additional record.

The \$Y\$JACNT file record capacity per cylinder is shown in Table 2—1.

Table 2—1. Number of Text Records per Cylinder

Disc Subsystem	Records/Cylinder	
	First Cylinder*	2—n Cylinders
8411	63	70
8414,8424,8425	253	260

*The first seven records of the first cylinder are used for index records.

Example:

If a user processes an average of 390 job steps per day, and the maximum number of devices assigned in any step is 29, then a daily operation would consume approximately 1.5 cylinders of an 8425 SYSRES \$Y\$JACNT file. An 8-cylinder \$Y\$JACNT file would have a capacity for about 5 days accounting data.

2.4. AUXILIARY FILE GENERATION

A major function of the OS/4 job accounting system utility program UTJAS is to transfer accounting information to an auxiliary tape or disc file, where it may be accessed by, for example, user-written accounting, billing, and statistical programs.

Tape auxiliary files have standard labels and are block numbered.

Disc auxiliary files have sequential (SAM) organization.

Auxiliary file records (tape or disc) are variable in length, with a maximum record size of 615 bytes. Because record size depends on the number of I/O device or line/terminal counters assigned to a job, the amount of file space required cannot be accurately specified.

3. Operation

3.1. GENERAL

The OS/4 job accounting system is activated by either of two methods, both of which are input via the console keyboard.

- Reply to a supervisor message.
- Type in an operator command.

The first action occurs during system initialization. The operator command may be used when response to the supervisor message was negative; it may also occur if the system has to be reinitialized because of an unrecoverable error on the system accounting file.

3.1.1. Supervisor Message Display

At supervisor initialization (boot) time, the decision must be made whether or not to activate the job accounting function. The following message is displayed on the system console:

SV30 ACTIVATE JOB ACCOUNTING? ANS. INIT,Y,N

If the response is INIT, the \$Y\$JACNT file area is initialized and the job accounting mode is set to active.

NOTE:

The \$Y\$JACNT initialization routine is not activated until the first RUN command is issued to the system. Then, if the \$Y\$JACNT file space has never been initialized, or if an unrecoverable disc error has occurred since the last initialization, the routine format-writes the entire file area, resulting in a momentary time delay. If, however, no disc error has occurred since the last initialization, the routine performs only the seven index records and the first data record.

If the response is Y, the job accounting mode is set to active and accounting information is written commencing with the first free record in the \$Y\$JACNT file.

If the response is N, the job accounting mode remains inactive until the ACCOUNT ON operator command is typed in setting the mode to active.

If an error situation occurs in connection with the \$Y\$JACNT file, job accounting is not activated and any subsequent ACCOUNT ON operator commands are not accepted.

3.1.2. ACCOUNT Operator Command

The ACCOUNT operator command is available to systems that include job accounting capabilities. It is used to activate the job accounting function for all jobs that are initiated following the issuance of this command.

Format:

ACCOUNT ON

Positional Parameter 1:

ON

Specifies that the job accounting mode is to be changed from inactive to active. Accounting will be performed for all jobs that are initiated after AC ON is typed in.

This command may be entered when the response to the SV30 message at system initialization was N or when the \$Y\$JACNT file has been initialized by the UTJAS routine.

This command may be entered as part of the recovery procedure for the JA32 message indicating that the \$Y\$JACNT file area is full. The file should be dumped to the auxiliary tape or disc, after which the file is compressed. AC ON may then be typed in.

3.1.3. ACCT Job Control Statement

This optional statement enables the user to insert up to three unique control fields into the accounting records for the job. There may be only one ACCT statement in a control stream. This statement, if used, must be located in the first job step. No embedded blanks are allowed in any parameter.

Format:

LABEL	Δ OPERATION Δ	OPERAND
	//ΔACCT	[account-code] [,project-code] [,account-name]

Positional Parameter 1:

account-code

Is an 8-character code identifying the account. If fewer than eight characters are given, the account code is right-justified and padded with blanks.

Positional Parameter 2:

project-code

Is an 8-character code identifying the project. If fewer than eight characters are given, the project code is right-justified and padded with blanks.

Positional Parameter 3:

account-name

Is a 10-character code naming the account. If fewer than 10 character are given, the name is right-justified and padded with blanks.

Example:

1	LABEL	△OPERATION△	OPERAND	△
		10 16		
	/I/ ACCT	90.00, A	190, J.A.SYS	

3.2. INACTIVE ACCOUNTING MODE

Job accounting does not output any accounting information while in the inactive mode. The following error conditions inhibit the active accounting mode; the action that may be taken to correct the error is described. These error conditions are associated with one or more error messages. For the 9400/9480 systems, see the OS/4 operations handbook, UP-7871 (current version); or, for the 90/60,70 systems see the OS/4 operations handbook, UP-7937 (current version), for an explanation of these messages.

- There is no \$Y\$JACNT file on the SYSRES volume (JA12, JA33).
 1. Allocate the \$Y\$JACNT file with the disc space management utility routine or with job control statement in the UTJAS control stream.
 2. Execute the initialize function of the UTJAS utility routine.
 3. Type in the ACCOUNT ON operator command.
- The \$Y\$JACNT file is not on a cylinder boundary (JA13, JA34).
 1. Scratch the \$Y\$JACNT file with the disc space management utility routine.
 2. Allocate the \$Y\$JACNT.
 3. Execute the initialize function of the UTJAS utility routine.
 4. Type in the ACCOUNT ON operator command.
- The \$Y\$JACNT file is not initialized (JA11, JA12).

This may be done in one of two ways:

1. Execute the initialize function of the UTJAS utility routine and type in the ACCOUNT ON operator command.
 2. Respond with INIT to the SV30 message after rebooting the supervisor.
- An I/O error has occurred on the \$Y\$JACNT file (JA11, JA23, JA35, JA36, JA51).
 1. Transfer the accounting information to the auxiliary file with the UTJAS utility routine.
 2. Initialize the \$Y\$JACNT file with the UTJAS utility routine.
 3. Type in the ACCOUNT ON operator command.

- There is no space in the \$Y\$JACNT file (JA01, JA32).

The job accounting logging routine displays a warning message on the console when accounting information is written as the first record of each track of the last cylinder. This console message has the format:

JA01 RESIDUAL TRACK = xx ON \$Y\$JACNT WARNING

where

XX

Is the number of the residual tracks in decimal.

When this message is displayed, the operator is made aware that the \$Y\$JACNT file is nearing capacity, at which time job accounting would be deactivated. To prevent this, the operator must execute the UTJAS utility routine to transfer the information to an auxiliary file and compress the \$Y\$JACNT file. Job accounting may then continue in the active accounting mode.

If the JA01 message is ignored, when the \$Y\$JACNT file space is exhausted, the following message appears:

JA32 JAS TERM ALL JOBS, NO SPACE ON \$Y\$JACNT

Accounting is automatically deactivated.

1. Transfer the accounting information to the auxiliary file and compress the \$Y\$JACNT file with the UTJAS utility routine.
2. Type in ACCOUNT ON operator command.

- No system date given (JA31).

When the response to the SV60 initialization message was NONE and the SET DATE operator command has not been issued:

1. Type in the SET DATE operator command (Julian date, parameter 3, is required).
2. Type in the ACCOUNT ON operator command.

- Current initial number entry not available (JA22).

The initial number entry precedes the job number and has a maximum value of 255. When the initial number is incremented, the JAS program checks whether or not job data remains on the \$Y\$JACNT file with the same initial number as the current initial number. If it does, accounting is deactivated so that no newly initiated job will be accounted. However, the jobs running that have different initial number from the current initial number continue in the active accounting mode.

1. Transfer the accounting information to an auxiliary file and compress the \$Y\$JACNT file with the UTJAS utility routine.
2. Type in the ACCOUNT ON operator command to effect accounting for newly initiated jobs.

- An I/O error occurred on the control block file (JA21).

Job control writes the accounting information for a job step in that job's control block file. When an I/O error occurs on the control block file, the job is switched to the inactive mode. No further accounting is done for that job. However, the system job accounting function remains in the active mode for other existing and newly initiated jobs.

4. Job Accounting System Utility Routine

4.1. INTRODUCTION

The SPERRY UNIVAC Operating System/4 (OS/4) job accounting system utility routine (UTJAS) provides the basic functions to initialize, maintain, and display the job accounting system file (\$Y\$JACNT) on the SYSRES disc. With few restrictions, all functions of UTJAS can be performed on the \$Y\$JACNT file, whether it resides on the SYSRES device or on a systems disc pack being used as a data disc.

The initialization function uses the system-generated JAS transient routines \$YST7800 through \$YST7803 and preformats the entire file, thus destroying any previous data on that file. For the user's protection, UTJAS initializes (preformats) a \$Y\$JACNT file on the SYSRES device only when the JAS mode is inactive.

As a maintenance function, UTJAS makes space available by transferring the data to an auxiliary file. If this transfer is made while the JAS mode is active, all data belonging to active jobs remains on the \$Y\$JACNT file. When the transfer is completed, the remaining data is automatically compressed toward the front end of the file. The data on the auxiliary file may be used as input to a user-written program that produces cost-distribution, billing, control, or information reports.

As a display function, UTJAS provides two levels of information. A list of the jobs contained in the file is produced, along with limited associated data, or all accounted data is printed for each job step and totaled by job.

4.2. STRUCTURE, FUNCTIONS, AND OPERATING ENVIRONMENT

The UTJAS utility routine consists of a resident routine and nine overlays. The program requires 20K bytes of storage capacity and operates with any tape subsystem, disc subsystem, printer, or console printer supported by OS/4. The minimum requirement is one disc, one printer, and one console printer.

The resident portion of UTJAS, the root phase (phase 0), is made up of control routines and the DTF modules for the devices required by the utility routine. Overlay phases are read, as required, into an area of main storage immediately following the resident portion. The current phase overlays the preceding phase.

The phase numbering has no relation to the sequence in which it is called.

4.2.1. Phase 0, Root Phase

Phase 0 has the name UTJAS000 and is the resident portion of UTJAS. Phase 0 consists of the following:

- A routine that controls and provides access to the various overlay phases
- The control and I/O routines used by other phases in accessing the \$Y\$JACNT file

- Input and output DTFSD modules, input and output DTFMT modules, and DTFPR module
- A routine that writes diagnostic messages to the printer and/or the console
- An interface table that serves as the communications link between the overlay phases

If control is being passed to phase 9 because of a program check, except for a program check in phase 3, phase 0 will SNAP the program partition before calling in the phase 9 overlay.

4.2.2. Phase 1, Initial Routine

Phase 1 has the name UTJAS001 and consists of the following four functions:

- The interface table is initialized with data from the system information block and file control blocks of assigned files. The status of \$Y\$JACNT is verified; and SYSPOOL space is acquired as needed.
- After fulfilling one parameter request and before reading parameter data for the next function, phase 1 reinitializes switches and data fields set by the preceding parameter input and phase execution.
- Parameter input is processed, the required files are opened, and routines are set up to accomplish the requested functions. If the parameter data is valid, the information is set in the interface table and control is passed to phase 0, at which time the required phase is loaded.
- If the dump routine has been requested for a \$Y\$JACNT file residing on SYSRES and the accounting mode is active, phase 1 constructs a table containing initial number and job number of each currently running job. It also saves the current \$Y\$JACNT disc addresses used by the supervisor accounting routines. This allows accounting to continue during the dump and compress process, which refers to the table to determine whether an accounting record should be dumped to auxiliary file or retained on the compressed file.

4.2.3. Phase 2, Initialize \$Y\$JACNT File

Phase 2 has the name UTJAS002 and calls in the \$Y\$T7800 through \$Y\$T7803 transient routines to initialize the \$Y\$JACNT file area with a format write (preformats the area).

4.2.4. Phase 3, Compress \$Y\$JACNT File

Phase 3 has the name UTJAS003 and is unconditionally executed following the phase 5 dump function if no errors occurred. If errors were detected, not resulting in termination, UTJAS provides the user with the option to compress the file or cancel the job without compressing the \$Y\$JACNT file. The compress routine makes space that was occupied by the dumped jobs available for logging new data. Phase 3 collects all records not dumped and rewrites them in the newly available space toward the beginning of the \$Y\$JACNT file area. It also updates the \$Y\$JACNT index records and the current \$Y\$JACNT FILE disc address in the supervisor accounting routine.

Any unrecoverable errors on the \$Y\$JACNT file during the compress function result in cancellation of the job and also of the system job accounting function if the latter is active. The partially compressed \$Y\$JACNT file is of questionable value and should be reinitialized or defined on a new area or on a different volume.

If a program check occurs during phase 3 processing, phase 3 regains control, takes a SNAP of the program partition, deactivates the system job accounting function, and then passes control to phase 9.

4.2.5. Phase 4, Sort Routine

Phase 4 has the name UTJAS004 and is executed for all input uses of the \$Y\$JACNT file except the list index routine (LI parameter specified on the PARAM statement).

In a multijobbing environment, the accounting data of the various jobs is interspersed on the \$Y\$JACNT file. Therefore, the OS/4 sort/merge routine is used to reorder each job's data for chronological output to a printer or an auxiliary file. If a dump function is being performed, then only data for jobs that were terminated prior to the initiation of this function will be transferred to the sort routine and ultimately to the auxiliary file. This is accomplished by reading the \$Y\$JACNT file sequentially and checking each record against the running job table constructed by phase 1.

If an entry for the job is found in the table, the record is bypassed. Then, the next sequential \$Y\$JACNT record is read. Each record is checked against the running job table until:

- the \$Y\$JACNT disc address equals that saved by phase 1;
- the \$Y\$JACNT disc address equals that supplied on a CCCHHR= parameter; or
- the end of the data record is encountered.

If the dump function is executed for a \$Y\$JACNT file not on the SYSRES device, then the entire \$Y\$JACNT data area is acceptable to the sort and is ultimately dumped to the auxiliary file.

If the PR parameter is specified on the PARAM statement, the entire \$Y\$JACNT file data area is acceptable to the sort and ultimately to the print routine in phase 5.

For each \$Y\$JACNT record not bypassed, the following information is passed to the sort routine:

- Job logging date (ydd)
- Job start time
- Initial number
- Job number
- Step number
- Sequence number
- Disc address (cchhr) of the record in the \$Y\$JACNT file

After all \$Y\$JACNT input has been processed, control is passed to UTDSM routine; a delay should be expected while the sort is executed.

When the sort routine (phase 4) terminates, the sorted information is retrieved; the 5-byte cchhr portion of the record is blocked 89 per record, and written to the SYSPool space acquired in phase 1 in standard 446-byte blocks to be used by phase 5.

4.2.6. Phase 5, Copy/Dump/Print \$Y\$JACNT File

Phase 5 has the name UTJAS005 and consists of the following functions:

- Copy Function

The copy function reads the alternate library (ALTLIB) file and writes it to the output library (LIBOUT) file until an end of file (EOF) is reached on ALTLIB. This function begins with a message to inform the operator of the program's progress.

- **Dump Function**

The dump function transfers from LIBIN to an auxiliary tape or disc file all accounting data for jobs that were terminated prior to the initiation of this function. All jobs running or initiated after the dump function began are passed over, and control is passed to phase 3 when the dump function terminates. This function begins with a message to inform the operator of the program's progress.

The dump function reads a block of sorted record addresses, unblocks the record, and randomly reads the \$Y\$JACNT file according to the sorted addresses. Each \$Y\$JACNT record retrieved is converted to auxiliary record format and placed in the auxiliary record buffer. When the buffer is full, the records are dumped to the printer, an auxiliary tape or disc file, or both. At completion of the dump function, the LIBOUT file is closed.

- **Print Function**

The print function prints and totals the data from the auxiliary buffer.

4.2.7. Phase 6, Print the Auxiliary File

Phase 6 has the name UTJAS006. It reads the auxiliary library input file and passes control to a subroutine that prints the record. This is the same print subroutine used by phase 5.

4.2.8. Phase 7, List \$Y\$JACNT File — Index Format

Phase 7 has the name UTJAS007 and reads the \$Y\$JACNT file sequentially on the library input file (LIBIN). Using the first record of each job (step #1, sequence #1), it outputs limited information to the printer file.

4.2.9. Phase 8, List Auxiliary File — Index Format

Phase 8 has the name UTJAS008 and reads the auxiliary input library file. Using the first record of each job (step #1, sequence #1), it outputs limited information to the printer file.

4.2.10. Phase 9, End-of-Job Routine

Phase 9 has the name UTJAS009.

If SYSPool space was used, the space is returned to the system.

If the \$Y\$JACNT file has been defined as an input or output library file, the amount of available space remaining on the \$Y\$JACNT file is calculated. This calculated value is output to a printer or to the system console if there is no printer.

The EOJ macro instruction is issued for normal termination. The CANCEL macro is executed as indicated in either the 9400/9480 systems operations handbook, UP-7871 (current version) or the 90/60,70 systems operations handbook, UP-7937 (current version) where UTJAS error messages are described. In general, the CANCEL macro is executed when a program check occurs or when the user responds with a U to a UNxx UTJAS error message.

4.3. LOGICAL FILE DEFINITIONS

All input and output files required by UTJAS must be defined in the control stream in accordance with job control specifications.

Before a tape can be used as LIBOUT, it must be initialized with standard labels by the magnetic tape preparation routine, UTPREP; the block number parameter must be specified on the parameter statement.

When an auxiliary tape or disc file is used as LIBIN or ALTLIB, the file must have been the output (LIBOUT) of a previous dump.

The logical file names as specified on the LFD statements for UTJAS files are given in Table 4—1, together with an explanation of their proper use.

The relationship of the function specified on the PARAM statement to the file definitions required in the control stream is shown in Table 4—2.

Table 4—1. File Names for Logical File Definitions

LFD Filename	Usage
LIBIN	Primary input file. Must be specified for all functions except ID. Depending on the functions requested, LIBIN may be: <ul style="list-style-type: none"> — $\\$Y\\$JACNT$, whether on SYSRES or on a systems disc pack used as a data disc — Auxiliary tape — Auxiliary disc
ALTLIB	Secondary input file. ALTLIB may be used only when the CD or CP parameter is specified on the PARAM statement or is input via the system console. ALTLIB may be: <ul style="list-style-type: none"> — Auxiliary tape — Auxiliary disc
LIBOUT	Output tape or disc file. LIBOUT is used with all functions except LI and PR. LIBOUT may be: <ul style="list-style-type: none"> — $\\$Y\\$JACNT$, whether on SYSRES or on a systems disc pack used as a data disc, with ID parameter — Auxiliary tape — Auxiliary disc
PRNTR	Printer output file. The printer must always be defined via job control statements in the control stream. The hardware printer or COOP must be available for LI, PR, DP, and CP functions. The DU, ID, and CD functions will execute without a printer, but one must be at least optionally assigned. <p>NOTE:</p> <p>When an optional printer is not available, the DU, ID, and CD functions output an abbreviated prntr output to the systems console printer.</p>
DM01...08 or PM01...08	SYSPOOL file or private work file required by sort/merge routine. (The file-id is $\$Y\$POOL$ or any user ID.) The file area must be large enough to sort either seventy 14-byte records per cylinder of $\$Y\$JACNT$ file residing on a SPERRY UNIVAC 8411 Disc Subsystem or two hundred sixty 14-byte records per cylinder of $\$Y\$JACNT$ file residing on a SPERRY UNIVAC 8414, 8424, 8425 Disc Subsystem. A total of eight work files may be defined.

Table 4-2. Relationship of PARAM Statement to LFD Statement

Parameter	Function	Action	LFD Filename				
			LIBIN	ALTLIB	LIBOUT	PRNTR	DM01...DM08 or PM01...PM08
ID	Initialize \$\$JACNT	Preformats LIBOUT	-	-	\$\$JACNT	Optional	-
LI	List-Index Format	LIBIN to PRNTR	{ \$\$JACNT Aux. disc Aux. tape }	-	-	Required	-
PR	Print	LIBIN to PRNTR	{ \$\$JACNT Aux. disc Aux. tape }	-	-	Required	Required if LIBIN=\$\$JACNT
DU	Dump	LIBIN to LIBOUT	\$\$JACNT	-	{ Aux. disc Aux. tape }	Optional	Required
CD	Copy, Dump	{ ALTLIB to LIBOUT LIBIN to LIBOUT }	\$\$JACNT	{ Aux. disc Aux. tape }	{ Aux. disc Aux. tape }	Optional	Required
DP	Dump, Print	{ LIBIN to LIBOUT LIBIN to PRNTR }	\$\$JACNT	-	{ Aux. disc Aux. tape }	Required	Required
CP	Copy, Dump, Print	{ ALTLIB to LIBOUT LIBIN to LIBOUT LIBIN to PRNTR }	\$\$JACNT	{ Aux. disc Aux. tape }	{ Aux. disc Aux. tape }	Required	Required

4.4. PARAMETER STATEMENT

The functions to be performed by the various phases of UTJAS are specified through parameters supplied either on PARAM statements in the control stream or on the systems console keyboard. Up to 10 parameters, separated by commas, may be submitted on the same PARAM statement or console transmission. (However, discretion should be used in doing this.) Parameters are processed in the order in which they are presented. Any excess beyond 10 parameters on a single card or console transmission is ignored.

If the PARAM statement is included in the control stream, UTJAS performs the requested functions. The end of parameter card input causes termination of UTJAS following completion of the final function requested.

If no PARAM statement is included, UTJAS solicits input through the system console keyboard by issuing the message:

UN10 ENTER PARAMETERS (CCCHHR=XXXXXX,LI,PR,DU,DP,CD,CP,ID,EN)

The operator replies by typing the appropriate parameters.

Certain combinations of parameters are unadvisable, such as PR and DP (time-consuming use of the printer), or DU and CD (dumping LIBIN twice).

The PARAM statement is included in the control stream immediately following the // EXEC UTJAS statement.

Format:

LABEL	△ OPERATION △	OPERAND
	//△ PARAM△	{ ID [CCCHHR=ccchhr] [,LI] [,PR] [,DU] [,CD] [,DP] [,CP] [,EN] }

Parameters:

ID

Initializes the \$Y\$JACNT file by preformatting the required area on SYSRES or on a system disc pack used as a data disc. If the \$Y\$JACNT file to be initialized is on the SYSRES device, the JAS mode must be inactive; also, following initialization, entries in the job accounting area of the supervisor are updated to reflect the new status of the file.

This parameter should not be specified in combination with any other parameter.

CCCHHR=ccchr

Each time an accounting data record is added to the \$Y\$JACNT file, an end-of-data record is written in the next record position. Each subsequent data record overwrites the previous end-of-data record, and a new end-of-data record is written. When an unrecoverable I/O error occurs while writing to the \$Y\$JACNT file, the end-of-data record is also compromised. JAS produces the error message:

JA51 I/O ERROR ON \$Y\$JACNT CCCHHR=ccchr

where:

ccchr

Is the disc ID of the unwritten end-of-data record. The system job accounting function is deactivated.

The CCCHHR parameter is provided to enable the user to access the \$Y\$JACNT file before taking corrective action described later. The CCCHHR=ccchr is submitted exactly as displayed, followed by, for example, PR and DU. UTJAS uses the ccchr in place of the \$Y\$JACNT end-of-data record.

Once submitted, the CCCHHR= parameter remains in effect for the remainder of the job step.

When the CCCHHR= parameter is used with a dump function, the \$Y\$JACNT file is not compressed.

To reactivate the job accounting function, the file must be reinitialized either by rebooting the system and responding with INIT to the SV30 message, or by using UTJAS to reinitialize the file and then keying in the ACCOUNT ON operator command.

LI

Lists library input file (LIBIN) in index format. The output consists of basic information, two jobs per print line.

PR

Prints the library input file (LIBIN). LIBIN may be the \$Y\$JACNT file, either on SYSRES or a data disc, or it may be an auxiliary tape or disc output from a previous dump run.

DU

Dumps the LIBIN \$Y\$JACNT file to LIBOUT. The accounting data for each (sorted chronologically) is written to auxiliary disc or tape file.

CD

Copies the auxiliary tape or disc input file (ALTLIB) to LIBOUT. (This is referred to as the copy function.) This is followed by the dump function which dumps LIBIN to LIBOUT.

DP

Dumps and prints the LIBIN \$Y\$JACNT file. This is a combination of the DU and PR parameters.

CP

This is a combination of the copy, dump, and print functions. ALTLIB is copied to LIBOUT; the current LIBIN is dumped to LIBOUT; and the current LIBIN is printed.

EN

Indicates the end of parameter input. This parameter is required when input is via the system console. This parameter is not necessary with card input.

Examples:

	LABEL	△OPERATION△	OPERAND	△
1		10	16	
1.	/ / / PARAM	LI		
2.	/ / / PARAM	ID		
3.	/ / / PARAM	CC,CHHR	=10A112C,CD	

1. Lists, in index format, the contents of the file identified as LIBIN.
2. Format-writes (preformats) the index and text areas of the LIBOUT \$Y\$JACNT file.
3. Copies ALTLIB to LIBOUT, then dumps LIBIN \$Y\$JACNT file to LIBOUT, using the supplied disc address instead of the EOF record.

4.5. AUXILIARY TAPE/DISC FILE

UTJAS uses the SPERRY UNIVAC OS/4 Data Management System to create the auxiliary tape or disc files. When defining the file with the DTFMT or DTFSD macro instruction, the record format is undefined (RCFM=UNDEF) and the maximum record size is 615 bytes (BKSZ=615). For auxiliary tape files, the blocks must be numbered (BKNO=YES). Each record in the job accounting auxiliary file consists of a standard area and from one to five other areas of varying lengths.

4.5.1. Standard Area

Every record in the auxiliary file has a 20-byte area that has the same format and similar contents as every other record in the file. The format of this area is shown in Figure 4-1. A brief description of each field in the record follows the figure.

	0	1	2	3
0	system initial number			job number
4	job number	job step number		
8	sequence number		fixed-length area size	
12	number of I/O counters		number of message counters	
16	job termination data area size		number of job end I/O counters	

Figure 4-1. Format of Standard Area

<u>Field</u>	<u>Code</u>	<u>Description</u>
Bytes 0—2	EBCDIC	System initial number in effect when the job was initiated
Bytes 3—4	EBCDIC	Job number as appears on the console log
Bytes 5—7	EBCDIC	Job step number
Bytes 8—9	EBCDIC	Sequence number, starting with 1, of the record for a given job step ←
Bytes 10—11	Packed decimal	Number of bytes in the fixed-length area (4.5.2). This fixed-length area is included in the first record of each job step.
Bytes 12—13	Packed decimal	Number of I/O counters (4.5.3) included in the record
Bytes 14—15	Packed decimal	Number of message (line/terminal) counters (4.5.4) included in the record
Bytes 16—17	Packed decimal	Number of bytes in the fixed-length area containing job termination data (4.5.5)
Bytes 18—19	Packed decimal	Number of job end I/O counters (4.5.6) included in the record. Only I/O counters that received data after job step termination until job termination are included.

4.5.2. Fixed-Length Area

The first record of each job step includes a fixed-length area that contains information and statistics for that job step. The format of this area is shown in Figure 4—2. A brief description of each field in the record follows the figure.

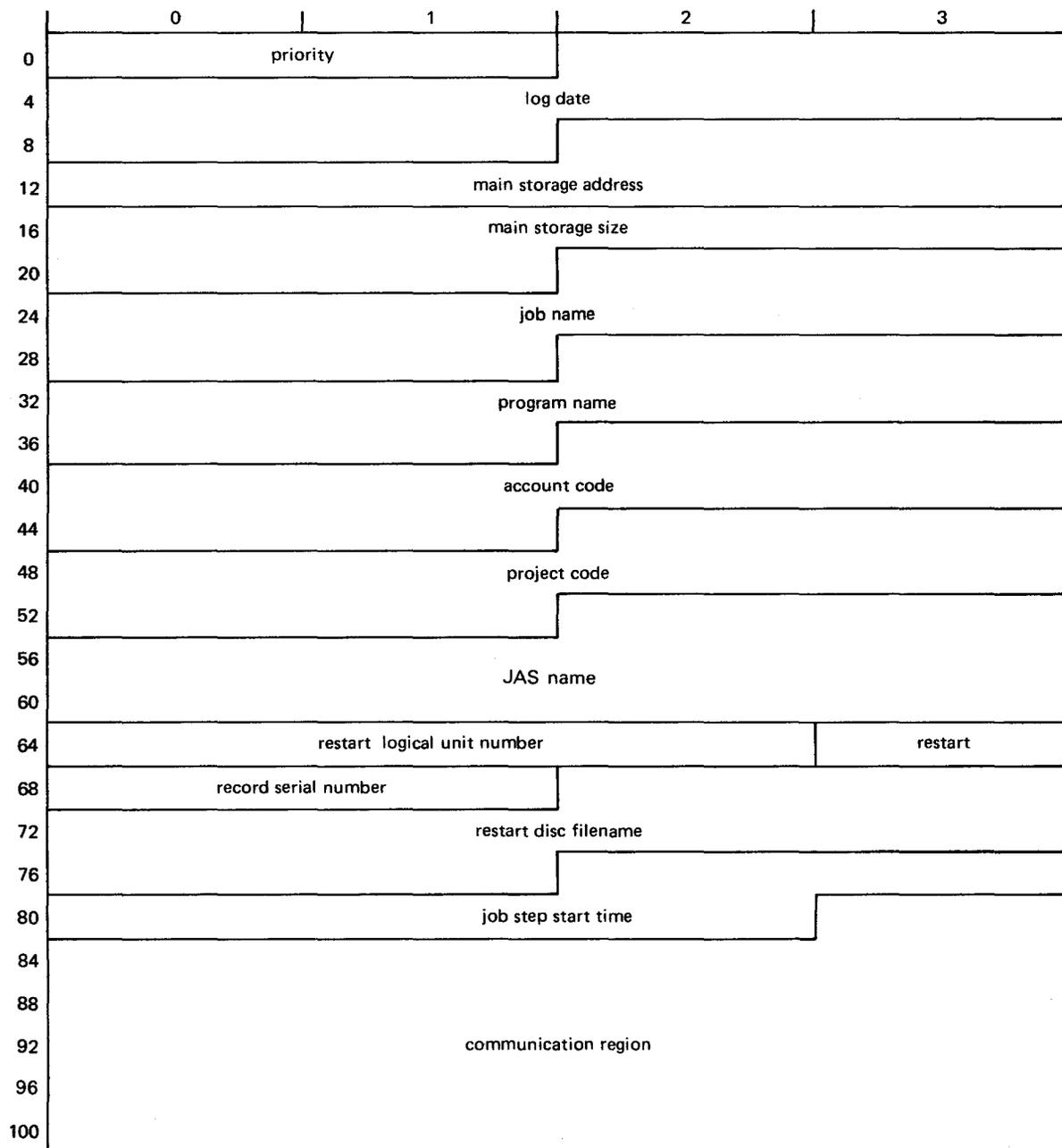


Figure 4-2. Format of Fixed-Length Area (Part 1 of 2)

	0	1	2	3
104		UPSI		alter
108	alter-no	BOF	DOF	IMSG off
112	IMSG on	IMSG ONP	no ERC log	MAYIDUMP
116	MCL	multifil	no dump	no ready
120	NOVOL	SYSDUMP	reserved	NOWP
124	retry	SCR	symbiont	9700
128	reserved			
132				
136				SCR factor
140	SCR factor	MCL factor		no I/O counter
144	no message counter	reserved		
148				
152	job step end time			
156	job step CPU time			
160				
164	phase counter			
168	transient counter			
172				
176	GETCS counter			
180	OPR counter			
184	SYSRES counter			
188	SYSLST print counter			
192				
196	SYSLST skip counter			
200	SYSPCH counter			
204	termination status			

OPTION
BYTES

Figure 4-2. Format of Fixed-Length Area (Part 2 of 2)

<u>Field</u>	<u>Code</u>	<u>Description</u>
Bytes 0—1	EBCDIC	Priority number as submitted on the JOB job control statement. The default value is 13.
Bytes 2—9	EBCDIC	The date stored in SB\$DTE when the job was initiated. The format is xx/xx/xx.
Bytes 10—15	EBCDIC	Low-order main storage location of the job, as it appeared in the JC01 console message
Bytes 16—21	EBCDIC	Number of bytes required by the job, as it appeared in the JC01 message. This is calculated as follows: (JP\$PAD + 12) — JP\$PRE + 1.
Bytes 22—29	EBCDIC	Job name as it appears on the JOB job control statement
Bytes 30—37	EBCDIC	Program name as it appears on the EXEC job control statement, left-justified and padded with EBCDIC zeros
Bytes 38—45	EBCDIC	Account code as it appears on the ACCT job control statement, right-justified and padded with blanks
Bytes 46—53	EBCDIC	Project code as it appears on the ACCT job control statement, right-justified and padded with blanks.
Bytes 54—63	EBCDIC	Job accounting name as it appears on the ACCT job control statement, right-justified and padded with blanks
Bytes 64—66	EBCDIC	Logical unit number as it appears on the RSTRT job control statement
Bytes 67—69	EBCDIC	Record serial number as it appears on the RSTRT job control statement
Bytes 70—77	EBCDIC	Disc file name as it appears on the RSTRT job control statement
Bytes 78—82	EBCDIC	Job step start time in the format hh:mm, where hh = hour and mm = minute, taken from SB\$TOD
Bytes 83—104	EBCDIC	The EBCDIC representation of the hexadecimal contents of the job's communication region. This requires two EBCDIC bytes for each hexadecimal byte.
Bytes 105—106	EBCDIC	The EBCDIC representation of the hexadecimal contents of the UPSI byte
Bytes 107—138	EBCDIC	Option bytes. When content of byte is 1, the option is set for the job step. When content is 0, the option is not set.
Bytes 139—140	EBCDIC	Multiplicative factor for the scratch file allocation in SYSPool, as stored in JP\$JDA
Bytes 141—142	EBCDIC	Multiplicative factor for the MCL file allocation in SYSPool, as stored in JP\$JDA

<u>Field</u>	<u>Code</u>	<u>Description</u>
Byte 143	EBCDIC	When set to 1, indicates that one or more I/O counters could not be assigned to allocated devices due to a shortage of counters
Byte 144	EBCDIC	When set to 1, indicates that one or more message counters could not be assigned due to a shortage of counters
Bytes 145—150	EBCDIC	Reserved; initialized to EBCDIC zeros
Bytes 151—155	EBCDIC	Job step end time, as stored in SB\$TOD
Bytes 156—163	Packed decimal	CPUT time used by the job step. This item is subdivided into four 2-byte packed decimal fields representing hours, minutes, seconds, and milliseconds, in that order.
Bytes 164—168	Packed decimal	A count of the number of attempts to load a phase for this job
Bytes 169—173	Packed decimal	A count of the number of requests for transient routines issued for this job; includes EOJ, LOADER, and GETCS requests
Bytes 174—178	Packed decimal	A count of the number of disc-buffered card images successfully retrieved via a GETCS macro or a COBOL ACCEPT verb by a user program. This includes // param cards, /\$, /*, and data cards.
Bytes 179—183	Packed decimal	A count of the number of OPRs issued for this job (OPRs issued by a user program, its transients, and job control)
Bytes 184—188	Packed decimal	A count of the number of I/O orders to SYSRES for this job
Bytes 189—193	Packed decimal	A count of the number of EXCPs to SYSLST, excluding SKIP EXCPs, for this job
Bytes 194—198	Packed decimal	A count of the number of SKIP EXCPs issued to SYSLST for this job
Bytes 199—203	Packed decimal	A count of the number of EXCPs to SYSPCH for this job
Byte 204	EBCDIC	Termination status: N Normal C Cancel D Dump J Job control abort

NOTE:

SB\$xxx and JP\$xxx labels are defined in Section 3 of the 9400/9480 systems OS/4 supervisor programmer reference, UP-7689 (current version) and 90/60,70 systems OS/4 supervisor programmer reference, UP-7934 (current version).

4.5.3. I/O Counter Area

This area, when present, contains information on the I/O counters allocated to the job. This area varies in length according to the number of counters assigned. If more I/O counters are assigned than can be contained in the first record for the job step, additional records are written. I/O counters that contain zero counts represent devices allocated but not used during the job step. Each I/O counter has the format shown in Figure 4—3. A brief description of each field in the record follows the figure.

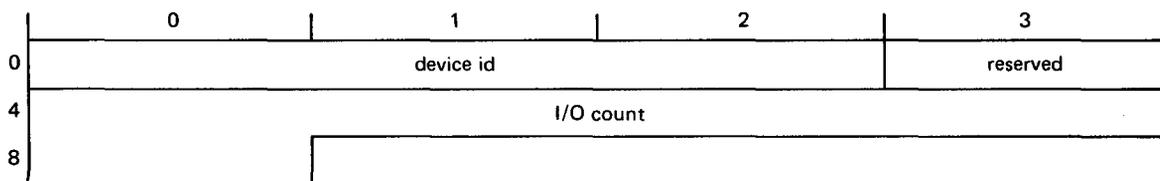


Figure 4—3. I/O Counter Area

<u>Field</u>	<u>Code</u>	<u>Description</u>
Bytes 0—2	EBCDIC	Device identification
Byte 3	EBCDIC	Reserved; initialized as X'40'
Bytes 4—8	Packed decimal	A count of the number of EXCPs to the device attempted by a user program, its called transients, and job control

4.5.4. Message Counter Area

This area, when present, contains information on the message (line/terminal) counters allocated to the job. This area varies in length according to the number of counters assigned. If more message counters are assigned than can be contained in one record, additional records are written. The format of the message counter is shown in Figure 4—4. A brief description of each field in the record follows the figure.

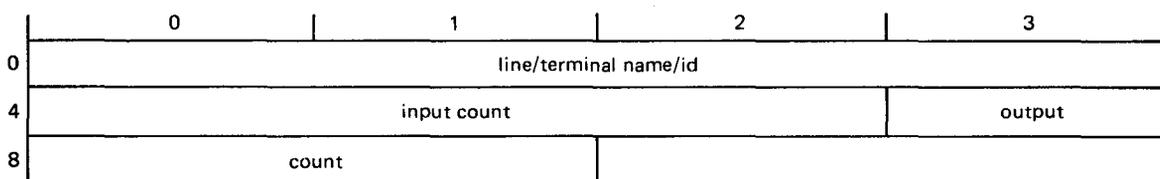


Figure 4—4. Message Counter Area

<u>Field</u>	<u>Code</u>	<u>Description</u>
Bytes 0—3	EBCDIC	Line/terminal name or identification as supplied by the user at MCP generation time
Bytes 4—6	Packed decimal	A count of the number of messages from the terminal to the processor
Bytes 7—9	Packed decimal	A count of the number of messages from the processor to the terminal

4.5.5. Job Termination Data Area

This area, when present, contains data concerning activity on behalf of a job from the final job step termination to job termination. The format of the job termination data area is shown in Figure 4—5. A brief description of each field in the record follows the figure.

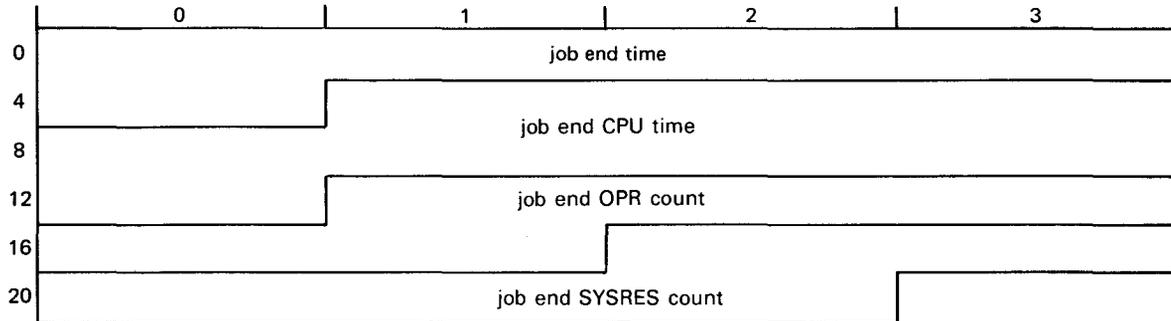


Figure 4—5. Job Termination Data Area

<u>Field</u>	<u>Code</u>	<u>Description</u>
Bytes 0—4	EBCDIC	Job end time, which has the format hh:mm, where hh = hours, and mm = minutes
Bytes 5—12	Packed decimal	CPU time used between the end of the final job step and job termination. This field is subdivided into four 2-byte packed decimal fields representing hours, minutes, seconds, and milliseconds, in that order.
Bytes 13—17	Packed decimal	A count of the number of OPRs issued for this job following termination of the final job step.
Bytes 18—22	Packed decimal	A count of the number of I/O orders to SYSRES for this job, following termination of the final job step.

4.5.6. Job End I/O Counters Area

This area, when present, contains information on the I/O counters for any device that received I/O EXCPs for this job, following termination of the final job step. Items such as TAKE ALL, MTC, and DUMP are accounted for in this area. These I/O counters are the same as those described in 4.5.3 with the format shown in Figure 4—3. Only I/O counters with nonzero count fields are included in this area.

4.6. JOB CONTROL STREAM EXAMPLES

Examples of control streams that may be used to execute UTJAS are given in the following paragraphs. If the PARAM statement is used, it must be placed in the control stream as shown in examples 1 through 4. If the parameters are to be entered via the system console, then the procedure is as shown in example 5.

4.6.1. Parameter Input via the PARAM Statement

Example 1:

1	LABEL	△OPERATION△ 10 16	OPERAND	△
	// JOB	A		
	// OPTION	MAYIDUMP		
	// DNC	20,P	// LED PRNTR	
	// DNC	80	// VOL DSP313	
	// LBL	\$Y\$JACNT	,DSP313 // LED LIBOUT	
	// EXEC	UTJAS	,LOAD\$LIB,REL	
	// PARAM	ID		
	//&			

This example initializes the \$Y\$JACNT file on LIBOUT.

Example 2:

	// JOB	B		
	// OPTION	MAYIDUMP,NOREADY		
	// DNC	20,P	// LED PRNTR	
	// DNC	80	// VOL DSP313	
	// LBL	\$Y\$JACNT	,DSP313 // LED LIBIN	
	// EXEC	UTJAS	,LOAD\$LIB,REL	
	// PARAM	LI		
	//&			

This example lists LIBIN in index format on the printer.

Example 3:

	// JOB	C		
	// OPTION	MAYIDUMP,NOREADY		
	// DNC	20,P	// LED PRNTR	
	// DNC	70	// VOL DSP706	
	// LBL	AUX1	,DSP706 // LED LIBIN	
	// EXEC	UTJAS	,LOAD\$LIB,REL	
	// PARAM	LI,PR		
	//&			

This example lists LIBIN in index format and then prints the entire LIBIN file.

Example 4:

1	LABEL	Δ OPERATION Δ	OPERAND	Δ
		10	16	
/ /	JOB	D		
/ /	OPTION	IMAYID	DUMP, NOREADY	
/ /	DVC	20, P	/ / LFD PRNTR	
/ /	DVC	80	/ / VOL DSP313	
/ /	LBL	\$Y\$JACNT	, DSP313 / / LFD LIBIN	
/ /	DVC	50, T	/ / VOL SP1798	
/ /	LBL	AUX001	, SPA001 / / LFD ALTLIB	
/ /	DVC	81, D	/ / VOL DSP576	
/ /	LBL	\$Y\$POOL	, DSP576 / / LFD DMO1	
/ /	DVC	82, D	/ / VOL DSP313	
/ /	LBL	\$Y\$POOL	, DSP313 / / LFD DMO2	
/ /	DVC	51, T	/ / VOL SP1976	
/ /	LBL	AUX002	, SPA002 / / LFD LIBOUT	
/ /	EXEC	UTJAS	, LOAD\$LIB, REL	
/ /	PARAM	CD	} Any of these statements may be used with this control stream	
/ /	PARAM	CP		
/ /	PARAM	DU		
/ /	PARAM	DP		
/ /	PARAM	LI		
/ /	PARAM	PR		
/ /	PARAM	LI, DU		
/ &				

4.6.2. Parameter Input via System Console

Example 5:

1	LABEL	△OPERATION△		OPERAND	△
		10	16		
	// JOB	E			
	// OPTION	MAYIDUMP,	NOREADY		
	// DVC	201,P	// LFD PRNTR		
	// DVC	70	// VOL DS11111		
	// LBL	\$Y\$JACNT,	DS11111 // LFD LIBIN		
	// DVC	60	// VOL SYR100		
	// LBL	AUX1,	SYR100 // LFD ALT.LIB		
	// DVC	61,D	// VOL SYR200		
	// LBL	\$Y\$PDOL,	SYR200 // LFD DM01		
	// DVC	62,D	// VOL SYR300		
	// LBL	USERWORK,	SYR300 // LFD DM01		
	// DVC	50,F	// VOL TP1000		
	// LFD	LIBOUT			
	// EXEC	UTJAS,	LOAD\$LIB,	REL	
	// &				

At execution time, UTJAS displays the following console message:

```
nn ENTER PARAMETERS (CCCHHR=XXXXXX,LI,PR,DU,DP,CD,CP,ID,EN)
```

where:

nn

Is the job number for 9400/9480, or is the message number for 9700.

Any of the following responses are valid for use with this control stream.

```
nnR LIⓈ
nnR DUⓈ
nnR PRⓈ
nnR DPⓈ
nnR CDⓈ
nnR CPⓈ
nnR CCCHHR=10A12C,DPⓈ
nnR LI,DU,ENⓈ
nnR LI,CD,ENⓈ
nnR CD,LI,ENⓈ
nnR ENⓈ
```

If EN is not present in a parameter input transmission, UTJAS repeats the ENTER PARAMETERS message. The user may respond with additional parameters including EN.

4.7. PRINTER OUTPUT

There are four types of printer outputs: a heading page, a PRINT function output, an LI parameter output, and a UTJAS termination output. Each of these outputs is discussed in the following paragraphs. The abbreviations and terms that appear in these outputs are explained in Table 4-3.

Table 4-3. Printout Abbreviations and Terms (Part 1 of 2)

Abbreviation/Term	Explanation
ACCOUNT	From // ACCT card, if used
CHKPT NO.	Record number of the restart record. If a // RSTRT card was not used for the job, this item is not printed.
COMREG	Communications region. If its value is zero, the item is not printed.
ELAPS	Elapse time: the difference between start and end time
FILE NAME	Disc checkpoint file name: printed when available
FLAGS I	Unavailable I/O counter or counters
FLAGS L	Unavailable line/terminal counter or counters
I/O counters	All I/O counters assigned to the job step are printed. Zero counts indicate allocated devices that received no I/O activity. The format of the I/O counters is: DVC ID=count. A pair of identical DVC IDs (example: EE0=868, EE0=17) represents the count of nonskip EXCPs and the count of skip EXCPs, respectively, to a printer.
JJ	Job number
LIBIN=xxxxxx	Volume serial number of LIBIN storage device
Line/terminal counters	The format of the line/terminal counter is: NAME=x/y. NAME is the line or terminal identification assigned at MCP generation time; x is the count of messages from the device to the processor; y is the count of messages from the processor to the device.
LOG DATE yy/mm/dd	System date in effect when job data on printout was logged
MB	Memory base
MS	Memory size
NAME	From // ACCT card, if used
OPTIONS	All options in effect for the job step are listed.
P	Priority
PROJECT	From // ACCT card, if used
RESTART LUN	Restart logical unit number. If a // RESTART card was not used for the job, this item is not printed.
S/M=xx/yy	S = scratch file xx = multiplicative factor for SCRATCH file allocation in SYSPPOOL used by disc processors M = MCL file yy = multiplicative factor for MCL file allocation in SYSPPOOL used by disc processors
	NOTE: For additional information relating to size determination factors, refer to the software conventions programmer reference, UP-7945 (current version), paragraph 5.2.

Table 4-3. Printout Abbreviations and Terms (Part 2 of 2)

Abbreviation/Term	Explanation
SSS	Step number
Standard counters	Standard counters are allocated to every job step; if the count is zero, the item is not printed.
GCS=xx	Standard counter that indicates the number of disc-buffered card images successfully retrieved via GETCS by a user program, including // PARAM, /\$, and /* statements
LSTL=xx	Standard counter that indicates the number of EXCPs to SYSLST, excluding SKIPs
LSTS=xx	Standard counter that indicates the number of SKIP EXCPs to SYSLST
OPR=xx	Standard counter that indicates the number of OPR requests (user program, transients, and job control)
PCH=xx	Standard counter that indicates the number of EXCPs to SYSPCH
PHAS=xx	Standard counter that indicates the number of attempts to load phases
RES=xxx	Standard counter that indicates the number of EXCPs to \$Y\$RES
TRAN=xx	Standard counter that indicates the number of requests for transients
TS	Termination status
UPSI	User program switch. If its value is zero, this item is not printed.

4.7.1. Heading Page

When a printer is available, UTJAS outputs a heading page. An example of a header page is provided in Figure 4-6.

4.7.2. PRINT Function Output

Because of the potentially voluminous printout that could result from a large \$Y\$JACNT file and because of the varying amounts of data pertinent to individual jobs and job steps, the print output of the UTJAS has been designed with a free format.

Two examples of printer outputs for the PRINT function are provided in Figure 4-7.

4.7.3. LI Parameter Output

An example of a printer output for the LI parameter is provided in Figure 4-8.

```
① UNIVAC 9060/9070 05/4 10.00 JOB ACCOUNTING UTILITY 75/12/0R 14:41 SUPERVISOR YZ 10.01 JOB 14 CP1548  
② { LIBIN DS1548 SYSJACNT  
  { ALTLIB DSP576 DAUX1  
  { LIBOUT SPD416 TAPE0416  
③ // PARAM LI,CP  
④ { UNxx  
  { ↓  
  { UNxx
```

Explanation:

- ① Heading line showing:
 - Machine type
 - Job accounting utility version number
 - System date
 - Time of day
 - Supervisor identification
 - Job number
 - Job name
- ➔ ② Volume serial number and file IDs of LIBIN, ALTLIB, and LIBOUT, if assigned
- ③ // PARAM (parameter card input). If parameter input is via console keyboard, this line is suppressed.
- ④ Diagnostic messages (UNxx), if any

Figure 4-6. Example of Heading Page for Printer Output

```

① OS/4 JOB ACCOUNTING UTILITY LOG DATE 75/09/24 INITIAL NO. 128 LIBIN = 051548 PAGE 1U
② JOBNAME JJ 555 PROGRAME START END ELAPS CPU TIME TS P M8 MS ACCOUNT PROJECT NAME FLAGS
③ USERT4 11 1 USERT400 17:02 17:06 00:03 00:00:00:512 N 13 024000 002000 130.25 302.12 ENGINEERNG L ⑤
④ { S/M=1/1 OPTIONS: ALTER,ALTER-NO,MAXIDU*P,NOVOL,SYSDUMP PHAS=1 TRAN=8 OPR=11 RES=122 G92=14 LNES=5/4
TRM6=5/4
TERMINATION AT 17:05 , CPU TIME 00:00:00:052 OPR=1 RES=17
TOTALS: ELAPS 00:03 CPU TIME 00:00:00:564 PHAS=1 TRAN=8 OPR=12 RES=139 G92=14 LNES=5/4 TRM6=5/4

PRNT1548 12 1 UTDIPR00 17:06 17:07 00:01 00:00:03:749 N 13 024000 004000 12345678 12345678 ABCDEFGHIJ I
S/M=1/1 PHAS=1 TRAN=2 GCS=2 OPR=6 RES=255 EEO=868 EEO=17
TERMINATION AT 17:07 , CPU TIME 00:00:00:046 OPR=1 RES=16
TOTALS: ELAPS 00:01 CPU TIME 00:00:03:995 PHAS=1 TRAN=2 GCS=2 OPR=7 RES=271 EEO=868 EEO=17

PR1548 13 1 UTJAS000 17:09 17:10 00:01 00:00:09:918 N 13 024000 006000 200.05 407.75 PAYROLL
S/M=1/1 PHAS=11 TRAN=16 GCS=2 OPR=5 RES=632 EEO=342 EEO=22
TERMINATION AT 17:10 , CPU TIME 00:00:00:050 OPR=1 RES=16
TOTALS: ELAPS 00:01 CPU TIME 00:00:09:968 PHAS=11 TRAN=16 GCS=2 OPR=6 RES=648 EEO=342 EEO=22
    
```

Explanation:

- ① First heading line (at top of page) showing:
 - Title: OS/4 JOB ACCOUNTING UTILITY
 - LOG DATE xx/xx/xx: System date in effect when job data that follows was logged
 - INITIAL NO. nnn: System initial number in effect when job data that follows was logged
 - ② Second heading line: Refer to Table 4-3 for an explanation of abbreviations used in this line.
 - ③ First data line: Contains data corresponding to items in second heading lines.
 - ④ Second, third, etc. data line of job step data: This is a free format area, the length of which corresponds to the amount of information to be printed.
 - ⑤ Flags:
 - L Shortage of line/terminal counters: One or more lines/terminals were not accounted for this job.
 - I Shortage if I/O counters: One or more I/O devices were not accounted for this job.
- NOTE:
- When log date or initial number changes, a new page is started.
- LIBIN=xxxxxx: Volume serial number of LIBIN storage device
 - PAGE number: Numbered sequentially from 1 for each parameter processed

a. Example 1

Figure 4-7. Examples of Printer Outputs for PRINT Function (Part 1 of 2)

```

①          05/4 JOB ACCOUNTING UTILITY LOG DATE 75/10/01 INITIAL NO. 140 LIBIN = 051548 PAGE 16
② JOBNAME JJ SSS PROGNAME START END ELAPS CPU TIME TS P M8 MS ACCOUNT PROJECT NAME FLAGS
③ S/M=1/1 OPTIONS: MAYIDUMP,NOREADY PHAS=11 TRAN=14 GCS=206 OPR=4 RES=270 EEO=254 EEO=8 LA6=781
  15 2 DAS44000 18:33 18:37 00:04 00:01:35:757 N 13
  S/M=1/1 OPTIONS: MAYIDUMP,NOREADY PHAS=10 TRAN=24 GCS=4 OPR=3 RES=435 EEO=3,283 EEO=50 LA6=989 J84=2,869
  K81=1,678
④ 15 3 LIBUPS00 18:37 18:38 00:01 00:00:01:455 N 13
  COMREG 13580070000103070000 S/M=1/1 OPTIONS: MAYIDUMP,NOREADY PHAS=10 TRAN=13 GCS=7 OPR=3 RES=78 EEO=24
  EEO=4 LA6=270 J84=20 K81=0
⑤ TERMINATION AT 18:38 , CPU TIME 00:00:00:116 OPR=2 RES=32 J84=2 K81=1
⑥ TOTALS: ELAPS 00:07 CPU TIME 00:01:43:583 PHAS=31 TRAN=51 GCS=217 OPR=12 RES=815 EEO=3,561 EEO=62 LA6=2,040 J84=2,891
  K81=1,679

ASNUJ3 16 1 LIBUPS00 18:38 18:40 00:02 00:00:14:776 N 12 012000 009000 EX=800 205.ABC 125-GROUP
  S/M=1/1 OPTIONS: MAYIDUMP,NOREADY PHAS=13 TRAN=16 GCS=207 OPR=4 RES=274 EEO=242 EEO=7 LA6=2,395
  16 2 DAS44000 18:40 18:44 00:04 00:01:14:804 N 12
  S/M=1/1 OPTIONS: MAYIDUMP,NOREADY PHAS=10 TRAN=24 GCS=3 OPR=3 RES=435 EEO=2,396 EEO=38 LA6=746 J84=2,292
  K81=1,230
  
```

Explanation:

- | | |
|---|--|
| <p>① First heading line: Same as example 1</p> <p>② Second heading line: Refer to Table 4-3 for an explanation of abbreviations used in this line.</p> <p>③ Data line of job step data: This line is a continuation of job step data from previous page (page 15).</p> <p>④ Other data lines of same job: Job name is not repeated if job has more than one step.</p> <p>⑤ Termination data line: Items shown on this line or lines represent data included in the job termination data area of auxiliary accounting file record.</p> | <p>⑥ Totals line showing:</p> <ul style="list-style-type: none"> - Elapsed time (time from start of job to job termination) - CPU time (time from start of job to job termination) - Standard counters - I/O counters - Line/terminal counters <p>The totals include counts from all job steps, including the termination step.</p> |
|---|--|

b. Example 2

Figure 4-7. Examples of Printer Outputs for PRINT Function (Part 2 of 2)

LISTING OF SYSJACNT DS1548 MADE ON 75/12/08															PAGE 1
III	JJ	JOB NAME	LOG DATE	START	ACCOUNT	PROJECT	NAME	III	JJ	JOB NAME	LOG DATE	START	ACCOUNT	PROJECT	NAME
127	11	TAPE1548	75/09/24	16:47	305.75	103.20	ACCOUNTING	128	11	USERT4	75/09/24	17:02	130.25	302.12	ENGINEERNG
128	12	PRNT1548	75/09/24	17:06	12345678	12345678	ABCDEFGHIJ	128	13	PR1548	75/09/24	17:09	200.05	407.75	PAYROLL
137	11	PR1548	75/09/26	15:46	425.50	100.10	DATA-PROC	137	12	PR1548	75/09/26	15:46	425.50	205.5	PROGRAMING
137	14	PR1548	75/09/26	15:47	500.10	415.36	ADVERTIZNG	139	10	MLTIPR	75/10/01	08:34	1234	1234	ABCD
139	12	A	75/10/01	08:41	EX=800	205.ABC	125=GROUP	139	11	MLTIPR	75/10/01	08:39			
139	13	A	75/10/01	08:49				139	14	A	75/10/01	08:50	705.25	A.B.COOL	MAINTENANC
139	15	MLTIPR	75/10/01	08:54				139	16	MLTIPRC	75/10/01	08:56			
139	17	A	75/10/01	09:00				139	18	CDDKTP	75/10/01	09:06			
139	20	PRNT576	75/10/01	09:11				139	21	VTOCS76	75/10/01	09:13			
139	30	DUD	75/10/01	09:32	130.25	302.12	ENGINEERNG	140	10	GABELASH	75/10/01	18:04	100.21	2059.3	DEVELOPMNT
140	11	ASMUJD	75/10/01	18:05	200.05	407.75	PAYROLL	140	12	ASMUJI	75/10/01	18:10			
140	13	ASMUJD	75/10/01	18:26	425.50	205.5	PROGRAMING	140	14	GABELASH	75/10/01	18:31	305.75	103.20	ACCOUNTING
140	15	ASMUJI	75/10/01	18:31	1234	1234	ABCD	140	16	ASMUJ3	75/10/01	18:38	EX=800	205.ABC	125=GROUP
140	17	ASMUJ9	75/10/01	18:44				140	18	LINK	75/10/01	18:54	425.50	100.10	DATA-PROC
140	20	ASMUJ9	75/10/01	19:01	705.25	A.B.COOL	MAINTENANC	140	21	LINK	75/10/01	19:05	500.10	415.36	ADVERTIZNG
140	22	LINK	75/10/01	19:08				141	11	JASDISK	75/10/02	18:18	EX=800	205.ABC	125=GROUP

Explanation:

- ① First heading (at top of page) showing:
 - Title: LISTING OF \$Y\$JACNT
 - Volume serial number of LIBIN device (DS1548, in this example)
 - Current system date at the time of UTJAS execution
 - Page number
- ② Second heading line: Contains the items that are to be listed in the printout. (Refer to Table 4-3 for an explanation of abbreviations used in this line.)
- ③ Data lines: Each data line consists of basic data for two jobs.

Figure 4-8. Example of Printer Output for LI Parameter

4.7.4. UTJAS Termination Output

At the termination of UTJAS, if the \$Y\$JACNT file was defined as LIBIN or LIBOUT for the job step and if no unrecoverable error had occurred on the \$Y\$JACNT file, then UTJAS skips to a new page and outputs a heading line. Next, the UN98 message is produced:

UN98 xxxCYL yyyTRK REMAIN ON zzzzzz \$Y\$JACNT

where:

xxx

Is the number of unused (available) cylinders.

yyy

Is the number of unused (available) tracks.

zzzzzz

Is the volume serial number of the device containing the \$Y\$JACNT file.

An example of this printout is shown in Figure 4—9.

- ① UNIVAC 9060/9070 05/4 10.00 JOB ACCOUNTING UTILITY 75/12/08 14:43 SUPERVISOR Y2 10.01 JOB 14 CP1548
- ② UN98 1 CYL 19 TRK REMAIN ON DS1548 \$Y\$JACNT

Explanation:

- ① Heading line showing:
 - Machine type
 - Job accounting utility version number
 - System date
 - Time of day
 - Supervisor identification
 - Job number
 - Job name
- ② UN98 message, which indicates the number of unused (available) cylinders and tracks on the device (volume serial number — in this example, DS1548) which contains the \$Y\$JACNT file

Figure 4—9. Example of UTJAS Termination Printer Output



Comments concerning this manual may be made in the space provided below. Please fill in the requested information.

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UP No: _____ Revision No: _____ Update: _____

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