Program Product

OS/VS2 MVS
Resource Measurement
Facility (RMF) Version 2
Reference and User's Guide

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The Resource Measurement Facility (RMF) is a measurement collection tool that is designed to measure selected areas of system activity and present the data collected in the form of SMF (System Management Facility) records, formatted printed reports, or formatted display reports. An installation can use the information in the RMF output to evaluate system performance and identify reasons for performance problems.

This book provides a description of what RMF is, what it can do, and how to use it. It is intended for use by the system programmer responsible for installing or removing RMF and modifying its functions, for the system personnel responsible for measuring and improving system performance, and for the operator and terminal user. Because RMF is a tool for measuring system performance, this book assumes that the reader has extensive knowledge of the OS/VS2 MVS system. The book does not define most system terms, but it does include an acronym list.

The book contains three types of information:

- A basic, conceptual description of what RMF is and how it can help you to measure system performance.
- Procedural information that describes step-by-step approaches to making RMF work for you.
- Reference information that enables you to locate a specific piece of required information.

The contents and suggestions for use of each chapter are:

Chapter 1: Introduction presents basic, conceptual information about RMF. Everyone involved with installing, operating, modifying, and using RMF should read this chapter.

Chapter 2: Operating Procedures presents the operator commands, options, display commands, and display report menu items needed to run RMF. Separate sections describe RMF initialization, each type of session, and use of the post processor. A reference summary is provided for the system operator and for the terminal user.

Chapter 3: Procedures for Adding User Reports describes how to add a user report to Monitor I session processing, how to add a field to the fields traced by RMF, how to add a user report to Monitor II session processing, and how to add a routine to limit the use of RMF under TSO.

Chapter 4: Support Procedures describes the diagnostic flow for determining the type of any error encountered, and directions for submitting an APAR.

Chapter 5: Formatted Reports is a reference chapter that describes each report RMF issues. The report description includes suggestions for using the information in the report, a description of each field in the report, and at least one sample report. There is a separate section for Monitor I session reports and Monitor II session reports; within each section, the reports are described in alphabetical order. A third section describes the duration, summary, and plot reports the post processor generates. Note that each

field in each report also appears in the Index to help you to locate the description for a specific field as rapidly as possible.

Chapter 6: SMF Records is a reference chapter that describes each SMF record built by RMF. The length, source, and a brief description is given for each field in each record. The SMF records are presented in numerical order.

Chapter 7: Fixed Storage Requirements consists of a table that you can use to determine, according to the options you specify, the fixed storage requirements for the Monitor I session.

Chapter 8: Resource Measurement Facility User Completion Codes lists, in numerical order, each user completion code RMF issues. Problem determination information is also provided. If useful at your installation, you might want to place this chapter with the system completion code information kept at the operator console to aid the operator in responding to the messages issued by RMF.

The prerequisite publication is:

OS/VS2 MVS Resource Measurement Facility (RMF) Version 2 General Information Manual, GC28-0921

Other manuals contain information related to using RMF; these associated publications are:

OS/VS System Modification Program (SMP) System Programmer's Guide, GC28-0673.
MVS Selectable Unit Installation Guide, GC28-0747.
OS/VS2 System Programming Library: Initialization and Tuning Guide, GC28-0681.
OS/VS2 System Programming Library: System Management Facilities (SMF), GC28-0706.
OS/VS Message Library: VS2 System Messages, GC38-1002.
OS/VS Message Library: VS2 System Codes, GC38-1008.
OS/VS Message Library: VS2 Routing and Descriptor Codes, GC38-1102.
OS/VS Utilities, GC35-0005.
OS/VS2 System Programming Library: Service Aids, GC28-0674.
OS/VS2 System Programming Library: Job Management, GC28-0627.
OS/VS2 TSO Guide to Writing a Terminal Monitor Program or a Command Processor, GC28-0648.
OS/VS2 System Programming Library: TSO, GC28-0629.

Additional information about RMF appears in System Library Supplements. These Supplements are:

SC38-1041 for *OS/VS Message Library: VS2 System Messages*, GC38-1002. The Supplement describes each message RMF issues.
SC38-1043 for *OS/VS Message Library: System Codes*, GC38-1008. The Supplement describes the system completion codes RMF issues.
SC38-1042 for *OS/VS Message Library: VS2 Routing and Descriptor Codes*, GC38-1102. The Supplement describes the routing and descriptor codes for the messages RMF issues.

Acronym List

ACDS	Alternate Control Data Set
AFC	Available Frame Count
ASCB	Address Space Control Block
ASID	Address Space Identifier
ASM	Auxiliary Storage Manager
ASMVT	Auxiliary Storage Manager Vector Table
CDS	Control Data Set
CPU	Processor
CSA	Common Storage Area
CVT	Communications Vector Table
DCB	Data Control Block
DLIB	Distribution Library
ERV	Enqueue Residence Value
EXCP	Execute Channel Program
I/O	Input/Output
IORB	Input/Output Request Block
IPS	Installation Performance Specification
JCL	Job Control Language
LPA	Link Pack Area
LSQA	Local System Queue Area
MPL	Multiprogramming Level
MSO	Main Storage Occupancy
PG	Performance Group
PGP	Performance Group Period
PLPA	Pageable Link Pack Area
PPT	Program Properties Table
PSCB	Protected Step Control Block
PTF	Program Temporary Fix
PTS	PTF Temporary Store
PVT	Paging Vector Table
RMF	Resource Measurement Facility
RSM	Real Storage Management
SMF	System Management Facility
SMP	System Modification Program
SQA	System Queue Area
SRB	Service Request Block
SRM	System Resources Manager
SVC	Supervisor Call Instruction
TCB	Task Control Block
TSO	Time Sharing Option
UADS	User Attribute Data Set
UCB	Unit Control Block
UIC	Unreferenced Interval Count
VIO	Virtual Input/Output

Contents

Figures

This revision describes facilities added to RMF that enable the post processor to generate:

- Interval reports from data collected during a Monitor I session or a Monitor II background session.

- Duration reports that can summarize processor, channel, I/O device, page/swap data set, paging, or workload activity over a user-specified time period.

- Summary reports that include a line of system summary data for each interval included in the report and a single line of system summary data for all intervals included in the report. Either or both types of system summary data can be produced.

- Plot reports that present a graphic overview of system activity in a number of areas, such as processor busy percentage, maximum number of batch users, or activity rate for a channel or device.

This revision also includes miscellaneous technical corrections and additions. Changes are marked by revision bars to the left of the changed text or illustration.

The chapter describing the detailed procedures required to install, remove, and re-apply RMF after a subsequent system generation has been deleted from the book; these procedures are fully described in the Program Directory shipped with the RMF product.

**Summary of Amendments
for SC28-0922-0
Version 2 Release 1**

This book has been completely rewritten to reflect the additional functions supplied by Version 2 of RMF. Because of the extensive changes, no revision bars appear; the book should be reviewed in its entirety before Version 2 of RMF is used.

To improve the usefulness of message documentation, the descriptions of the messages and the system completion codes that RMF issues appear in System Library Supplements. These Supplements are described in the Preface to this book.

Chapter 1: Introduction

The OS/VS2 MVS Resource Measurement Facility (RMF) is a powerful
and flexible tool for measuring the performance of your system and helping
you to pinpoint the sources of performance problems. Effective system
tuning requires a long-term measurement tool that is easy to use, has little
impact itself on system performance, and is capable of reporting required
data at various levels of detail. RMF is such a measurement tool; using it
enables you to take a structured, disciplined approach to managing the
performance of your system.

Experience has taught us that a haphazard approach to system tuning
seldom results in performance improvements. As a result, a methodology —
a series of steps — has emerged; this effective approach to system tuning
has much in common with true experimentation. It includes the following
processes:

1. Use RMF to measure the current performance of your system in
   concrete terms, such as service provided, transaction rate, or TSO
   response time.

2. Define the objectives for your system in the same concrete,
   measurable context.

3. Use the measurements obtained during the first step to determine the
   general areas, such as I/O, processor, or real storage, where
   constraints are occurring. Based on these high-level measurements,
   use RMF to take more detailed measurements to determine the
   reasons for the constraints, enabling you to direct your tuning efforts
   toward specific problem areas.

4. Once these areas are identified, determine what steps to take to
   improve performance. Take these steps one at a time to isolate the
   effect of each improvement. To determine the effectiveness of the
   step you have taken, evaluate the result and compare the
   measurement to the earlier measurements and the concrete objectives
   you have set. Repeat the process until your objectives are met.

5. Continue to measure and evaluate your system's performance to
   enable you to spot performance problems before they become critical.

The common factor in all of these steps is constant measurement of the
system's performance, and RMF provides you with both the ability to
constantly measure the high-level performance indicators and the ability to
take detailed measurements of many problem areas indicated by the
high-level measurements. The data obtained can help you to:

- Identify system components that show patterns of exceptional
  utilization.
- Identify periods of system activity during which the utilization of
  particular resources is exceptional.
- Relate the service different classes of users are receiving to the
  specification provided in the IPS.
- Identify bottlenecks of resource contention.
- Locate excessive users of particular system services.

To use RMF as a high-level measurement tool, you might constantly measure processor (CPU) activity, paging activity, workload activity, channel activity, and direct access device activity, recording the data gathered in SMF records. These records, when archived, provide machine readable performance data over an extended period of time; the RMF post processor can be used at regular intervals to report high-level performance data with a minimal volume of printed output. When these high-level measurements indicate a problem, you can initiate more detailed reporting to isolate the cause.

To allow you to use RMF effectively, there are different ways to execute RMF. Each execution is called a session, and, as with the resources that can be measured and the feedback forms available, you choose the type of session that best meets your needs. During an RMF session, the basic unit of measurement and reporting is called an interval. At the end of the interval, RMF summarizes the data it has measured, formats the data, and reports it in the form you have selected.

RMF measures data in two ways: by exact count and by sampling. Data that is measured by exact count is obtained by checking the appropriate system indicators at the beginning and the end of the interval and computing the difference. Data that is sampled is obtained by checking the appropriate system indicators at each cycle within an interval. A cycle is a unit of time within an interval, usually relatively small in comparison to the length of the interval. At each cycle, RMF samples the data it requires. At the end of the interval, the mass of data collected at each cycle is reduced for reporting — for example, to present minimum, maximum, and average values for a field. You control the length of the interval for each type of RMF session and the length of the cycle for the type of RMF session that can sample data.

The resources RMF can measure, the forms of feedback it can generate, and the types of sessions that are available are described in the following sections. This chapter also includes information on system requirements for running RMF.

Measurement Activities

RMF can measure resource utilization in the following areas of system activity:

- Processor (CPU) activity, enabling you to determine how much wait time each processor experiences.
- Address space activity, in a variety of forms. The processor activity report includes an address space analysis section that gives an overview of how address spaces are being used and their status. Additional reports, available either at a display station or in printed or SMF record form, provide more detailed information. These reports cover address space state data, address space resource data, and address space SRM data. You can obtain these reports for all address spaces, groups of address spaces, or individual jobs. Thus, you can use RMF to obtain address space activity analysis at whatever level of detail you require.
- Channel activity, including both physical and logical channels. This information can be used most effectively in conjunction with the

detailed data presented in the I/O device activity report. Together, the reports can give you the information you require to achieve the best possible balance in configuring paths to devices and in workload management.

- I/O device activity, including detailed information about the activity of each device being measured and, when I/O requests are being delayed, the reasons for the delays. I/O device activity can be measured for direct access devices, magnetic tape devices, unit record devices, communication equipment, graphics devices, and character reader devices, depending on your particular configuration and needs.

- Paging activity, which can be reported on two levels. RMF provides a system overview report that can be obtained at a display station for immediate inspection. The report can also be printed or obtained as an SMF record. There is also a paging activity report that gives detailed information on paging activity, available in printed form or as an SMF record. These reports can alert you to a performance problem caused by excessive paging and give you the information you need to pinpoint the cause of the problem and take steps to correct it.

- Workload activity, which can be reported at three levels: performance group period, performance group, and system summary. By assigning unique performance group numbers and domain numbers to a particular user or set of users (such as subsystems, monitor programs, groups of users, and batch initiator classes), you can use the workload activity reports to show the system services provided for the particular user or set of users.

- Page/swap data set activity, which includes separate sections for page data sets and swap data sets. The information in these reports can help you to verify that the space allocation for each data set is right for your particular installation.

- ASM/RSM/SRM trace activity, which enables you to trace the contents of certain fields in the PVT control block, ASMVT control block, SRM data area, and SRM domain tables. This information can help you to monitor the SRM multiprogramming level (MPL) adjustment. There is a user exit provided in the tracing routine that enables you to add a field or fields to those offered by RMF.

- Enqueue activity, which measures the contention for a serially-reusable resource that is controlled by enqueuing. There is both a summary report and a detail report, and the detail report includes the names of one or two jobs that are contributing to the contention for a particular resource. The information on enqueue contention activity can be of great help in spotting points when excessive contention is occurring. You can then take steps, such as balancing the workload, to minimize performance problems caused by jobs waiting on a particular resource.

- Real storage/processor/SRM activity, which is available at a display station or in printed or SMF record form. This is an overview "snapshot" report that can be used to alert you at the beginning of a performance problem so that you can initiate more detailed reporting to give information about the problem as it develops.

In addition to the areas of system activity measured by RMF, your installation can measure other areas of system activity by replacing the user

exit routines RMF provides with your own routines that measure and report on an activity that your installation requires.

Types of Output

Feedback on the system activity measurements you select is available in three forms:

- printed reports
- SMF records
- display reports

All activity measurements can be reported in the form of SMF records or printed interval reports. SMF records are built at the end of each measurement interval. Interval reports can be generated at the end of each interval, at the end of a session, at the end of RMF processing, or at a later time by the post processor. The post processor can also generate three additional types or reports. It creates these reports from data collected during a Monitor I session over a reporting period that normally spans multiple intervals. The three additional types of post processor reports are:

- Duration reports, which can summarize processor activity, channel activity, I/O device activity, paging activity, page/swap data set activity, and workload activity over a reporting period that you select.
- Summary reports, which can contain one line of data summarizing system activity during each interval included in the reporting period and a single line of data containing total summary figures for all intervals in the reporting period.
- Plot reports, which present a graphic view of many areas of system activity, such as the time the processor is busy, the number of batch users, or the activity rate for a channel or device.

These post processor reports are especially useful when you are using RMF as a high-level measurement tool.

Some system activities — paging, address space, and real storage/processor/SRM — can also be reported at a display station for immediate inspection. Display reports are generated during a display session. Printed copies of either single reports or all reports can also be obtained during a display session.

You can choose any or all of the forms of feedback data to give your installation the information you need when you need it in the form that is most useful. The feedback data can then be used to tune the system for better performance and to plan for resource changes.

Types of Sessions

To give flexibility in the types of system activity that can be measured and the type of feedback that can be generated, RMF is executed during several types of sessions. Although the term "session" is normally used to refer to an interactive use of computing facilities, an RMF session is, simply, a unique execution of RMF. There are two basic types of RMF sessions, the Monitor I session and the Monitor II session.

A **Monitor I session** can collect information about processor activity, physical and logical channel activity, I/O device activity, workload activity, paging activity, enqueue activity, page and swap data set activity, and

ASM/RSM/SRM trace activity. User exits allow you to measure and report on other areas of system activity that are relevant to your installation. Feedback on the activities measured can be in the form of SMF records and printed reports. Either or both feedback forms can be selected.

The activities to be measured, the feedback required, the length of the interval, the length of the sampling cycle, and the length of the session itself are specified on options that you supply to RMF at the beginning of the session. Only one Monitor I session can be active at any particular time, but you can modify the options during the session. Thus, although the Monitor I session has a potentially long duration, the activities it measures and the form of feedback can be changed at any time during the session to meet changes in your information needs.

A Monitor II session, in contrast, measures different areas of system activity. A Monitor II session can collect information about address space activity, paging activity, and real storage/processor/SRM activity. As with the Monitor I session, you can use a Monitor II session to gather and report data on other areas of system activity that are relevant to your installation. Feedback on the resources measured can be in the form of display reports for immediate inspection or in the form of SMF records and printed reports. Up to 32 non-TSO Monitor II sessions can be active at the same time.

Conceptually, a Monitor II session is basically a "snapshot" session; that is, unlike the Monitor I session that can report on multiple areas of system activity over the duration of an interval, a Monitor II session generates its report on a requested area of system activity from a single sample of system indicators. You can control the time that elapses between measurements, but each report is the result of a single sample.

To allow for the variety of output forms — printed reports, SMF records, and display reports — a Monitor II session can be either a display session or background session.

A Monitor II display session is either a task that runs as a local 3270 display session or a TSO display session. Both types of sessions measure the same areas of system activity — address space, paging, and real storage/processor/SRM — and generate output in the form of display reports for immediate inspection, with the option of obtaining printed copies of individual reports or all reports produced during a session. The differences between the two types of display sessions lie in the area of operating techniques, as summarized in the following sections.

Local 3270 Display Session: A local 3270 display session is started by an operator command. Once started, it is controlled by the terminal user through display commands. The session can be stopped by either the operator or the terminal user, but only the terminal user can modify its processing. Because the session is started by an operator command, RMF must be initialized before the session can be started.

TSO Display Session: A TSO display session is started when a terminal user who has logged on to TSO issues the RMFMON command. Once started, the session is controlled by the terminal user through display commands. The session can be stopped or modified only by the terminal user. A TSO display session does not require that RMF be initialized.

A **Monitor II background session** measures the same areas of system activity — address space, paging, real storage/processor/SRM — as a display session, but it generates output in the form of printed reports and SMF records. Either or both output forms can be selected for a particular session. A background session is started by an operator command, and processing, such as the interval between the snapshot reports, is controlled by options determined when the session is started. These options can be modified during the session. The session is stopped by an operator command or the expiration of a user-specified length of time for the session. Because the session is started by an operator command, RMF must be initialized before the session can be started.

Because the types of system activity measured and the types of feedback generated differ for each session, the type of session required depends on what you need to know about your system's performance at any particular time and what form of output you require. Figure 1-1 summarizes the various types of sessions. The shaded part of the figure highlights the sessions that require RMF initialization, that is, those sessions that execute in the RMF address space. TSO display sessions execute in the TSO user's address space.

In addition to the wide choice of resource measurement and resource reporting offered by the various types of sessions, the post processor can generate interval, duration, summary, and plot reports whenever convenient. You can thus use RMF in a way that best meets your installation's particular needs and procedures.

System Requirements

The approximate auxiliary storage required for RMF on the system libraries is:

SYS1.LPALIB	10 tracks of IBM 3330 Disk Storage (including 7 directory blocks)
SYS1.LINKLIB	80 tracks of IBM 3330 Disk Storage (including 60 directory blocks)

Fixed storage requirements for RMF include temporarily fixed PLPA code space, temporarily fixed private area space, and SQA global fixed space. The amount of storage used depends on the set of options that are requested when RMF processing begins. The table in Chapter 7 can help you to determine the fixed storage requirements for your use of RMF.

RMF requires no special OS/VS2 hardware, with one exception. Display session output is formatted specifically for the IBM 3277 Display Station, Model 2. If you you want to run display sessions, you should use this device.

Measures:

processor activity
channel activity
I/O device activity
workload activity
paging activity
enqueue activity
ASM/RSM/SRM trace
page/swap data set activity
user-specified activity

Monitor I
Session

SMF
Records

Printed
Reports

Measures:

address space activity
paging activity
real storage/processor/
    SRM activity
user-specified activity

Monitor II
Local 3270
Display
Session

Display
Reports

Optional
Hardcopy
Reports

Measures:

address space activity
paging activity
real storage/processor/
    SRM activity

Monitor II
Background
Session

SMF
Records

Printed
Reports

Measures:

address space activity
paging activity
real storage/processor/
    SRM activity
user-specified activity

Monitor II
TSO Display
Session

Display
Reports

Optional
Hardcopy
Reports

Figure 1-1. Summary of RMF Session Concepts

Chapter 2: Operating Procedures

Chapter 1 explained what RMF is and what it can do for you. This chapter, in contrast, explains **how** to get RMF to work for you. It consists of five self-contained units:

- "RMF Control" tells how to initialize RMF, issue session commands, display RMF status, and terminate RMF processing.
- "Monitor I Session Control" describes how to start the Monitor I session, what options apply to the session, how RMF determines the options for a particular session, how to modify the options for a session, and how to end the session.
- Monitor II Display Session Control" describes the different procedures required to start and end a local 3270 display session and a TSO display session; it also explains the common procedures for controlling a display session of either type.
- 'Monitor II Background Session Control" describes how to start a session, what options apply to the session, how RMF determines the options for a particular session, how to modify the options, and how to end the session.
- "Post Processing" describes how to run the post processor as a batch job and how to use the control statements to tell the post processor what output you require.

Syntax Notation

This book uses the the "brackets and braces" syntax language to describe the commands, options, and menu items. The set of symbols listed below define the format of each item; you should never enter these symbols in the actual command, option, or menu item.

Underscore: The underscore (__) indicates a default option. If you want to select an underscored alternative, you need not actually specify it when you enter the command, option, or menu item, although, of course, you can.

Braces: Braces { } group related items, such as alternatives, and indicate that you must choose **one** of the items enclosed within the braces, unless you are accepting a default value.

Brackets: Brackets [ ] can also group related items; however, everything within the brackets is optional and can be omitted.

You should use uppercase letters, commas, and parentheses exactly as shown. Lower case letters represent variables for which you should substitute specific information. Stacked items, enclosed in either braces or brackets, indicate alternatives. One or more of the alternatives can be selected.

RMF Control

RMF processing requires certain JCL statements. The statements required are described under "RMF JCL" later in this chapter; "RMF Initialization" describes how to initialize RMF by using the START system command or submitting a batch job. Once RMF is initialized, you control its processing through the use of system commands. These commands enable you to issue session commands and stop all RMF processing. Session commands are used to start, stop, and modify sessions. The DISPLAY session command enables you to display status information on all active non-TSO sessions at any time.

Examples of commands are used to illustrate each RMF control function. Some of these commands include Monitor I session options. The full meaning of each option is described later in this chapter under "Monitor I Session Options."

RMF JCL

Whether you initialize RMF by an operator START system command or a batch job, certain JCL statments are required. RMF supplies a cataloged procedure that is invoked in response to a START command for RMF or an EXEC statement specifying PROC=RMF or RMF. The contents of the IBM-supplied procedure are:

```
//IEFPROC      EXEC    PGM=ERBMFMFC,REGION=1024K
//IEFRDER      DD      DSN=SYS1.PARMLIB,DISP=SHR
//SYSUDUMP     DD      SYSOUT=A
```

When you are running a large number of sessions, you might find it necessary to override the REGION parameter on the EXEC statement to provide a larger region size.

The IEFRDER DD statement identifies the RMF partitioned data set, which can contain any number of members. You can change the RMF partitioned data set by changing the IEFRDER DD statement. Any data set that you choose must have the same characteristics as SYS1.PARMLIB. It must be a fixed blocked partitioned data set with a logical record length of 80 and a block size of 80. Each record within a member is a card image record and must conform to the following rules:

- Valid data must be placed in columns 1 to 72. Columns 73 to 80 are ignored.
- The RMF options can appear in any order. They must be separated from each other by commas, one or more blanks, or comments, in the form /* text */.
- No blanks can appear within an option.

The RMF partitioned data set is normally SYS1.PARMLIB. The contents of the four parmlib members supplied by IBM are described later in this section under "Contents of the Parmlib Members."

RMF dynamically allocates all message and report data sets to SYSOUT. However, if the system returns a code that indicates that the ddname is in use, RMF proceeds as if the dynamic allocation had been successful. Thus, your installation can allocate the data sets for RMF in the JCL, enabling you, for example, to route output data to a permanent data set rather than

to SYSOUT. RMF data sets can thus also be pre-allocated. The message and report data sets that RMF uses and the ddnames for these data sets are:

Ddname	Use
MFMESSGE	Allocated during a Monitor I or Monitor II background session, this data set contains messages that do not pertain to a particular session. One MFMESSGE data set is allocated each time RMF is initialized.
RMFSCxx	Allocated during a Monitor I or Monitor II background session, this data set contains messages that pertain to a particular session. One data set is allocated for each session, and xx is the session identifier. For example, RMFSCZZ is always the ddname for the Monitor I session, and RMFSCDD would be the ddname for a Monitor II background session with a session identifer of DD.
MFRnnnnn	Allocated during a Monitor I session, this data set contains report output. A ddname is generated and one data set is created for each interval during the session; nnnnn is a decimal number from 00001 to 99999. The first interval is assigned the ddname MFR00001, the second, MFR00002, and the process of generating ddnames is repeated for each successive interval. Thus, if a session has fifteen intervals, ddnames MFR0001 through MFR00015 are used for the interval reports produced.
MFEnnnnn	Allocated during a Monitor I session, this data set is used by ESTAE to re-allocate the report data sets after a recoverable abnormal termination. The meaning of nnnnn and the process of assigning ddnames are the same as for MFRnnnnn.
RMFDMxxx	Allocated during a Monitor II local 3270 or TSO display session, this data set contains hardcopy output generated when hardcopy mode is in effect or when a print command is used. One data set is generated for each session; xxx is the session identifier for a local 3270 session or TSO for a TSO session.
RMFxxnnn	Allocated during a Monitor II background session, this data set contains report output. One RMFxxnnn data set is allocated for each report; xx is the two-character session identifier, and nnn is a decimal number from 001 to 999. A ddname is generated for each report requested. The first report is assigned the ddname RMFxx001, the second, RMFxx002; the process of generating ddnames is repeated for each report. Only one ddname is used for each report, regardless of the number of intervals occurring during the session. If session options are modified to stop and then restart a particular report, a new ddname is generated when the report is restarted. For example, if a session with a session identifier of AB is started, and reports are requested for ASD, SRCS, and SPAG, the three ddnames are RMFAB001, RMFAB002, and RMFAB003. If the session options are modified to NOASD, SRCS, and SPAG, then modified again to re-specify ASD, the ASD reports would be sent to a data set with the ddname RMFAB004.

Note: When you omit the DCB characteristics for the message and report data sets described above, the characteristics used are:

```
DCB=( RECFM=VBA,LRECL=125,BLKSIZE=1693 )
```

When you change the DCB characteristics, you cannot change the record format; you must specify RECFM=VBA.

RMF Initialization

RMF must be initialized in order to start sessions (except TSO sessions) or display RMF status. You initialize RMF by issuing a START system command, which invokes the RMF cataloged procedure. RMF can also be initialized as a batch job. When you initialize RMF, you can either simply initialize RMF or you can both initialize RMF and simultaneously start a Monitor I session.

The syntax of the START system command is:

```
{START}  RMF[.id],[ddd],[ser],[parm],[keyword=option]
{  S  }
```

id

A one- to eight-character identifier to be assigned to this initialization of RMF. This is an optional field, but it must be specified in order to stop or modify RMF processing through subsequent operator commands.

ddd

The device address or device type (such as 3330 or 2314) used when you are overriding any corresponding unit specifications on the IEFRDER DD statement in the RMF cataloged procedure. This is a positional parameter; the preceding command can be omitted only when you are omitting this field and all of the following fields.

ser

The volume serial number used when you are overriding the corresponding volume serial specifications on the IEFRDER DD statement in the RMF cataloged procedure. This is a positional parameter; the preceding command can be omitted only when you are omitting this field and all of the following fields.

parm

The options for the Monitor I session, if a Monitor I session is to be started concurrently with RMF initialization. To start a Monitor I session using options taken from other sources, omit this field. See "Input Merge for the Monitor I Session" and "Monitor I Session Options" later in this chapter for more details. When you specify options, each option has the form

```
option [(value)]
```

When you specify more than one option, each option must be separated from any other options by a comma, and the entire field must be enclosed in parentheses.

If you do not want to start a Monitor I session concurrently with RMF initialization, you must specify the NOZZ option in this field. When you specify NOZZ, it must be the only option specified. See "Monitor I Session Options" later in this chapter for a complete explanation of the NOZZ option.

keyword = option

Any keywords required when you are overriding the data set specifications on the IEFRDER DD statement in the RMF cataloged procedure. The keywords specified must be keywords that are valid on a DD statement. If you have replaced the RMF cataloged procedure supplied by IBM with a procedure that contains symbolic parameters, you can specify in this field any symbolic parameters defined in your procedure. Normally, this field is not used.

Examples

1. To use the START command to initialize RMF without starting a Monitor I session, issue the command

   ```
   START RMF.A,,,NOZZ
   ```

2. To initialize RMF as a batch job without starting a Monitor I session, the following JCL is required to invoke the RMF cataloged procedure:

   ```
   //RMFJOB    JOB     (accounting information)
   //RMF       EXEC    RMF,PARM='NOZZ'
   ```

3. To use the START command to initialize RMF and start a Monitor I session, issue the command:

   ```
   START RMF.A
   ```

   All options for the Monitor I session are taken from other sources (see "Input Merge for the Monitor I Session" later in this chapter), and the session is assigned a session identifier of ZZ.

4. To initialize RMF and start a Monitor I session as a batch job, using the RMF cataloged procedure, the following JCL is required to invoke the RMF cataloged procedure:

   ```
   //RMFJOB    JOB     (accounting information)
   //RMF       EXEC    RMF
   ```

   All options for the Monitor I session are taken from other sources (see "Input Merge for the Monitor I Session" later in this chapter), and the session is assigned a session identifier of ZZ.

5. To use the START command to initialize RMF and start a Monitor I session, specifying a system level workload activity report, setting a cycle length of 150, and taking the other options from other sources, issue the command:

```
START RMF.A,,,(WKLD(SYSTEM),CYCLE(150))
```

The Monitor I session is assigned a session identifier of ZZ.

6. To initialize RMF as a batch job and start a Monitor I session, specifying a system level workload activity report, setting a cycle length of 150, and taking the other options from other sources, use the following JCL:

```
//RMFJOB    JOB     (accounting information)
//RMF       EXEC    RMF,REGION=1024K,
//                  PARM='WKLD(SYSTEM),CYCLE(150)'
```

The Monitor I session is assigned a session identifier of ZZ.

RMF Session Control

Session commands can start and stop all non-TSO RMF sessions, modify the options for an active Monitor I session or Monitor II background session, or display the status of active non-TSO sessions. Only one Monitor I session can be active at any particular time; up to 32 Monitor II non-TSO sessions can be active concurrently.

To enable RMF to identify a particular session, each session must be assigned a session identifier. You use this identifier on all session commands for that particular session; it also appears in all RMF messages that pertain to that session.

For the Monitor I session, the session identifier must be ZZ. If you start the Monitor I session when you initialize RMF, the ZZ session identifier is assigned automatically. If you start the Monitor I session with a START session command, you must specify a session identifier of ZZ. See "Starting the Monitor I Session" later in this chapter.

For a Monitor II session, you assign the identifier when you start the session. The format required for the session identifier depends on the type of session:

- For a local 3270 display session, the session identifier is the three-character device address, in the form **cuu**, of the display station used for the session. See "Starting and Ending a Local 3270 Display Session" later in this chapter.

- For a background session, the session identifier is any two-character alphameric field (except ZZ) that you choose. See "Starting a Monitor II Background Session" later in this chapter.

- The session identifier for a Monitor II TSO display session is always TSO; the identifier is assigned automatically when the session is started.

Session commands are passed to RMF through use of the system MODIFY command. The syntax of the MODIFY command is:

```
{MODIFY}  [RMF.]id,input
{  F   }
```

id

The identifier assigned to RMF when it was initialized.

input

A session command that starts, stops, or modifies the options of a non-TSO session. This field is also used to issue a DISPLAY command, described later under "Displaying RMF Status."

Example

Assume that RMF has been initialized with the system command

```
START RMF.A,,,NOZZ
```

To start the Monitor I session, issue the command

```
MODIFY RMF.A,START ZZ,NOCPU
```

As a result, the session is started, processor activity is not measured, and all other options are taken from other sources.

To modify the options to include measurement of processor activity, issue the command:

```
MODIFY RMF.A,MODIFY ZZ,CPU
```

To stop the Monitor I session from the operator console, issue the command:

```
MODIFY RMF.A,STOP ZZ
```

This command stops only the Monitor I session; other active sessions can continue processing, and RMF remains ready to accept further session commands.

Other examples of using the system MODIFY command to enter session commands that control session processing are given under "Monitor I Session Control", "Starting and Ending a Local 3270 Display Session," and "Monitor II Background Session Control" later in this chapter.

Displaying RMF Status

Displaying RMF status enables the system operator to determine what sessions are active and what options are in effect for each active session. Note that TSO sessions are not included in the status information displayed because TSO sessions are completely controlled by the terminal user.

To display RMF status, issue a DISPLAY session command. The DISPLAY session command is passed to RMF through the input field of the system MODIFY command. The required sysntax is:

$$\left\{ \begin{matrix} MODIFY \\ F \end{matrix} \right\} [RMF.]id, \left\{ \begin{matrix} DISPLAY \\ D \end{matrix} \right\} \left\{ \begin{matrix} ACTIVE \\ session\text{-}id \\ ALL \end{matrix} \right\}$$

id

The identifier assigned to RMF when it was initialized.

ACTIVE

Specifies that the session identifiers of all active non-TSO sessions are to be displayed. ACTIVE is the default value.

session-id

The session identifier for a particular session; when session-id is specified, the options for the named session are displayed.

ALL

Specifies that the session identifiers and current options for all active non-TSO sessions are to be displayed.

Examples

1. To display the session identifiers of all active non-TSO sessions, issue either the command:

    ```
    MODIFY RMF.A,DISPLAY ACTIVE
    ```

    or, because ACTIVE is the default, the command:

    ```
    MODIFY RMF.A,DISPLAY
    ```

2. To display the options for the Monitor I session, issue the command:

    ```
    MODIFY RMF.A,DISPLAY ZZ
    ```

3. To display the session identifiers and options for all active non-TSO sessions, issue the command

    ```
    MODIFY RMF.A,DISPLAY ALL
    ```

RMF Termination

The processing of all active non-TSO sessions can be ended by issuing a STOP system command. The required syntax is:

$$\begin{Bmatrix} \text{STOP} \\ \text{P} \end{Bmatrix} \quad \text{[RMF.]id}$$

id

The identifier assigned to RMF when it was initialized. Issuing this command causes all active non-TSO RMF sessions to end their processing. A message will be issued informing you that RMF has terminated. Methods of stopping individual sessions are described under "Ending the Monitor I Session," "Starting and Ending a Local 3270 Display Session," "Starting and Ending a TSO Display Session," and "Ending a Monitor II Background Session."

Example

To terminate RMF processing (that is, to end the processing of all active non-TSO sessions), issue the command

```
STOP RMF.A
```

Contents of the Parmlib Members

Four parmlib members are shipped with RMF. They reside in SYS1.RMFMAC01. ERBRMF00 contains possible options for running the Monitor I session as a high-level measurement tool. ERBRMF01 contains possible options for a Monitor II background session. The other two members contain options for a Monitor I session (ERBRMF02) and for a Monitor II background session (ERBRMF03) that produce very detailed reporting. These members are intended for use when you verify the installation of RMF. The options contained in each member are listed in the following sections.

ERBRMF00: The options supplied for the Monitor I session are:

```
CPU                                 INTERVAL( 30M )
PAGING                              STOP( 8H )
CHAN                                CYCLE( 1000 )
WKLD( PERIOD )                      NOEXITS
DEVICE( NOTAPE,DASD,NOCHRDR,        RECORD
    NOUNITR,NOCOMM,NOGRAPH )        NOREPORT
PAGESP                              OPTIONS
NOTRACE                             SYSOUT( A )
NOENQ
```

ERBRMF01: The options supplied for a Monitor II background session are:

```
ASD                                 RECORD
NODELTA                             REPORT( DEFER )
SINTV( 30 )                         SYSOUT( A )
STOP( 10M )                         OPTIONS
```

ERBRMF02: The installation verification options for the Monitor I session are:

```
CPU                                 TRACE( RCVTOTDF,END )
PAGING                              TRACE( DMDTMPLT,END )
CHAN                                TRACE( DMDTCMPL,END )
WKLD( PERIOD )                      TRACE( DMDTRUA,AVG )
DEVICE( TAPE,DASD,CHRDR,UNITR,      INTERVAL( 15M )
    COMM,GRAPH )                    STOP( 8H )
PAGESP                              CYCLE( 250 )
ENQ( SUMMARY )                      NOEXITS
TRACE( RCVUICA,END )                RECORD
TRACE( RCVCPUA,END )                REPORT( REALTIME )
TRACE( RCVASMQA,END )               OPTIONS
TRACE( RCVPTR,END )                 SYSOUT( A )
```

ERBRMF03: The installation verification options for a background Monitor II session are:

```
ASD                                 SINTV( 30 )
ARD                                 STOP( 8H )
SPAG                                RECORD
SRCS                                REPORT( DEFER )
ASRM                                SYSOUT( A )
DELTA                               OPTIONS
```

Monitor I Session Control

The measurement activities of a Monitor I session can be started at the operator console by a START command or as a batch job. See "Starting the Monitor I Session." Only one Monitor I session can be active at any particular time.

The options that you select control session processing. Each option is described under "Monitor I Session Options." The options for a session can be specified in:

- The **parm** field of the START command that starts the session.
- The PARM field of the EXEC statement in the RMF cataloged procedure.
- The RMF partitioned data set member(s), normally included in SYS1.PARMLIB.

The input from the sources is merged to form a final set of options for the session. When you do not specify an option in any of these sources, RMF uses a program default. Input merge is described under "Input Merge for the Monitor I Session." The set of options established by input merge can be modified during the session, as described under "Modifying the Monitor I Session Options."

Methods of ending the session are described under "Ending the Monitor I Session."

Monitor I Session Options

This section describes, in alphabetical order, the options that can be specified for a Monitor I session. The program defaults are underscored where appropriate.

CHAN/NOCHAN
Specifies whether or not channel activity is to be measured.

CPU/NOCPU
Specifies whether or not processor activity is to be measured.

CYCLE(value)
Specifies, in milliseconds, the length of the cycle at the end of which sampling observations are to be made. The valid range is from 50 to 9999 milliseconds. A specification of less than the minimum value (50 milliseconds) is increased to 50 milliseconds. A specification of more than the maximum value (9999 milliseconds) is decreased to 9999 milliseconds. The default value is 1000 milliseconds. See "INTERVAL and CYCLE Options" later in this section for considerations that apply to choosing a cycle length.

DEVICE (list)/NODEVICE

Specifies whether or not system device activity is to be measured. When DEVICE is specified, the device list must indicate the classes of devices to be measured. Any or all of the following can be specified in the device list:

CHRDR/NOCHRDR	-	Character reader devices.
COMM/NOCOMM	-	Communications equipment.
DASD/NODASD	-	Direct access storage devices.
GRAPH/NOGRAPH	-	Graphics devices.
TAPE/NOTAPE	-	Magnetic tape devices.
UNITR/NOUNITR	-	Unit record devices.

When you omit the option, the defaults are as underscored above; that is, the device report is produced for direct access storage devices. If you explicitly specify DEVICE, you must include list. However, the device list need include only the classes you want to change. For example, to request device reporting for magnetic tape devices and direct access storage devices, you would specify

    DEVICE(TAPE)

Direct access storage device reporting would be included by default, and the other device classes would, also by default, not be reported.

ENQ({DETAIL / SUMMARY} [,majorname[,minorname]])/NOENQ

Specifies whether or not enqueue contention activity is to be measured. When DETAIL is specified, the report includes the names of one or two jobs owning and one or two jobs waiting for the resource that has the longest period of contention. The names reported are selected during the period of maximum contention. No names are reported when you specify SUMMARY. When you omit the ENQ option, the default is NOENQ. If you explicitly specify ENQ, you must specify either DETAIL or SUMMARY; specifying ENQ without choosing DETAIL or SUMMARY causes a syntax error.

The optional majorname field can contain the one to eight character major name of a serially-reusable resource. Optionally, the major name is followed by a comma and a minor name. The minorname field can contain the one to forty-four character minor name of the resource. For example,

    ENQ(DETAIL,MAJNM,MINORNAME)

Using the name fields enables you to measure the contention for a certain specific resource; when you omit a specific name, all resources for which contention occurs are measured. When you omit a minor name, all resources with the major name you specify are included.

EXITS/NOEXITS

Specifies whether or not Monitor I user exit routines are to be executed during session processing to enable your installation to gather and report data in addition to that measured by RMF. See "Monitor I Session User Reports" in Chapter 3 for information on using the exit routines.

INTERVAL(value[M])

Specifies, in minutes (M), the length of the RMF reporting interval. At the end of each interval, all data is gathered and sampled data is summarized. The data is then formatted for an interval report or an SMF record. Either or both can be done. SMF records are written at this point, while reports can be written or held for later printing, depending on the value you specify for the REPORT option. The valid INTERVAL range is from 1 to 60 minutes. Specifying a value outside this range causes RMF to use the default value. The default is thirty minutes (30M).

MEMBER(list)

Specifies the member or members of the RMF partitioned data set that contain the options to be used for the session. The list can contain from one to five entries, separated by commas, and each entry consists of a two-character alphameric value to be appended to ERBRMF to form the member name. When more then one member is specified, input merge takes the options from the members in left to right priority order.

For a Monitor I session, the default is 00, indicating member ERBRMF00 in the partitioned data set named on the IEFRDER DD statement in the RMF cataloged procedure (normally SYS1.PARMLIB). The option must not be specified within a partitioned data set member.

For a list of the options specified in the RMF partitioned data set members supplied by IBM, see "Contents of the Parmlib Members" earlier in this chapter.

Each member specified must contain options appropriate for the Monitor I session. A member containing Monitor II background session options will cause syntax errors.

NOZZ

Specifies that the Monitor I session is not to be started when RMF is initialized. NOZZ indicates RMF initialization only. NOZZ is mutually exclusive with all other options; that is, when NOZZ is specified, it must be the only option specified. When NOZZ is specified on the EXEC statement and RMF is initialized by a START command that does not specify NOZZ, the NOZZ option on the EXEC statement is ignored, and RMF starts the Monitor I session as specified on the START command.

OPTIONS/NOOPTIONS

Specifies whether or not a list of the options to be used is to be printed at the operator console at the start of the session. If the list is printed (OPTIONS specified), the operator can respond with any desired changes, except the MEMBER option.

On the operator command, OPTIONS can be abbreviated OPTN, and NOOPTIONS can be abbreviated NOOPTN.

You can avoid unnecessary console output and delay in starting the session by specifying NOOPTIONS. However, if RMF detects any syntax errors during input merge, OPTIONS is forced.

Figure 2-1 shows an example of the console output produced when OPTIONS is in effect. Each option is followed by the input source from which RMF input merge obtained the option. The possible sources are:

- COMMAND -- the option was specified on a START or MODIFY command.
- DEFAULT -- the option was taken from the program defaults.
- EXEC -- the option was specified on the EXEC statment in the RMF cataloged procedure.
- CHANGED -- the option was changed by RMF. The preceding message, ERB301I, describes the nature of the conflict and the change RMF has made.
- MEMBER -- the option was specified in a member of the RMF partitioned data set.

```
ERB305I ZZ : PARAMETERS
ERB305I ZZ :   WKLD (PERIOD) -- DEFAULT
ERB305I ZZ :   TRACE (RCVPTR,ALL) -- MEMBER
ERB305I ZZ :   TRACE (RCVASMQA,ALL) -- MEMBER
ERB305I ZZ :   TRACE (RCVCPUA,ALL) -- MEMBER
ERB305I ZZ :   TRACE (RCVUICA,ALL) -- MEMBER
ERB305I ZZ :   NOEXITS -- MEMBER
ERB305I ZZ :   ENQ(DETAIL) -- MEMBER
ERB305I ZZ :   OPTIONS -- COMMAND
ERB305I ZZ :   STOP(168H) -- MEMBER
ERB305I ZZ :   CYCLE(250) -- MEMBER
ERB305I ZZ :   INTERVAL(15M) -- MEMBER
ERB305I ZZ :   RECORD -- MEMBER
ERB305I ZZ :   SYSOUT(Z) -- MEMBER
ERB305I ZZ :   REPORT(REALTIME) -- MEMBER
ERB305I ZZ :   PAGESP -- MEMBER
ERB305I ZZ :   DEVICE(NOCHRDR) -- DEFAULT
ERB305I ZZ :   DEVICE(GRAPH) -- MEMBER
ERB305I ZZ :   DEVICE(COMM) -- MEMBER
ERB305I ZZ :   DEVICE(DASD) -- MEMBER
ERB305I ZZ :   DEVICE(TAPE) -- MEMBER
ERB305I ZZ :   DEVICE(UNITR) -- MEMBER
ERB305I ZZ :   CHAN -- MEMBER
ERB305I ZZ :   PAGING -- MEMBER
ERB305I ZZ :   CPU -- MEMBER
ERB305I ZZ :   MEMBER(04) -- COMMAND
```

Figure 2-1. Console Output From the Options Option

PAGESP/NOPAGESP
Specifies whether or not page/swap data set activity is to be measured.

PAGING/NOPAGING
Specifies whether or not system paging activity is to be measured.

RECORD/NORECORD
Specifies whether or not measured data is to be written to the SMF data set. In order for RECORD to take effect, the complementary SMF enabling procedures must first be performed. These procedures are described in OS/VS System Programming Library: System Management Facilities (SMF).

REPORT({REALTIME / DEFER})/NOREPORT

Specifies whether or not printed interval reports of the measured data are to be produced. When you omit the option, the default is NOREPORT. If you explicitly specify REPORT, you must specify either REALTIME or DEFER; specifying REPORT without choosing either REALTIME or DEFER causes a syntax error.

REALTIME indicates that the reports are to be printed when formatted at the conclusion of the interval; DEFER indicates that the reports are to be printed after RMF processing terminates.

STOP (value [M / H])/NOSTOP

Specifies the desired duration for the Monitor I session in minutes (M) or hours (H). The range is from one minute to one week (168 hours or 10,080 minutes). The default value is 8 hours. If you specify a value outside the range, RMF substitutes the default value. If neither M nor H is specified, M (minutes) is assumed. NOSTOP means that the session can be ended only by a STOP command.

The operator STOP command can end the session at any time, regardless of the value specified for this option, provided that a session identifier was specified or assigned automatically when the session was started.

Because of SYSOUT space limitations, STOP (interval) will be forced when both NOSTOP and REPORT(DEFER) are specified, where interval is the value of the INTERVAL option after it has been validated during input merge.

SYSOUT(class)

Specifies the SYSOUT class to which the formatted interval reports are directed. Class A is the default. The SYSOUT option cannot be modified during the session.

TRACE(fieldname[,opt list])/NOTRACE

Specifies whether or not the contents of ASM/RSM/SRM control block fields are to be traced, where:

fieldname

is a valid field name in one of the following:
- Paging Vector TaBLE (PVT)
- Auxiliary Storage Manager Vector Table (ASMVT)
- System Resource Management Data Areas
- System Resource Management Domain Table

or a user-specified field name.

The PVT fields that can be specified and their meanings are:

field	meaning
PVTAFC	available frame count
PVTPOOL	number of real storage frames available
PVTSQDC	SQA deficient count
PVTDFRS	number of times frame allocation request deferred
PVTNPIN	number paged in
PVTNPOUT	number paged out
PVTVAMI	number of VIO page-ins
PVTVAMO	number of VIO page-outs
PVTVAMR	number of VIO reclaims
PVTSPIN	number of pages swapped in
PVTSPOUT	number of pages swapped out
PVTNPREC	number of pages reclaimed
PVTNSWPS	number of successful swap-ins
PVTCAIN	number of non-VIO page-ins
PVTCAOUT	number of common area non-VIO page-outs
PVTCAREC	number of reclaims in common area non-VIO pages
PVTCFMCT	number of frames currently assigned to pageable common areas
PVTSPFR	number of frames freed by swap-out without output I/O
PVTCNTFX	global fixed frame count
PVTSQAFX	fixed SQA frame count
PVTCOMFX	fixed LPA/CSA frame count

The ASMVT fields that can be specified and their meanings are:

field	meaning
ASMBKSLT	count of unreserved local slots
ASMSLOTS	total local slots (sum of slots in open local page data sets)
ASMVSC	total local slots allocated for VIO private area pages
ASMNVSC	total local slots allocated for non-VIO private area pages
ASMERRS	bad slots on local page data sets
ASMIORQR	count of I/O requests received by I/O control
ASMIOCNT	count of Start I/O requests made to IOS that have not completed
ASMIORQC	count of I/O requests completed and returned to RSM

The SRM data area fields that can be specified and their meanings are:

field	meaning
RMCAUSSC	unilateral swap out count
RMCANQSC	CPU enqueue exchange swap count
RMCATOSC	terminal output swap count
RMCAEXSC	exchange on recommendation value swap count
RMCARSSC	real storage shortage swap count
RMCATISC	terminal input swap count
RMCALWSC	long wait swap count
RMCAXSSC	auxiliary storage shortage swap count
RMCADWSC	detected wait swap count
RMCARQSC	requested swap count
CCVRBSWT	recent base system wait time
CCVRBSTD	recent base time of day comp.
CCVEJST	low priority user job step time
CCVIMBBT	time of last CPU imbalance
CCVUTILP	system CPU utilization
CCVLGUTL	long term CPU utilization * 256
CCVENQCT	number of users non-swappable for enqueue reasons
CCVCPUCT	number of online CPUs
MCVSTCRI	highest system UIC
MCVFRCNT	number of pages needed to be stolen by force steal routine
RCVUICA	UIC average
RCVCPUA	CPU usage average * 16
RCVAVQC	AVQ low count
RCVASMQA	ASM queue length average
RCVPTR	paging rate
RCVTOTDF	average logical channel utilization of all active logical channels

The Domain table fields that can be traced and their meanings are:

field	meaning
DMDTMPLT	current mutliprogramming level target
DMDTCMPL	current multiprogramming level
DMDTINCU	users per domain in storage
DMDTOUTU	users per domain out of storage
DMDTRUA	average number of ready users

opt list

is one or more of the following:

MIN   - the minimum sampled value of the field over the sampling period.

MAX   - the maximum sampled value of the field over the sampling period.

AVG   - the average value of the field over the sampling period.

END   - a snapshot of the last value in the sampling period.

STDDEV - the standard deviation from the values sampled.

ALL   - the default for opt list, meaning all of the above.

WKLD (⟨PERIOD / GROUP / SYSTEM⟩)/**NOWKLD**

specifies whether or not system workload activity is to be measured. When you omit the option, the default is WKLD(PERIOD). If you explicitly specify WKLD, you must specify the level of detail for the report to be produced by choosing one of the following:

PERIOD   Requests the most detailed workload activity monitoring. (Data is reported for each performance group period in the IPS.) PERIOD is the default.

GROUP   Requests an intermediate level of detail. (Data is reported for each performance group in the IPS.)

SYSTEM   Requests the least detail. (A workload manager summary.)

Explicitly specifying WKLD without choosing one of the above operands causes a syntax error.

Need for Careful Choice of Options

Care should be taken in specifying certain groups of RMF options. Some options cannot be used concurrently to control a single Monitor I session. Should any conflicts occur, RMF detects the mutually-exclusive options during input merge and selects compatible values for these options; the operator is notified of the selections made. The possible conflicts are described in Figure 2-2.

Conflict	Problem	RMF Resolution
NOREPORT AND NORECORD specified	No way for installation to obtain measurement data	Change NOREPORT to REPORT (DEFER)
STOP value specified is less than INTERVAL	Indicates session termination before obtaining any data	Set STOP value equal to INTERVAL value
REPORT(DEFER) and NOSTOP specified	SYSOUT will become cluttered with unprinted reports	Change NOSTOP to STOP value equal to INTERVAL value

Figure 2-2. RMF Response to Conflicting Options

Other groups of options do not cause actual conflicts, but their values must be chosen carefully to avoid undesirable results. Those options that must be specified with care include:

- INTERVAL values and CYCLE values
- STOP, INTERVAL, and REPORT values
- RECORD, TRACE, INTERVAL, and CYCLE values
- Device class selection for the DEVICE option

The factors to be considered in choosing values for these options are given in the following sections.

INTERVAL and CYCLE Options

Much of the data in the paging, page/swap data set, processor, ASM/RSM/SRM trace, channel, and device activity reports is statistically sampled. Because, according to statistical theory, the accuracy of sampled data increases with the number of samples taken of random events, you would expect to observe more precise results with decreased CYCLE time (for a fixed INTERVAL value), or with increased INTERVAL length (for a fixed CYCLE value). For example, 400 samples taken of random independent events provide a value that, with 90% confidence, should fall within 4% of the true value; 1,600 samples of random independent events decrease to 2% the expected range of error, with 90% confidence.

However, pure statistical predictions are not always applicable to a software measurement tool such as RMF because the assumptions on which they are based (unbiased random independent samples and an infinite population) might not hold in an operating environment. Bias might occur because RMF samples internal indications of external system events. Thus, RMF values might not precisely approach the values measured by a hardware measurement tool.

The independence assumption becomes less and less realistic as CYCLE gets very small. As CYCLE gets smaller, each sample is more likely to find the system performing the same functions as in the previous sample; therefore, the new sample adds little additional information. The use of a smaller CYCLE value (while holding INTERVAL constant) should not be detrimental to accuracy, but any increase in accuracy might be of questionable benefit when compared with the system overhead that is introduced. A reasonable minimum CYCLE value is a function of the timing characteristics of the hardware being measured.

STOP, INTERVAL, and REPORT Options

As mentioned earlier, the specification of NOSTOP along with REPORT(DEFER) is considered a conflict by RMF, because of the possible filling up of SYSOUT spool space. A similar problem can occur when the STOP value specified is very large, the INTERVAL value is small, and REPORT(DEFER) is specified.

RECORD, TRACE, INTERVAL, and CYCLE Options

When writing SMF trace records (RECORD specified) discretion must be used when specifying INTERVAL, CYCLE, and the trace options desired. SMF restricts the size of records written by the user to 32K bytes; therefore, the SMF record (type 76) will be truncated after the last complete set that will fit within 32,756 bytes. However, the truncated "set data" is still included in the fields of the trace record that contain totals for all set data.

Note: Trace reports printed with the REPORT option are not affected by a truncated SMF record and will contain all the set data. However, trace reports printed by the post processing routine from the same record would lack the truncated set data.

The following formula should be used in calculating the type 76 record size:

$$\text{record size} = 108 + \left(\frac{\text{interval}}{\text{cycle} * \text{samples per set}}\right) * \text{set size}$$

where:

108

indicates the length, in bytes, of the data fields common to all trace records.

interval

indicates the value specified on the INTERVAL option, converted to milliseconds.

cycle

indicates the value specified on the CYCLE option in milliseconds.

samples per set

indicates the IBM-supplied default of 60 unless superzapped by the system programmer. (See "ASM/RSM/SRM Trace Activity Report" in Chapter 5.)

set size

indicates the length, in bytes, of the array that contains the set data for the field name. This value depends on the length of the data field traced and the trace options specified as follows:

Trace Option	4-byte data field	2-byte data field
MIN	4	2
MAX	4	2
AVG	8	6
END	4	2
STDDEV	20	14
STDDEV and AVG	20	14
ALL	32	20

Note: If the IBM-supplied default of 60 samples per set is used with a cycle value equal to or greater than 60 milliseconds, data will never be truncated from the SMF record.

Examples

1. If the interval value specified is 30 minutes (1,800,000 milliseconds), the cycle value specified is 250 milliseconds, and the trace options specified for PVTPOOL (a 2-byte data field) are minimum, maximum, and standard deviation, the resulting calculation would be:

```
record size = 108 + 1,800,000 * 18 or 2,268 bytes
                    ─────────
                    250 * 60
```

Notes:

- The IBM-supplied default of 60 was in effect for samples per set.

- MIN for a 2-byte field name requires 2 bytes, MAX requires 2 bytes, and STDDEV requires 14 bytes, totaling 18 bytes for the set size value.

2. If the interval value specified is 60 minutes (3,600,000 milliseconds), the cycle value specified is 100 milliseconds, all the trace options for ASMSLOTS (a 4-byte data field) are specified, and the samples per set value was zapped to 30, the resulting calculation would be:

```
record size = 108 + 3,600,000   * 32 or 38,508 bytes
                    ─────────
                    100 * 30
```

A record size of 38,508 causes the last 180 sets to be truncated.

3. If the interval value specified is 60 minutes (3,600,000 milliseconds), the cycle value specified is 60 milliseconds, all the trace options for RMCAUSSC (a 4-byte data field) are specified, and the samples per set value is the IBM-supplied default of 60, the resulting calculation would be:

```
record size = 108 + 3,600,000   * 32 or 32,108 bytes
                    ─────────
                    60 * 60
```

Device Class Selection for the DEVICE Option

Because RMF overhead is directly related to the number of device classes being measured, the DEVICE option device list should include only those device classes that require measurement.

By decreasing CYCLE length or increasing INTERVAL length, you can increase sample size (number of samples per interval). Note, however, that decreasing the CYCLE length could significantly degrade system performance, especially in the device measurements area. At each sampling cycle, there is system overhead introduced by processing the periodic interruption and collecting the data. Because device data collection is the major contributor to this type of overhead, installations with a large number of UCBs (internal control blocks describing the devices generated with the system) can use the following approximation to estimate the total overhead (number of instructions executed) for each sampling cycle:

$$\text{\# of instructions} \cong 62 + (11 * D_1) + (72 * D_2)$$

where:

D_1 - is the number of UCBs associated with offline devices for monitored device classes.

D_2 - is the number of UCBs associated with online devices for monitored device classes.

Note: When a condition (such as device busy, control unit delay, device reserved, reserve delay, device not ready, and mount pending) is tested and found to be true for an online device, the number of instructions executed for each sampling cycle increases by approximately 5 for each true condition. If the device is a multiple exposure device (such as an IBM 2305 Fixed Head Storage Device), the instruction count increases by approximately 17.

Therefore, the cycle value should not be made too small, especially when the number of UCBs for measured device classes is large.

Input Merge for the Monitor I Session

Input merge is the process RMF performs to determine what options are to be established for the Monitor I session. Input merge is performed at the start of the session and whenever the MODIFY session command is used to modify the options of an active Monitor I session. Input merge takes options from various input sources and merges them to form a list of options for the session.

When the Session Is Started

At the start of the session, input merge uses a "fill in the blanks" procedure; that is, it takes options from the four possible input sources in a defined priority order. Once an option is filled in, no options from a lower-priority input source can override that option. The input sources and their priority order are:

1. The **parm** field of the START command. Any options specified in this input source have the highest priority. If the MEMBER option is specified, the options contained in the member(s) are processed after any other options specified on the START command and before RMF proceeds to the next input source.

    The MEMBER option can be used to specify up to five members of the RMF partitioned data set (normally SYS1.PARMLIB). If the MEMBER option is used to specify more than one member, RMF takes options from the members in left to right order. If, for example, MEMBER(02,04) is specified, RMF generates the member names ERBRMF02 and ERBRMF04 and takes options from ERBRMF02 first. Thus, if ERBRMF02 specifies ENQ(DETAIL) and ERBRMF04 specifies ENQ(SUMMARY), ENQ(DETAIL) is the option established for the session. If a specified member does not exist, RMF continues with the next specified member, if any, or proceeds to the next input source.

2. The PARM field of the EXEC statement in the RMF cataloged procedure. Any options specified in this input source have the second highest priority. Options specified here cannot override any options from the **parm** field of the START command. If, for example, CHAN is specified on the START command and NOCHAN is specified on the EXEC statement, CHAN is established during input merge.

    If the MEMBER option is specified, the options contained in the member(s) are processed after any options specified on the EXEC statement and before RMF proceeds to the next input source. Use of the MEMBER option is as described earlier for item 1. Note that the EXEC statement is not used when the Monitor I session is started by a START session command.

3. If the MEMBER option has not been specified on either the START command or the EXEC statement, RMF uses a default member name, ERBRMF00, as the third highest priority input source. Options from the default member can fill in only those options not specified earlier on a higher priority input source.

4. The program defaults. The program defaults are the lowest priority input source; that is, the program defaults can fill in only those options not filled in by a higher-priority input source.

During input merge, RMF might detect mutually exclusive options or syntax errors. When either occurs, RMF notes the condition and issues a warning message, but it does not terminate the merge. When RMF detects mutually exclusive options (such as both RECORD and NORECORD), it takes the value associated with the first specification for the option. When an invalid value is detected for CYCLE, INTERVAL, or STOP, RMF substitutes a valid value, as described for each option under "Monitor I Session Options." When other errors are detected, RMF ignores the input option in error and uses the next valid specification from a lower priority source.

At the end of input merge, RMF checks for conflicting options; see Figure 2-2 for a description of these options and the actions RMF takes. RMF displays the options resulting from input merge at the operator console when:

- OPTIONS is in effect.
- An error has been detected during the merge.
- Conflicting options have been detected and changed.

The system operator can change the options, if necessary, before session processing begins.

Example

To show how the input merge process works, assume:

1. RMF partitioned data set member ERBRMF02 contains the options:

    ```
    WKLD( SYSTEM )
    OPTIONS
    NOPAGESP
    EXITS
    ```

2. RMF partitioned data set member ERBRMF10 contains the options:

    ```
    NOEXITS
    DEVICE( NOUNITR, TAPE )
    ```

3. The RMF cataloged procedure contains the following statement:

    ```
    //IEFPROC EXEC  PGM=ERBMFMFC,REGION=1024K,
    //                PARM='CYCLE( 150 ),DEVICE( NOTAPE,DAS
    //                MEMBER( 02 )'
    ```

If the operator initializes RMF and starts the Monitor I session with the following START command:

```
START RMF.A,,,( WKLD( GROUP ),MEMBER( 10 ),CYCLE( 100 ),
    DEVICE( COMM ) )
```

Input merge uses the three options from the START command to begin the list of session options:

```
WKLD( GROUP )
CYCLE( 100 )
DEVICE( COMM )
```

Next, RMF generates the member name ERBRMF10 from the MEMBER option specified on the START command, and takes options from the member to continue filling in the list of options. After processing ERBRMF10, the option list consists of:

```
WKLD( GROUP )
CYCLE( 100 )
DEVICE( COMM,NOUNITR,TAPE )
NOEXITS
```

Input merge then proceeds to the second highest priority source, the PARM field of the EXEC statement in the RMF cataloged procedure. CYCLE(150) and DEVICE(NOTAPE) are ignored because these options have been filled in by a higher-priority source. RMF adds

```
DEVICE( DASD )
```

to the list of options and generates the member name ERBRMF02 from the MEMBER option specified on the EXEC statement. WKLD(SYSTEM) and EXITS in member ERBRMF02 are ignored because these options have been filled in. After processing the other options contained in ERBRMF02, the option list consists of:

```
WKLD( GROUP )
CYCLE( 100 )
DEVICE( COMM,NOUNITR,TAPE,DASD )
NOEXITS
OPTIONS
NOPAGESP
```

Because all options have not been filled in, input merge uses the program defaults (indicated earlier in this section under "Monitor I Session Options") to complete the list. Figure 2-3 shows the final option list, including the source for each option.

```
WKLD(GROUP) -- COMMAND          NOPAGESP -- MEMBER
NOTRACE -- DEFAULT              DEVICE(NOCHRDR) -- DEFAULT
NOEXITS -- MEMBER               DEVICE(NOGRAPH) -- DEFAULT
NOENQ -- DEFAULT                DEVICE(COMM) -- COMMAND
OPTIONS -- MEMBER               DEVICE(DASD) -- EXEC
STOP(8H) -- DEFAULT             DEVICE(TAPE) -- MEMBER
CYCLE(100) -- COMMAND           DEVICE(NOUNITR) -- MEMBER
INTERVAL(30M) -- DEFAULT        CHAN -- DEFAULT
RECORD -- DEFAULT               PAGING -- DEFAULT
SYSOUT(A) -- DEFAULT            CPU -- DEFAULT
NOREPORT -- DEFAULT             MEMBER(02) -- EXEC
                               MEMBER(10) -- COMMAND
```

Figure 2-3. Example of Input Merge for the Monitor I Session

When the Session Options Are Modified

When the MODIFY session command is used to modify the options established for an active session, RMF performs an input merge process. However, the process differs from the input merge used at the start of the session. Input merge as a result of a MODIFY session command starts with the list of options previously established and uses the input sources to **override** any previously established option.

The input sources and the order in which they are processed are:

1. The **options** field of the MODIFY session command. Any options specified here will override and replace any options in effect prior to the MODIFY session command.

2. The library data source. If the **options** field of the MODIFY command includes a MEMBER option, RMF will generate the member name and use any options specified in the member to **override and replace** any options in effect prior to the processing of the library data source, including any options specified in the MODIFY command **options** field.

   When more than one member is specified, RMF processes the members in left to right order. However, because the merge process that occurs in response to a MODIFY session command uses the input sources to override any previously-established options, options from the rightmost member will override any corresponding options from a previously-processed member. For example, if MEMBER(02,04) is specified on a MODIFY command, RMF generates the member names ERBRMF02 and ERBRMF04 and takes options from ERBRMF02 first. Thus, if ERBRMF02 specifies ENQ(DETAIL), the merge process places the option in the list of options currently established for the session. If, however, member ERBRMF04 specifies ENQ(SUMMARY), ENQ(SUMMARY) overrides the currently-established ENQ(DETAIL). ENQ(SUMMARY) is thus the option established for the session as a result of the MODIFY command.

When input merge is complete, RMF displays the options resulting from the merge at the operator console when an error is detected or when OPTIONS is in effect. The actions RMF takes in response to errors and the response the operator can make are identical to those for input merge at the start of the session.

For example, assume that the options for a currently-active session include CHAN, NOCPU, and NOSTOP, and that you want to modify these options to NOCHAN, CPU, and STOP(40M).

If you issue the command:

```
MODIFY RMF.A,MODIFY ZZ,NOCHAN,CPU,STOP(40M)
```

the options will be modified as you want.

If, however, member ERBRMF10 includes the options:

```
NOCHAN
CPU
NOSTOP
```

and you issue the command:

```
MODIFY RMF.A,MODIFY ZZ,STOP(40M),MEMBER(10)
```

RMF will:

1. Merge the input option from the command and replace NOSTOP in the current option list with STOP(40M).

2. Merge the options from ERBRMF10 with the current options list, replacing CHAN with NOCHAN, NOCPU with CPU, and STOP(40M) with NOSTOP.

Thus, any options in a member will override both any current options **and** any options specified on the MODIFY session command.

Starting the Monitor I Session

The Monitor I session can be started concurrently with the initialization of RMF, as described earlier in this chapter under "RMF Initialization." Once RMF has been initialized, you can also start the Monitor I session by issuing a START session command.

The START session command is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$\begin{Bmatrix} MODIFY \\ F \end{Bmatrix} \text{ [RMF.]id,} \begin{Bmatrix} START \\ S \end{Bmatrix} \text{ ZZ [,parm]}$$

id
    The identifier assigned to RMF when it was initialized.

zz
    The identifier for the session to be started. For a Monitor I session, ZZ **must** be specified.

parm
    The options for the session. Each option has the form

```
option[(value)]
```

Each option must be separated from the other options by a comma. If the MEMBER option is specified, any members identified in the value field are used during input merge to produce the list of options for the session. Options specified in this field of the START command have a higher priority than options in a library member.

When the START command is issued, RMF merges the input options. If the merge is free of error, RMF issues message ERB100I to indicate that the Monitor I session is active, and begins session processing.

When the OPTIONS option is in effect or when errors are detected during input merge, the option list is displayed at the operator console; the operator can change the options, if necessary, before session processing begins.

Examples

1. To start a Monitor I session when all options are to be taken from other input sources, issue the command

   ```
   MODIFY RMF.A,START ZZ
   ```

2. To start a Monitor I session that does not measure processor activity, produces reports at each interval, and samples data every 100 milliseconds, issue the command:

   ```
   MODIFY RMF.A,START ZZ,NOCPU,
          REPORT( REALTIME ),CYCLE( 100 )
   ```

Modifying the Monitor I Session Options

When required, the options in effect for an active Monitor I session can be modified by issuing a MODIFY session command specifying the options to be changed.

Issuing the MODIFY session command forces an immediate end of interval. After interval processing, RMF stops the session, modifies its options, and restarts the session. Although RMF automatically stops and restarts the session, you should be aware of these actions because no data is sampled during the brief period required to stop, modify, and restart the session.

Message ERB104I is issued when the options specified on the MODIFY command have been changed and session processing has begun using the new options.

The MODIFY session command is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$\left\{ \begin{matrix} \text{MODIFY} \\ \text{F} \end{matrix} \right\} \text{[RMF.]id,} \left\{ \begin{matrix} \text{MODIFY} \\ \text{F} \end{matrix} \right\} \text{ZZ[,options]}$$

ZZ

The identifier for the session to be modified. For a Monitor I session, ZZ must be specified.

options

The session options to be changed. Each option has the form

```
option[(value)]
```

and must be separated by a comma. All options except SYSOUT can be specified; the SYSOUT option cannot be changed during a session. Note that, if you specify the MEMBER option, any options within the member will override any options specified in the command.

Example

To modify the options of an active Monitor I session to end the measurement of processor activity and magnetic tape device activity, issue the command:

```
MODIFY RMF.A,MODIFY ZZ NOCPU,DEVICE(NOTAPE)
```

Note: At the start of the session, RMF uses the values in the INTERVAL and STOP options to calculate the number of measurement intervals for the session. If the STOP value is 30 minutes and the INTERVAL value is 30 minutes, there is one measurement interval during the session. When you change either of these values during the session, the duration of the session can be affected. Assume that a session has been started with the STOP and INTERVAL values noted above. After 15 minutes, you decide to change INTERVAL to 15 minutes, while STOP remains at 30 minutes. RMF re-calculates the number of intervals required by dividing the STOP value by the INTERVAL value. In this example, the number of intervals would be two. The duration of the session is therefore 45 minutes.

Ending the Monitor I Session

The Monitor I session can be ended in three ways:

- Issuing a system STOP command that stops all active non-TSO RMF sessions. The syntax of the command and an example of its use are given earlier in this chapter under "RMF Termination."

- Expiration of the time value specified in the STOP option when the session was started. Use of the STOP option is described under "Monitor I Session Options" earlier in this chapter.

- Issuing a STOP session command to stop the Monitor I session. All other active sessions continue processing. This method is described here.

The STOP session command is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$\begin{Bmatrix} \text{MODIFY} \\ \text{F} \end{Bmatrix} \quad [\text{RMF.}]\text{id,} \begin{Bmatrix} \text{STOP} \\ \text{P} \end{Bmatrix} \quad \text{ZZ}$$

id

The identifier assigned to RMF when it was initialized.

ZZ

The identifier for the session to be stopped. For a Monitor I session, ZZ **must** be specified.

Issuing this command forces an immediate end of interval; after interval processing is complete, RMF issues message ERB102I and ends the session.

Example

To stop the Monitor I session while allowing all other active RMF sessions to continue processing, issue the command

```
MODIFY RMF.A,STOP ZZ
```

Monitor II Display Session Control

There are two types of Monitor II display sessions: the local 3270 display session and the TSO display session. The only differences between them occur when they are started and ended; processing during the session is identical.

Starting and ending each type of session is described under "Starting and Ending a TSO Display Session" and "Starting and Ending a Local 3270 Display Session."

Session processing for both types of display sessions is described under "Controlling Display Session Processing," and a list of the valid menu items appears under "Display Session Menu Items."

Starting and Ending a TSO Display Session

A Monitor II TSO display session differs from other RMF sessions in that it is completely independent of RMF initialization and cannot be affected in any way by RMF commands issued by the system operator.

To start a TSO session, logon to TSO. When the logon procedure is complete, and TSO is ready to receive your commands, enter the command

    RMFMON

to invoke RMF. RMFMON can also be entered at any point during a TSO session. The response to RMFMON builds the control blocks your session requires, creates a display session task, and readies the Monitor II display functions of RMF. The response might also include calling a routine supplied by your installation to verify that you are authorized to use RMF. RMF displays the menu when it is ready to receive your display session commands. TSO appears in the session-id field of all RMF messages issued to you during the RMF session.

Session processing is described under "Controlling Display Session Processing."

To end the RMF session, use the stop display command, which is Z. You can then either logoff TSO or continue with other TSO work.

Starting and Ending a Local 3270 Display Session

The system operator must start a Monitor II local 3270 display session. The operator or the terminal user can end it. Excessive swapping can occur during a local 3270 session. If this problem occurs, you might consider making the RMF address space non-swappable.

Starting the Session

An RMF START session command starts the session; the command is passed to RMF through the input field of the system MODIFY command. The command is issued from the operator console. The required syntax is:

$$\left\{ \begin{matrix} \text{MODIFY} \\ \text{F} \end{matrix} \right\} \quad [\text{RMF.}]\,id\text{,} \left\{ \begin{matrix} \text{START} \\ \text{S} \end{matrix} \right\} \; cuu$$

id

The identifier assigned to RMF when it was initialized.

cuu

The three-character device address of the display station to be used for the session. This device address is the identifier for your session; it appears in all RMF messages issued to you. It must be unique; it cannot be the same as an identifier assigned to another currently-active session. Specifying a session identifier that is not unique or is not the valid address of a display station will cause an error message.

When a valid START command is issued, RMF responds by building the control blocks your session requires, creating a display session task, and readying the Monitor II display functions of RMF. Message ERB100I is issued to the operator console when RMF is ready to receive your display commands. The menu is displayed on the screen.

Example

To start a Monitor II local 3270 display session at a display station with a device address of 642, issue the command:

```
MODIFY RMF.A,START 642
```

Ending the Session

The terminal user or the system operator can end the session. When a session is ended, RMF issues message ERB102I to the operator console and terminates the session.

The terminal user can end the session by entering the stop display command, which is Z.

The system operator can end the session by issuing either a STOP system command, which ends all active non-TSO RMF sessions, or a STOP session command for your particular session. The STOP session command is passed to RMF through the input field of the system MODIFY command. The syntax required is:

$$\begin{Bmatrix} MODIFY \\ F \end{Bmatrix} [RMF.]id, \begin{Bmatrix} STOP \\ P \end{Bmatrix} cuu$$

id

The identifier assigned to RMF when it was initialized.

cuu

The three-character device address session identifier assigned when your session was started.

Example

To end a session started with a session identifier of 642, issue the command:

```
MODIFY RMF.A,STOP 642
```

Controlling Display Session Processing

When RMF is ready to receive your commands, the menu frame appears on the display screen. The format of the display screen for an RMF display session, the use of the display station keys, and the display commands you can issue to RMF are described in the following sections.

Display Screen Format

Figure 2-4 shows the format of the screen for an RMF display session. The use of each field is described in the following text. The encircled letters in the figure refer to the encircled letters in the text.

Ⓐ The input area. Use this field to enter display commands, such as a request for a report. At the beginning of the session or after RMF has responded to a display command, the cursor is positioned at the beginning of the field. The input area is the only unprotected area of the screen; that is, it is the only area whose contents you can modify. The input area is blank at the beginning of the session and after RMF has responded to a command, unless one of the two following situations has occurred:

1. You have entered a display command that contains a syntax error. In this case, the command is displayed in the input area to enable you to correct and re-enter the command. A message describing the error appears in the status/message area (areaⒷ in the figure).

2. You have requested a table report that is longer than 21 lines. In this case, an F appears in the input area (areaⒶ in the figure) and the first 21 lines of data appear in the output area (areaⒻ in the figure). The F indicates that you should enter the frame command to view the next frame of output data. Because the area contains an F, you can view the next frame by pressing the enter key. The F continues to appear in the input area until all frames of data have been viewed. When the last frame is displayed, the end of the report is indicated by a blank input area. Should you decide at any point that you do not need to see the remaining frames, blank out the F in the input area and press the enter key, or enter your next command.

Ⓑ The status/message area. It normally contains the following general system load indicators:

CPU	-	the current processor utilization
UIC	-	the highest unreferenced interval count
AFC	-	the average length of the available frame queue
ASMQ	-	the current SRM view of the length of the ASM queue

When you have entered an invalid command or a command with a syntax error, a message describing the error appears in the status/message area.
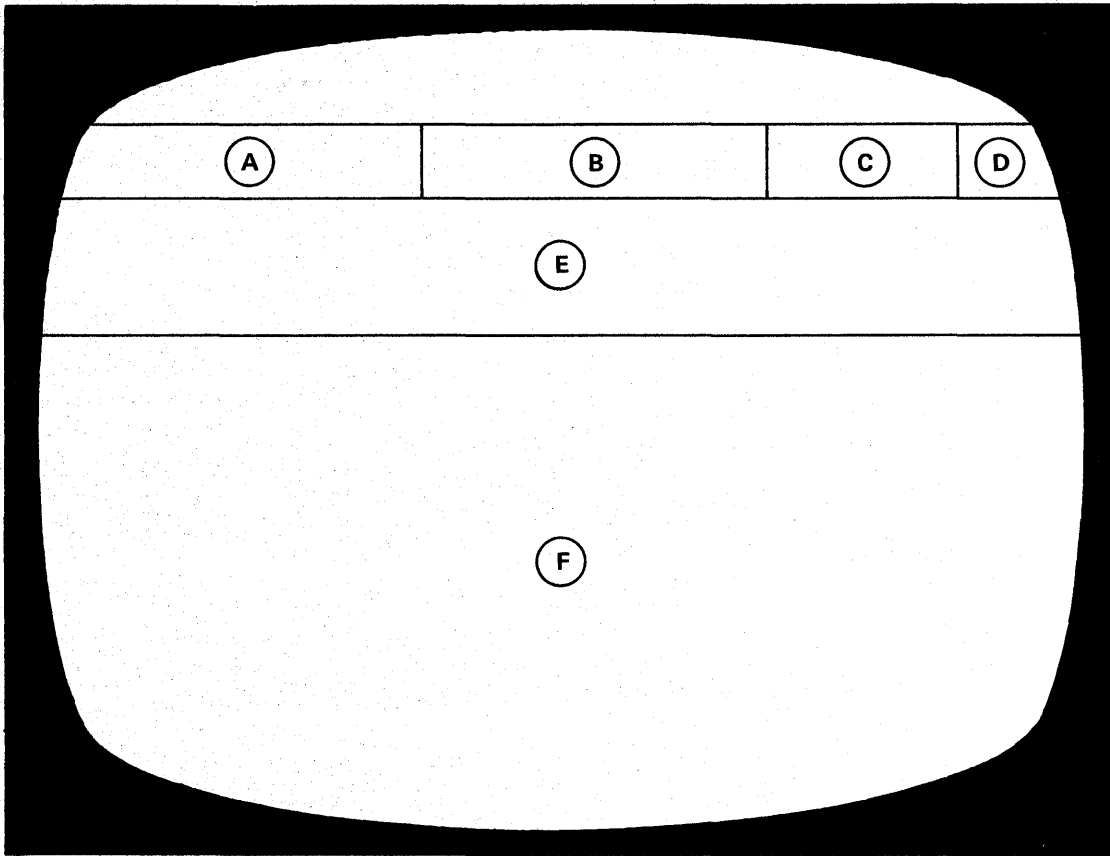
Figure 2-4. Display Station Screen Format

Ⓒ The report name field. It contains the name of the report whose output is currently shown in the output area (area Ⓕ in the figure). If there is no report output shown, this field contains the name of the report that will be generated if you press the enter key without entering a display command. The report name field is blank when the session begins. If you press the enter key when the report name field is blank at the beginning of the session, the first report listed in the menu will be produced, using default operands.

Ⓓ The mode field. It indicates the current setting of the delta and hardcopy modes for the session. The field contains two characters.

The first character can be either D, indicating delta mode for the session, or T, indicating total mode for the session. See "Set Delta Mode" later in this section for more information. D appears after you have entered a D ON or D command; T appears at the beginning of the session or after you have entered a D OFF command.

The second character can be either an H, indicating that hardcopy mode is in effect, or a blank, indicating that hardcopy mode has not been specified. See "Set Hardcopy Mode" later in this section for more information. H appears after you have entered an H ON or H command. A blank appears at the beginning of the session or after you have entered an H OFF command.

Ⓔ The header area. When the output area (area Ⓕ in Figure 2-4) contains report data, the two lines of the header area contain the column headings for the displayed report. When a processing error occurs, descriptive messages appear in this area, and no data is displayed in the output area.

Ⓕ The output area. It contains report output displayed in response to your report request. At the beginning of the session or in response to a menu (M) command, the menu frame appears in the output area. Occasionally, the output area can contain an informational message, such as message ERB405I, which is issued when you have requested a report for which no data is currently available.

Display Station Keys

The only key that can be used to transmit data from the IBM 3277 Display Station, Model 2, to RMF is the enter key. Normally, you would enter your commands in the input area and press the enter key to transmit the command to RMF. However, there are three situations when you can press the enter key without previously entering a command. These situations are:

1. At the beginning of a session when the menu frame is displayed in the output area, you can press the enter key without entering a command. This will cause the first report in the menu to be generated, with all operands defaulted.

2. If, after entering a report request and inspecting the output, you want to make a repetitive request for the same report, press the enter key without respecifying the report request. Pressing the enter key in this situation will cause the previously requested report to be generated again. The operands RMF uses are the same as those specified on the original request. This use of the enter key enables you to build a table of repetitive requests with a minimum of input and is especially useful when you are requesting a row report.

3. If an F appears in the input area, indicating that there are subsequent frames in the table report you have requested, you can view the next frame by pressing the enter key.

For a TSO session, the attention key (PA1) can be used in the same way it can be used for any TSO command. For a local 3270 session, the key has no effect. Pressing any of the other input-generating keys, such as PA2 or PF1-12, causes RMF to re-display the previous screen contents and wait for additional input. These keys can, therefore, be thought of as "recall" keys, as their only effect is to display again the previous contents of the screen.

Display Commands

Display commands enable you to perform the following functions:

- display the menu frame at any time
- set the delta mode for the session
- set the hardcopy mode for the session
- request a report
- frame through a table report
- recall the previous data
- print a report
- stop the session

The functions and the commands that they require are described in the following sections.

Display the Menu

To display the menu, issue the menu command. The syntax is:

M

When you enter M, RMF responds by displaying the menu of reports available. Figure 2-5 shows the menu frame. If your installation has added additional reports to those provided by RMF, the menu item and, possibly, a description of the report also appear in the menu frame.

Set Delta Mode

To set the delta mode for the session, use the delta command. The syntax is:

D $\left\{ \begin{array}{l} \underline{ON} \\ OFF \end{array} \right\}$

When delta mode is in effect, certain fields in some reports, such as the processor (CPU) time in the address space state report, reflect values that show the change since the previous invocation of the report. The first request for the report will show the value RMF detects at that time; all subsequent invocations of the report will show only the change since the previous report.

Delta mode is set off when the session begins. You must enter D ON or D to set the session in delta mode. If you later want to turn off delta mode, enter D OFF. All report fields that can reflect either session or delta values will then reflect session totals rather than changes.

Set Hardcopy Mode

To set the hardcopy mode for the session, use the hardcopy command. The syntax is:

H $\left\{ \begin{array}{l} \underline{ON} \\ OFF \end{array} \right\}$

When hardcopy mode is in effect, all data in all reports requested during the session is written to the output data set.

A single output data set is created for all hardcopy and print command output generated during a single session. Because reports requested might be multi-frame reports and you might choose not to frame through all of the data during the display session, the data written to the output data set when hardcopy mode is in effect can be more extensive than that displayed on the screen.

Hardcopy mode is turned off when the session begins. You must enter H ON or H to set hardcopy mode on. The command takes effect with the next report you enter. Thus, if you decide in the middle of inspecting a multi-frame table report that you would like a printed copy of the report, you must either use the print command (P) for each frame or set hardcopy mode on and then recall the report.

```
                    RMF DISPLAY MENU

      NAME        DESCRIPTION

      ASD         ADDRESS SPACE STATE DATA
      ASDJ        STATE DATA FOR SPECIFIC JOBNAME
      ARD         ADDRESS SPACE RESOURCE DATA
      ARDJ        RESOURCE DATA FOR SPECIFIC JOBNAME
      ASRM        ADDRESS SPACE SRM DATA
      ASRMJ       SRM DATA FOR SPECIFIC JOBNAME
      SRCS        REAL STORAGE / CPU / SRM DATA
      SPAG        PAGING DATA
      USER        USER PICTURE
```

Figure 2-5. Contents of the Menu Frame

Request a Report

To request a report, you enter the menu item name shown in the menu frame and any operands you require. The syntax is:

```
mm [operands]
```

where **mm** is the menu item for the report and **operands** represents any operands needed for the report. At least one blank must appear between the menu item and any operands you specify. The menu items, possible operands, and a brief description of each report provided by RMF are shown in Figure 2-6. Additional lines are left in the figure for you to note any user reports added by your installation. Each of the menu items provided by RMF is described in more detail under "Display Session Menu Items" later in this chapter.

Menu Item and Operands	Report Description
ASD class,status,domain	Address space state data
ASDJ jobname	Address space state data by jobname
ARD class,status,domain	Address space resource data
ARDJ jobname	Address space resource data by jobname
ASRM class,status,domain	Address space SRM services data
ASRMJ jobname	Address space SRM services data by jobname
SPAG	Paging
SRCS	Real storage/processor/SRM
USER	Reserved for an installation-supplied report

Figure 2-6. Menu Items

RMF generates two types of reports: table reports and row reports.

Table Reports: Table reports consist of up to two lines of header information and a variable number of data lines. A maximum of 21 lines can appear on the screen. The data lines for all address spaces that are not waiting will be highlighted. When a table report has more than 21 lines, you can use the frame command (F) to frame through all the data in the report.

Row Reports: Row reports consist of up to two lines of header information and one line of data. When you request a row report repetitively with no intervening requests for another report, the header lines and one data line appear for the first request. Each subsequent request causes an additional data line to be displayed. The newest data line is highlighted. Repetitive requests for the same report can thus be used to build a table of information. When 21 lines of data appear on the screen, the next request will cause the display to wrap around. The new line overlays the first data line of the existing display, and the new line is highlighted. The process is repeated for the second and all subsequent lines that wrap around. Any lines that are overlaid will be lost unless the report is printed.

Frame Through a Table Report

To display all of the data contained in a multi-frame table report (a report that consists of more than 21 lines), use the frame command. The syntax is:

F

When RMF displays the first frame of a multi-frame report, a frame command (F) automatically appears in the input area. After inspecting the data in the current frame, press the enter key to see the next frame. Continue the process until you have seen all of the data that you require. If you decide at any point that you do not need to see all of the frames in a report, blank out the frame command or enter a new command and press the enter key. When RMF displays the last frame in the report, the input area is blank.

Figure 2-7 shows an example of screen output for a multi-frame report. Note that the input area is blank when the last frame is displayed.

If you enter F when there are no subsequent frames, the command is ignored.

JOBNAME	DMN	P G	P P	TRAN TIME	C L	R LS	DP PR	DP PO	FS F	WS IN	TX SC	WRK RV	CPU RV	I/O RV	SRM SRVC	CPU TIME
MASTER	0	0	1	10:18:20	NS		FF	1	18	0	0	0	+0	+0	684824	1462.5
JES2	0	0	1	10:18:07	NS		FF	2	60	11	0	0	+0	+0	1.212M	633.35
WHO	1	39	1	00:55:26	WM	DW	74		0	4	.3	100	+0	+0	26	0.22
TCAMNCP	0	0	1	10:04:17	NS		FF	3	69	20	0	0	+0	+0	1.093M	919.44
SUPERY12	5	27	2	03:35:50	WM	DW	7F		0	7	128	150	+0	+0	5616	80.06
VTAMIPO	1	39	1	01:18:18	NS		FB	4	9	18	0	128	+0	+0	6	11.11
RMF	0	0	1	10:12:48	WL	LW	70		0	22	11	192	+0	+0	1170	7.53
SUPERY10	5	27	2	03:35:00	WM	DW	7F		0	9	116	150	+0	+0	983	50.31
INIT	0	16	1	00:02:11	WM	DW	CB		0	12	0	100	+0	+0	0	0.35
D20ARRTT	1	16	2	00:01:49	IN		71	8	58	11	0	81	+15	+0	20602	8.69
SUPER014	5	29	1	01:11:15	WM	DW	7F		0	12	10	150	+38	+0	89	0.54
D89BAR1A	1	3	2	00:26:07	IN		70	9	72	31	0	1	+0	+0	1.649M	727.46
INIT	0	11	1	00:44:46	WM	DW	CB		0	12	0	100	-38	+38	0	0.20
UZ07310	1	16	2	00:07:56	IN		70	11	132	12	0	50	+5	+0	93836	30.67
#IPO004	1	5	2	00:06:19	IN		74	6	28	34	0	62	+8	+0	143675	39.73
ERBMFCNV	1	11	2	00:08:11	IN		70	10	92	12	0	99	+0	+0	401	0.17
D16BAB1G	1	3	1	00:01:32	NS		71	7	40	24	0	100	+8	+0	131	0.07
SUPERZ15	5	28	1	00:55:11	WM	DW	7F		0	10	12	150	+0	+0	376	1.36
D02CFH1	2	41	1	01:20:18	WT	TI	7E		0	20	0	100	+0	+0	0	73.67
D24RBH1	2	46	3	05:30:24	WL	LW	74		0	13	2	100	+0	+0	1931	20.90
D94SAL7	3	74	1	00:01:21	WT	TI	7E		0	18	0	100	+0	+0	0	0.63

(Header: 18:13:28   CPU=101 UIC= 71 AFC= 141 ASMQ= 0   ASD   TH)

JOBNAME	DMN	P G	P P	TRAN TIME	C L	R LS	DP PR	DP PO	FS F	WS IN	TX SC	WRK RV	CPU RV	I/O RV	SRM SRVC	CPU TIME
D81KLL1	2	41	1	02:17:23	WT	TI	7E		0	14	0	100	+0	+0	0	1.76
E06FEJ1	2	41	1	00:00:09	WT	TI	7E		0	22	0	100	+0	+0	0	1.17
D81RFR1	2	41	1	00:00:01	WT	TI	7E		0	18	0	100	+0	+0	0	2.27
D81PHD1	2	41	1	00:00:02	WT	TI	7E		0	21	0	100	+0	+0	0	6.96
D16BAB1	2	41	1	00:00:00	IN		8B	5	28	27	0	100	+0	+0	0	11.55
D82SFS1	2	41	1	00:00:03	WT	TI	7E		0	17	0	100	+0	+0	0	7.12

(Header: 18:13:28   CPU=101 UIC= 71 AFC= 141 ASMQ= 0   ASD   TH)

Figure 2-7. Use of the Frame Command

Recall the Previous Data

To cause the most recently displayed set of data (either a full table for a table report or a single line for a row report) to be displayed again, use the recall command. The syntax is:

```
Rmm [operands]
```

where **mm** is the menu item name and **operands** can be either the operands you specified when you requested the report or or a subset of these operands. For example, if you entered ASD A,I,A, you could enter RASD T to see only the TSO address spaces or RASD B to see only the batch address spaces. No blanks can intervene between R and the menu item name. At least one blank must appear between the menu item name and any operands you require.

Example

If you requested the address space state report for a job named JOB1 with the command

```
ASDJ JOB1
```

you would recall the report with the command

```
RASDJ JOB1
```

Print a Report

To request that the data currently displayed on the screen be written to the default SYSOUT class, use the print command.

The syntax is:

```
P
```

The command causes the current contents of the screen to be printed. Because the command causes only the current screen image to be printed, you would have to use repetitive frame commands and print commands to cause all of the data in a multi-frame table report to be printed.

Use this command when you want to print a single report and the session is not in hardcopy mode. In hardcopy mode, all screen images are automatically printed, and you would not need to use the print command.

A single output data set is created for all print command and hardcopy output generated during a single session.

Stop the Session

To stop the session, use the stop command. The syntax is:

```
Z
```

When you enter Z, RMF ends the session.

Menu Items

This section describes, in alphabetical order, the menu items provided by RMF. When you enter one of these menu items during a display session, the corresponding report is displayed on the screen. If your installation adds reports to those provided by RMF, you might want to note the menu item, any operands and their meanings, and the report description in this section.

ARD [class, status,domain]

Requests the report on address space resource data; the **class, status,** and **domain** operand fields specify the selection criteria for the address spaces to be included in the report.

The meaning of each operand field is:

class

A specifies all address spaces

B specifies batch, started task, and mount task address spaces

T specifies TSO address spaces

status

A specifies all address spaces

I specifies address spaces that are active; that is, those address spaces that are currently executing, non-swappable, or swapped out and eligible for swap-in

domain

A specifies all address spaces

nnn specifies those address spaces in the domain identified by **nnn.**

The **class, status,** and **domain** operand fields are optional; when all are omitted, the report includes all address spaces in the system that are currently active.

The operand fields are positional; thus, any operand omitted, except the last to be specified, must be replaced by a comma; RMF uses the default value for any omitted operand.

Defaults: If you request the report without specifying any operands, the value for **class** is A, the value for **status** is I, and the value for **domain** is A. These values come from two sources: the menu entry for the report and the routines that generate the report.

The menu defaults are specified in the RMF control section (ERBFMENU) that contains the menu list for display reports. Separate defaults are set for the data gathering routine and the data reporting routine. For the data gathering routine, the value for **class** is A, and the value for **status** is A. For the data reporting routine, the value for **class** is A, and the value for **status** is I. Because data is gathered for all address spaces, you can recall data for either batch, started task and mount task address spaces, or TSO address spaces without re-executing the report. You can change the menu defaults to fit the needs of your particular installation as described in Chapter 3 under "Installing a User Report" and "Using the PICTURE Macro."

Default values are also included in the data gathering routine and the data reporting routine. The "hard-coded" default for **class** is A, for **status** is A, and for **domain** is A.

To determine the operands for the report, RMF first uses the operands that you specify on the report request. If you do not specify all three operands, RMF uses the menu defaults. If the operands are still not complete, RMF uses the default values coded in the data gathering and data reporting routines.

Examples

1. To report on all address spaces that are currently active in domain 3, enter

   ARD , , 3

2. To report on all TSO address spaces that are currently active in any domain, enter

   ARD T

3. To report on all batch, started task, and mount task address spaces that are currently active in domain 3, enter

   ARD B , , 3

ARDJ jobname
Requests the report on address space resource data for the job specified in **jobname**.

ASD [class,status,domain]
Requests the report on address space state data; **class, status,** and **domain** specify the selection criteria for the address spaces to be included. The fields are optional; their meaning and use are as described under ARD.

ASDJ jobname
Requests the report on address space state data for the job specified in **jobname**.

ASRM [class,status,domain]
Requests the report on address space SRM data; **class, status,** and **domain** specify the selection criteria for the address spaces to be included. The fields are optional; their meaning and use are as described under ARD.

ASRMJ jobname
Requests the report on address space SRM data for the job specified in **jobname**.

SPAG
Requests the report on system paging.

SRCS
Requests the report on real storage/processor/SRM activity.

USER
Requests a user-specified report. Your installation must code a corresponding data-gathering module and data-reporting module before USER can take effect.

Monitor II Background Session Control

The measurement activities of a Monitor II background session are started from the operator console with a START session command. See "Starting a Monitor II Background Session."

The options that you select control session processing. Each option is described under "Monitor II Background Session Options." The options for a session can be specified in:

- the **parm** field of the START command that is issued to start the session, or
- the RMF partitioned data set member(s), normally included in SYS1.PARMLIB

When an option is not specified in either of these sources, a program default is used. The input from each of these sources is merged to form a final set of options for the session. This process is described under "Input Merge for a Background Monitor II Session."

The options selected when the session is started can be modified during the session, as described under "Modifying the Monitor II Background Session Options."

Methods of ending the session are described under "Ending a Monitor II Background Session."

Monitor II Background Session Options

This section describes, in alphabetical order, the options that can be specified for a Monitor II background session. If your installation adds reports to those provided by RMF, you might want to note here the option, any operands and their meaning, and a report description. The program defaults are underscored where appropriate.

ARD [class,status,domain)]/NOARD

Specifies whether or not address space resource data is to be collected; the **class, status,** and **domain** operand fields specify the selection criteria for the address spaces to be included. The meaning of each operand field is:

class

A specifies all address spaces

B specifies batch, started task, and mount task address spaces

T specifies TSO address spaces

status

A specifies all address spaces

I specifies address spaces that are active; that is, those address spaces that are currently executing, non-swappable, or swapped out and eligible for swap-in

domain

A specifies all address spaces

nnn specifies thaose address spaces in the domain identified by **nnn.**

The **class, status,** and **domain** operand fields are optional; when all are omitted, the report includes all currently active address spaces in the system. The operand fields are positional; thus , any operand omitted,

except the last to be specified, must be replaced by a comma; RMF uses the default value for any omitted operand.

Defaults: If you specify the option without specifying any operands, the value for **class** is A, the value for **status** is I, and the value for **domain** is A. These values come from two sources: the option list entry for the report and the routines that generate the report.

The option list defaults are specified in the RMF control section (ERBBMENU) that contains the option list for the Monitor II background session measurement activities. Separate defaults are set for the data gathering routine and the data reporting routine. For the data gathering routine, the value for **class** is A, and the value for **status** is A. For the data reporting routine, the value for **class** is A, and the value for **status** is I. You can change the menu defaults to fit the needs of your particular installation as described in Chapter 3 under "Installing a User Report" and "Using the PICTURE Macro."

Default values are also included in the data gathering routine and the data reporting routine. The "hard-coded" default for **class** is A, for **status** is A, and for **domain** is A.

To determine the operands for the option, RMF first uses the operands that you specify on the option list. If you do not specify all three operands, RMF uses the option list defaults. If the operands are still not complete, RMF uses the default values coded in the data gathering and data reporting routines.

Examples

1. To select for measurement all address spaces that are currently active in domain 3, specify

       ARD (, , 3)

2. To select for measurement all TSO address spaces that are currently active in any domain, specify

       ARD (T)

3. To select for measurement all batch, started task, and mount task address spaces that are currently active in domain 3, specify

       ARD (B , , 3)

ARDJ (jobname)/NOARDJ
Specifies whether or not address space resource data for a particular job is to be collected. The job to be measured is identified in the **jobname** field.

ASD [(class,status,domain)]/NOASD
Specifies whether or not address space state data is to be collected; **class, status,** and **domain** specify the selection criteria for the address spaces to be included. The fields are used as described under ARD.

ASDJ(jobname)/NOASDJ
Specifies whether or not address space state data is to be collected for a particular job. The job to be measured is identified in the **jobname** field.

ASRM[class,status,domain)]/NOASRM

Specifies whether or not address space SRM data is to be collected; **class, status,** and **domain** specify the selection criteria for the address spaces to be included. The fields are used as described under ARD.

ASRMJ(jobname)/NOASRMJ

Specifies whether or not address space SRM data is to be collected for a particular job. The job to be measured is identified in the **jobname** field.

DELTA/NODELTA

Specifies whether data in some reporting fields is to reflect either total values (NODELTA) or, after the first measurement, values that reflect changes since the previous measurement (DELTA). The fields that can be affected by the choice of DELTA or NODELTA are noted in the description of each report given in Chapter 5.

MEMBER (list)

Specifies the member or members of the RMF partitioned data set that contain the options to be used for the session. The list can contain from one to five entries, separated by commas, and each entry consists of a two-character alphameric value to be appended to ERBRMF to form the member name. When more than one member is specified, input merge takes the options from the members in left to right priority order.

The default is 01, indicating member ERBRMF01 in the partitioned data set named on the IEFRDER DD statement in the RMF cataloged procedure (normally SYS1.PARMLIB). The option must not be specified within a partitioned data set member.

For a list of the options specified in the RMF partitioned data set members supplied by IBM, see "Contents of the Parmlib Members" earlier in this chapter.

Each member specified must contain options appropriate for a Monitor II background session. A member containing Monitor I session options will cause syntax errors.

OPTIONS/NOOPTIONS

Specifies whether or not a list of the options to be used is to be printed at the operator's console at the start of the session. If the list is printed (OPTIONS specified), the operator can respond with any desired changes, except the MEMBER option.

Figure 2-8 shows an example of the console output produced when OPTIONS in in effect. Each option is followed by the input source from which RMF obtained the option. The possible sources are:

- COMMAND -- the option was specified on a START or MODIFY command

- DEFAULT -- the option was taken from the program defaults.

- CHANGED -- the option was changed by RMF. The preceding message, ERB301I, describes the nature of the conflict and the cahnge RMF has made.

- MEMBER -- the option was specified in a member of the RMF partitioned data set.

```
ERB305I AA : PARAMETERS
ERB305I AA :   NOASRMJ -- DEFAULT
ERB305I AA :   NOASRM -- DEFAULT
ERB305I AA :   NOSRCS -- DEFAULT
ERB305I AA :   NOARDJ -- DEFAULT
ERB305I AA :   NOASDJ -- DEFAULT
ERB305I AA :   SYSOUT(A) -- DEFAULT
ERB305I AA :   REPORT(DEFER) -- MEMBER
ERB305I AA :   RECORD -- MEMBER
ERB305I AA :   SINTV(10S) -- MEMBER
ERB305I AA :   NODELTA -- MEMBER
ERB305I AA :   NOUSER -- MEMBER
ERB305I AA :   STOP(1M) -- COMMAND
ERB305I AA :   ARD -- COMMAND
ERB305I AA :   SPAG -- COMMAND
ERB305I AA :   ASD -- COMMAND
ERB305I AA :   OPTIONS -- COMMAND
```

Figure 2-8. OPTIONS Output for a Monitor II Background Session

Notes:

- OPTIONS can be abbreviated OPTN on the operator command
- NOOPTIONS can be abbreviated NOOPTN on the operator command
- You can avoid unnecessary console output and delay in starting the session by specifying NOOPTIONS (or NOOPTN). When RMF detects any syntax errors, OPTIONS is forced to enable the operator to examine the options and make any required changes.

RECORD/NORECORD

Specifies whether or not measured data is to be written to the SMF data set. In order for RECORD to take effect, the complementary SMF enabling procedures must first be performed. These procedures are described in OS/VS2 **System Programming Library: System Management Facilities.**

REPORT({REALTIME / DEFER})/NOREPORT

Specifies whether or not printed interval reports of the measured data are to be produced. When reports are to be produced (REPORT specified), the REALTIME or DEFER option indicates when the reports are to be printed.

When you omit the option, the default is REPORT(DEFER). If you explicitly specify REPORT, you must specify either REALTIME or DEFER; specifying REPORT without choosing REALTIME or DEFER causes a syntax error.

REALTIME indicates that the reports are to be printed at the end of the session. When REPORT(REALTIME) is in effect, reports are also printed when:

- session options are modified to terminate the request for a particular report, or
- session options are modified to end the generation of all reports or to replace REPORT(REALTIME) with REPORT(DEFER).

For example, assume that the options ASRM, SPAG, and REPORT(REALTIME) are in effect for an active session. If you end the request for the system paging report by replacing SPAG with NOSPAG, any accumulated paging reports will be printed. If you change

REPORT(REALTIME) to REPORT(DEFER) or NOREPORT, all accumulated reports will be printed.

DEFER indicates that the reports are to be printed after RMF processing terminates.

SINTV (value)

Specifies the number of seconds in each measurement interval. The range is from 1 to 3600 seconds. The default is 30 seconds.

When you require a small SINTV value, RMF overhead increases and excessive swapping can result; if this should occur, you could make the RMF address space non-swappable to minimize this overhead.

SPAG/NOSPAG

Specifies whether or not paging activity is to be measured.

SRCS/NOSRCS

Specifies whether or not real storage/processor/SRM activity is to be measured.

STOP(value $\begin{bmatrix} M \\ H \end{bmatrix}$ **)/NOSTOP**

Specifies the desired duration for the session in minutes (M) or hours (H). The range is from one minute to one week (168 hours or 10,080 minutes). The default value is ten minutes. If you specify a value outside the range, RMF substitutes the default value. If neither M nor H is specified, M (minutes) is assumed. NOSTOP means the session can be ended only by a STOP command.

Note: The operator STOP command can end the session at any time, regardless of the value specified for this option.

SYSOUT(class)

Specifies the SYSOUT class to which the formatted interval reports are directed. Class A is the default. The SYSOUT option cannot be modified during session processing.

USER/NOUSER

Specifies whether or not a user-specified activity is to be measured. Your installation must supply a corresponding data-gathering module and data-recording module before USER can take effect.

Conflicts Between Options

After the operator enters the START session command to start the session, RMF merges the input options (see "Input Merge for the Monitor II Background Session" later in this section). After the merge is performed, it is possible that conflicts between options can arise because some options cannot be used concurrently to control a single Monitor II background session. Should any conflicts occur, RMF detects the mutually-exclusive options during input merge and selects compatible values for these options; the operator is notified of the selections made. The possible conflicts are:

Conflict	Problem	RMF Resolution
NOREPORT and NORECORD specified	No way for installation to obtain measurement data	Change NOREPORT to REPORT(DEFER)
STOP value specified is less than SINTV	Indicates session termination before obtaining any data	Set STOP value equal to SINTV value
REPORT(DEFER) and NOSTOP specified	SYSOUT will become cluttered with unprinted reports	Change NOSTOP to STOP value equal to SINTV value

Input Merge for a Monitor II Background Session

Input merge is the process RMF performs to determine what options are to be established for the session. Input merge is performed at the start of the session and whenever the MODIFY session command is used to modify the options of an active Monitor II background session. Input merge takes options from various input sources and merges them to form a list of options for the session.

When the Session Is Started

At the start of the session, input merge uses a "fill in the blanks" procedure; that is, it takes options from the three possible input sources in a defined priority order. Once an option is filled in, no options from a lower-priority input source can override that option. The input sources and their priority order are:

1. The **parm** field of the START command. Any options specified in this input source have the highest priority. If the MEMBER option is specified, the options contained in the member(s) are processed after any other options specified on the START command and before RMF proceeds to the next input source.

   The MEMBER option can be used to specify up to five members of the RMF partitioned data set (normally SYS1.PARMLIB). If the MEMBER option is used to specify more than one member, RMF takes options from the members in left to right order. If, for example, MEMBER(03,05) is specified, RMF generates the member names ERBRMF03 and ERBRMF05 and takes options from ERBRMF03 first. Thus, if ERBRMF03 specifies NOASD and ERBRMF05 specifies ASD, NOASD is the option established for the session. If a specified member does not exist, RMF continues with the next specified member, if any, or proceeds to the next input source.

2. If the MEMBER option has not been specified on the START command, RMF uses a default member name, ERBRMF01, as the second highest priority input source. Options from the default member can fill in only those options not specified earlier on a higher priority input source.

3. The program defaults. The program defaults are the lowest priority input source; that is, the program defaults can fill in only those options not filled in by a higher priority input source.

During input merge, RMF might detect mutually exclusive options (such as RECORD and NORECORD) or syntax errors. When either occurs, RMF notes the condition and issues a warning message but does not terminate the merge. When mutually exclusive options are detected, RMF takes the value associated with the first specification of the option. When an invalid value is detected for SINTV or STOP, RMF substitutes a valid value, as described for each option under "Monitor II Background Session Options." When other syntax errors are detected, RMF ignores the input option in error and uses the next valid specification from a lower priority source.

Following a merge during which an error was detected — or any merge when the OPTIONS option is in effect — RMF displays the options resulting from the merge at the operator console; the system operator can change the options, if necessary, before session processing begins.

Example

Assume that the operator issued the following START command to start a Monitor II background session:

```
MODIFY RMF.A,START AB,DELTA,SINTV(30),MEMBER(07)
```

The input merge process uses two of the three options from the START command to begin the list of session options:

```
DELTA
SINTV(30)
```

Because MEMBER (07) is specified in the START command, RMF generates the member name ERBRMF07 and locates it in SYS1.PARMLIB. Assume that ERBRMF07 contains the following options:

```
ASD
SINTV(10)
OPTIONS
STOP(20)
SPAG
SRCS
```

RMF would add all of these options except SINTV(10) to the option list. SINTV(10) would not be used because SINTV(30) was specified on the higher-priority START command. The option list for the session is now:

```
DELTA
SINTV(30)
ASD
OPTIONS
STOP(20)
SPAG
SRCS
```

To complete the option list, input merge would then proceed to the program defaults supplied by IBM. (These defaults are indicated in the discussion of each option earlier in this chapter under "Monitor II Background Session Options.") As a result of merging the defaults with the options already specified, input merge would build a complete list of session options. The final option list would be:

merge would build a complete list of session options. The final
option list would be:

```
NOASRMJ -- DEFAULT              SYSOUT(A) -- DEFAULT

NOASRM -- DEFAULT               SRCS -- MEMBER

NOARDJ -- DEFAULT               SPAG -- MEMBER

NOARD -- DEFAULT                ASD -- MEMBER

NOASDJ -- DEFAULT               STOP(20M) -- MEMBER

NOUSER -- DEFAULT               DELTA -- COMMAND

REPORT(DEFER) -- DEFAULT        SINTV(30) -- COMMAND

RECORD -- DEFAULT               OPTIONS -- MEMBER
```

When the Session Options Are Modified

When the MODIFY session command is used to modify the options
established for an active session, RMF performs an input merge process.
However, the process differs from the input merge used at the start of the
session. Input merge as a result of a MODIFY session command starts with
the list of options previously established and uses the input sources to
override any previously established option.

The input sources and the order in which they are processed are:

1. The **options** field of the MODIFY session command. Any options
   specified here will override and replace any options in effect prior to
   the MODIFY session command.

2. The library data source. If the **options** field of the MODIFY
   command includes a MEMBER option, RMF will generate the
   member name and use any options specified in the member to
   override and replace any options in effect prior to the processing of
   the library data source, including any options specified in the
   MODIFY command **options** field.

   When more than one member is specified, RMF processes the
   members in left to right order. However, because the merge process
   that occurs in response to a MODIFY session command uses the
   input sources to override any previously-established options, options
   from the rightmost member will override any corresponding options
   from a previously-processed member. For example, if
   MEMBER(03,05) is specified on a MODIFY command, RMF
   generates the member names ERBRMF03 and ERBRMF05 and takes
   options from ERBRMF03 first. Thus, if ERBRMF03 specifies
   NOASD, the merge process places the option in the list of options
   currently established for the session. If, however, member
   ERBRMF05 specifies ASD, ASD overrides the currently-established
   NOASD. ASD is thus the option established for the session as a
   result of the MODIFY command.

When input merge is complete, RMF displays the options resulting from
the merge at the operator console when an error is detected or when
OPTIONS is in effect. The actions RMF takes in response to errors and the
response the operator can make are identical to those for input merge at
the start of the session.

For example, assume that the options for a currently-active session include NOASD, SPAG, and NOSTOP, and that you want to modify these options to ASD, NOSPAG, and STOP(40M).

If you issue the command:

```
MODIFY RMF.A,MODIFY AB,ASD,NOSPAG,STOP(40M)
```

the options will be modified as you want.

If, however, member ERBRMF09 includes the options:

```
ASD
NOSPAG
NOSTOP
```

and you issue the command:

```
MODIFY RMF.A,MODIFY AB,STOP(40M),MEMBER(09)
```

RMF will:

1. Merge the input option from the command and replace NOSTOP in the current option list with STOP(40M).

2. Merge the options from ERBRMF09 with the current options list, replacing NOASD with ASD, SPAG with NOSPAG, and STOP(40M) with NOSTOP.

Thus, any options in a member will override both any current options and any options specified on the MODIFY session command.

Starting a Monitor II Background Session

A Monitor II background session is started by a START session command, which is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$\left\{ \begin{matrix} \text{MODIFY} \\ \text{F} \end{matrix} \right\} \quad \text{[RMF.]id,} \left\{ \begin{matrix} \text{START} \\ \text{S} \end{matrix} \right\} \quad \text{session-id[,parm]}$$

id
The identifier assigned to RMF when it was initialized.

session-id
A two-character alphameric identifier for the session to be started. This session identifier can be any two characters except ZZ (ZZ always indicates the Monitor I session). The session identifier appears in all RMF messages pertaining specifically to the session being started. The identifier specified must be unique; it cannot be the same as an identifier already assigned to a session that is currently active.

parm
The options for the session. Each option has the form

```
option[(value)]
```

and must be separated by a comma. If the MEMBER option is specified, any members identified in the value field are used during input merge to

produce the list of options for the session, though the options specified in this field of the START command have a higher priority.

Examples

1. To start a Monitor II background session when all options are to be taken from the program defaults, issue the command

   ```
   MODIFY RMF.A,START AB
   ```

2. To start a Monitor II background session and specify that reports be produced at the end of the session and that other options be taken from the RMF partitioned data set member ERBRMF07, issue the command:

   ```
   MODIFY RMF.A,START BB,MEMBER( 07 ),REPORT( REALTIME )
   ```

Modifying the Monitor II Background Session Options

When required, the options in effect for an active Monitor II background session can be modified by issuing a MODIFY session command specifying the options to be changed.

Issuing a MODIFY session command forces an immediate end of interval; after interval processing, those options specified in the command are changed, message ERB104I is issued, and the session resumes processing using the new set of options. The MODIFY session command is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$
\begin{Bmatrix} \text{MODIFY} \\ \text{F} \end{Bmatrix} \text{ [RMF.]id, } \begin{Bmatrix} \text{MODIFY} \\ \text{F} \end{Bmatrix} \text{ session-id[,options]}
$$

id
   The identifier assigned to RMF when it was initialized.

session-id
   The two-character alphameric identifier of the session to be modified.

options
   The session options to be changed. Each option has the form

   ```
   option[( value )]
   ```

and must be separated by a comma. All options except SYSOUT can be specified; the SYSOUT option cannot be modified during a session. Note that, if you specify the MEMBER option, any options within the member will override any options specified in the command.

Note: At the start of the session, RMF uses the values in the SINTV and STOP options to calculate the number of measurement intervals for the session. If the STOP value is 30 minutes and the SINTV value is 30 seconds, there are 60 measurement intervals during the session. When you change either of these values during the session, the duration of the session can be affected. Assume that a session has been started with the STOP and SINTV values noted above. After 15 minutes, you decide to change SINTV to 20 seconds, while STOP remains at 30 minutes. RMF re-calculates the number of intervals required by dividing the STOP value by the SINTV

value. In this example, the number of intervals would be 90. The duration of the session is therefore 45 minutes.

Example

To modify the options of an active Monitor II background session to add printed output to SMF record output (NOREPORT and RECORD in effect), enter the command

```
MODIFY RMF.A,MODIFY AB,REPORT(DEFER)
```

Ending a Monitor II Background Session

A Monitor II background session can be ended in three ways:

- Issuing a system STOP command that stops all active non-TSO RMF sessions. The syntax of the command and an example are given earlier in this chapter under "RMF Termination."
- Expiration of the time value specified in the STOP option. Use of the STOP option is described under "Monitor II Background Session Options" earlier in this section.
- Issuing a STOP session command to stop a specific active session. All other active RMF sessions continue processing. This method is described here.

The STOP session command is passed to RMF through the input field of the system MODIFY command. The required syntax is:

$$
\left\{ \begin{array}{c} \text{MODIFY} \\ \text{F} \end{array} \right\} \quad \text{[RMF.]id,} \quad \left\{ \begin{array}{c} \text{STOP} \\ \text{P} \end{array} \right\} \quad \text{session-id}
$$

id
The identifier assigned to RMF when it was initialized.

session-id
The two-character session identifier assigned to the session when it was started.

Issuing the command forces an immediate end of interval for the session; after interval processing is complete, RMF issues a message and ends the session.

Example

To stop a Monitor II background session started with a session identifier of AR, issue the command

```
MODIFY RMF.A,STOP AR
```

Post Processing

The RMF post processor can generate interval, duration, summary, and plot reports, thus enabling your installation to obtain interval reports during off-shift hours instead of during RMF processing and to obtain reports that summarize the information collected by RMF during a Monitor I session.

There are two types of input to the post processor: data input and control input.

Data input consists of a data set that contains SMF records. Thus, the input data set can be either SYS1.MANX, SYS1.MANY, or a data set that consists of records dumped from either or both of the SMF record data sets by means of the IFASMFDP program. If your input data set combines records from SYS1.MANX and SYS1.MANY, the records must be dumped in the order in which they were written or sorted according to interval start date and interval start time before they are used as input to the post processor. If your input data set combines SMF records created by more than one system, the records must always be sorted according to interval start date and interval start time.

Control input consists of control statements. The control statements describe the type of reporting you want the post processor to do.

Output from the post processor consists of the printed reports you requested and any messages issued by the post processor.

The post processor verifies the control statements and uses the information they contain to build a list of options that control its execution. If you omit a statement, RMF substitutes the default value. If a syntax error is detected, RMF substitutes the default value, if there is one, or ignores the option. In most cases, an error in a control statement does not cause the post processor to terminate; it notes the condition, issues a warning message to the output message data set, and continues with the process of building a list of options for execution. After this process is complete, the post processor issues message ERB103I to the output message data set to indicate the options in effect.

The option list consists of the options you have entered on control statements and any options for which the default values were used.

Each option listed is followed by the input source from which the post processor obtained the option. The possible sources are:

- SYSIN -- the option was specified on a control statement for the post processor.
- DEFAULT -- the option was taken from the control statement defaults. When RMF detects an invalid value and substitutes a default value, a warning message is issued, and DEFAULT appears in the option list.

After establishing the list of options, the post processor generates the reports you specify for the reporting period you require. The duration of the reporting period can be established in two ways:

1. Through the use of control statements (DATE,RTOD,PTOD, and STOD) that indicate a specific range of dates and specific ranges of times.

2. Through the contents of the input SMF record data set. The defaults for the control statements that define the reporting period cause the post processor to include all dates and all times in the reporting period. Thus, omitting these control statements causes the requested reports to be generated for all dates and times included in the input data set.

A single execution of the post processor can generate interval reports, plot reports, and a summary report. Duration reports, plot reports, and a summary report can also be generated during a single execution. However, duration and interval reports cannot be generated during the same execution of the post processor. The use of control statements to describe the type of reporting you require is given later in this section under "Post Processor Control Statements."

When all requested reports have been generated, the post processor issues a return code and terminates execution. The return codes the post processor uses are:

Code	Meaning
0	Normal completion – reports generated as requested
4	Normal completion – no RMF input records found
8	Error – see accompanying RMF message
12	Terminating error – see accompanying RMF message

Post Processor JCL

The post processor runs as a batch job; the JCL required to invoke the post processor is:

```
//EXAMPLE    JOB      accounting information
//POST       EXEC     PGM=ERBRMFPP
//MFPINPUT   DD       data set containg SMF records (tape or
                      DASD)
//SYSIN      DD       *
  control statements
/*
```

Because RMF can generate spanned SMF records -- particularly when I/O device activity is measured -- the DD statement for the MFPINPUT data set should specify RECFM=VBS and a logical record length (LRECL) that is at least equal to the length of the longest record.

The control statements can appear in any order. Data can appear in columns 1 to 72. No continuation statements are allowed; however, a control statement can be repeated until all required options are specified. Each control statement is described in detail in the following section. Examples of using control statements to describe the types of reporting required are given under "Examples."

The post processor dynamically allocates all message and report data sets to SYSOUT. However, if the system returns a code that indicates the ddname is in use, the post processor proceeds as if the dynamic allocation had been successful. Thus, your installation can allocate the data sets for the post processor in the JCL, enabling you to change some characteristics of the output. The report data sets for Monitor I interval reports and duration reports use the ddnames MFRnnnnn and MFEnnnnn, which are described earlier in this chapter under "RMF JCL." The other report data

sets and the message data set that the post processor uses and the ddnames for these data sets are:

Ddname	Use
MFPMSGDS	This data set contains message output. One MFPMSGDS data set is allocated each time the post processor is executed.
RMFPnnnn	This data set contains Monitor II session interval report output. A ddname is generated and a data set is created for each report for each session-identifier included in the reporting; **nnnn** is a decimal number from 0001 to 9999. When the post proessor is to generate reports for more than one system, a separate data set is allocated for each report for each system. When operands for a Monitor II session were not specified on the REPORTS statement, the post processor uses the operands in the SMF record, and a separate data set is allocated each time the operands change.
PPSUMnnn	This data set contains summary report output. A ddname is generated and a data set is created for each system included in the input data set; **nnn** is a decimal number from 001 to 999. The first system encountered is assigned the ddname PPSUM001, and each subsequent system is assigned a ddname in ascending numerical order.
	The data set the post processor creates has a variable blocked (VBA) record format and a logical record length of 125. Thus, the maximum length of the output line is 120 characters. If your system has two processors, TSO, block multiplexor and selector channels for both processors and you use the full reporting facilities of RMF, the summary report is truncated because it cannot fit into 120 characters. To avoid this problem, pre-allocate this data set, specifying a logical record length of 130 characters.
PPPLTnnn	This data set contains plot report output. A ddname is generated and a data set is created for each system included in the input data set; **nnn** is a decimal number from 001 to 999. The first system encountered is assigned the ddname PPPLT001, and each subsequent system is assigned a ddname in ascending numerical order.
	The data set the post processor creates has a variable blocked (VBA) record format and a logical record length of 125, a length that allows for two plot reports per page. If your printer has a longer line length, you can pre-allocate this data set with a logical record length of 184 to allow three plots per page. A logical record length of 184 allows 177 characters for the three 59-character plots, two separator characters between the plots, one ASA control character, and four characters for the variable record header.

Note: When you omit the DCB characteristics for the message and report data sets described above, the characteristics used are:

    DCB=(RECFM=VBA, LRECL=125, BLKSIZE=1693)

When you change the DCB characteristics, you cannot change the record format; you must specify RECFM=VBA.

Post Processor Control Statements

This section describes in alphabetical order each of the post processor control statements. Figure 2-9 shows which control statements are needed for interval, summary, duration, and plot reports. It also indicates which control statements are required and which control statements can be omitted when the default value is what you want.

Post Processor Control Statement	Used For:					
	Monitor I Session Interval Report	Monitor II Session Interval Report	Duration Report	Summary Report	Plot Report	Notes
DATE	X	X	X	X	X	1
DELTA		X				1
DINTV			X			2, 3
EXITS	X					1
MAXPLEN					X	1
PINTV					X	1
PLOTS					X	2
PTOD					X	1
REPORTS	X	X	X			2
RTOD	X	X	X			1
SESSION		X				1
STOD				X		1
SUMMARY				X		1
SYSID	X	X	X	X	X	1
SYSOUT	X	X	X	X	X	1

Notes:

1. The control statement need not be explicitly specified if the default value is acceptable.

2. The control statement must be specified explicitly.

3. Duration reports cannot be requested concurrently with interval reports; separate executions of the post processor are required for each type. However, summary and plot reports can be requested concurrently with either duration or interval reports.

Figure 2-9. Post Processor Control Statements Summary

DATE Control Statement

The DATE control statement specifies the date or range of dates of the reporting period for all reports.

The syntax of the statement is:

```
DATE(yyddd,yyddd)
```

where **yy** is the last two digits of the year, and **ddd** is the Julian day. The first date is the starting date, and the second date is the ending date. The dates must be specified in chronological order.

When the DATE statement is omitted, the default value is DATE(00000,99366); that is, all dates found in the input data set are reported.

When the entire reporting period falls within one calendar day, the date must be specified twice. For example, to request reports for data collected on July 7, 1977, specify DATE(77188,77188).

DELTA Control Statement

The DELTA control statement specifies whether certain fields in Monitor II background session reports are to reflect total values or, after the first report, changed -- "delta" -- values. The fields that are affected by delta mode are described for each report under "Monitor II Session Reports" in Chapter 5. The syntax of the statement is:

```
DELTA/NODELTA
```

DELTA indicates that the affected fields are to reflect changed values; that is, the reports are to be generated in delta mode. NODELTA indicates that the affected fields are to reflect total values. NODELTA is the default.

DINTV Control Statement

The DINTV control statement specifies that the post processor is to generate duration reports and indicates the length of the duration interval. The duration interval is the length of time each report can cover. The syntax of the statement is:

```
DINTV( hhmm )
```

where hh is the hour and mm is the minute (military time). The time specified is the length of the duration interval, not the time of day when it is to begin.

The DINTV statement must be specified to obtain duration reports. When the statement is omitted, the post processor generates interval reports. When the statement is specified, the length of the duration interval must be specified because there is no default value for the length of the duration interval.

The duration interval can be the same length as the reporting period. It can also be less than the reporting period; in this case, the reporting period consists of several duration intervals. Figure 2-10 illustrates how the duration interval relates to the reporting period. Assume a reporting period that covers the twelve-hour block of time from 8:00 A.M. to 8:00 P.M. over a range of three days. As the figure shows, specifying DINTV(1200) causes the post processor to generate three duration reports, each covering twelve hours of system activity. Specifying DINTV(0600) causes the post processor to generate six duration reports, each covering six hours of system activity. You could also choose a duration interval that does not break the reporting period into equal blocks of time. As the figure shows, specifying DINTV(1000), indicating a duration interval of ten hours, would cause the post processor to generate the following reports:

1. 8 A.M. to 6 P.M. on the first day of the reporting period.

2. 6 P.M. to 8 P.M. on the first of the reporting period, and 8 A.M. to 4 P.M. on the second day.

3. 4 P.M. to 8 P.M. on the second day of the reporting period, and 8 A.M. to 2 P.M. on the third day.

4. 2 P.M. to 8 P.M. on the third day of the reporting period.

In this case, if you wanted to use the reports to compare system performance over the same hours on each day of the reporting period, it would be difficult because each report covers a different time range and some span two days and include a twelve-hour gap when no reporting was done.

Reporting Period

First Day   12-hour gap   Second Day   12-hour gap   Third Day

8 10 12 2 4 6 8   8 10 12 2 4 6 8   8 10 12 2 4 6 8
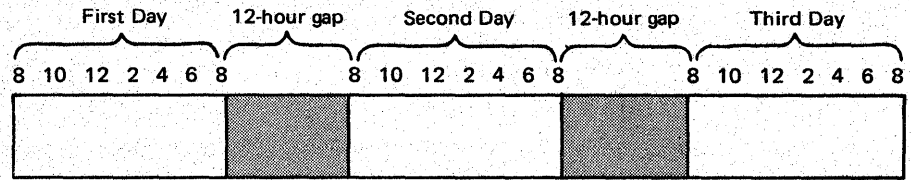
Duration Interval of Twelve Hours — DINTV (1200)

First Report   Second Report   Third Report

8 10 12 2 4 6 8   8 10 12 2 4 6 8   8 10 12 2 4 6 8
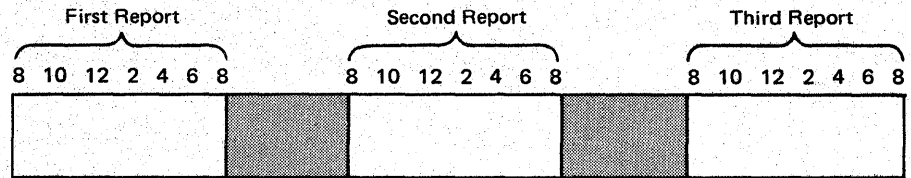
Duration Interval of Six Hours — DINTV (0600)

First   Second   Third   Fourth   Fifth   Sixth
Report   Report   Report   Report   Report   Report

8 10 12 2 4 6 8   8 10 12 2 4 6 8   8 10 12 2 4 6 8
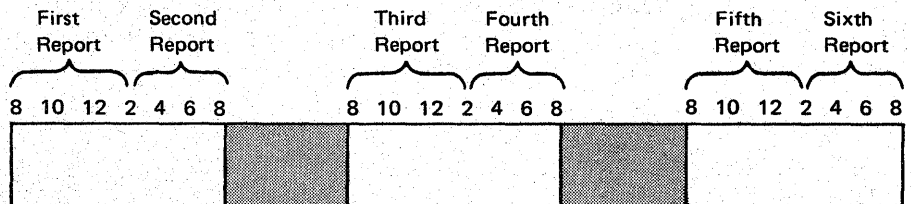
Duration Interval of Ten Hours — DINTV (1000)

First   Second   Third   Fourth
Report   Report   Report   Report

8 10 12 2 4 6 8   8 10 12 2 4 6 8   8 10 12 2 4 6 8
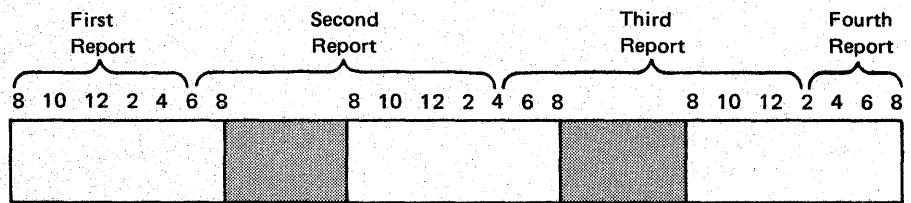
Figure 2-10. Relationship Between Duration Interval and Reporting Period

The syntax of the control statement allows a maximum duration interval of 99 hours and 60 minutes; however, the recommended maximum length is 24 hours. A duration interval greater than 24 hours could cause data values for report fields to overflow the space allowed in the formatted report. Such an overflow condition is indicated by a negative number or asterisks in the field, an indication that the length of the duration interval should be reduced.

Thus, care should be taken in selecting a duration interval, and, for most effective reporting, the duration interval should bear a relationship to the length of the reporting period.

The actual length of time included in the resulting duration report depends on the time within the duration interval when data was actually collected. For example, the following post processor control statements request a duration report for channel activity that has a duration interval of 12 hours (from 8:00 A.M. to 8:00 P.M.):

```
TOD( 0800,2000 )
DINTV( 1200 )
REPORTS( CHAN )
```

However, if channel activity measurement did not begin until 10:00 A.M., and ended at 6:00 P.M., the duration report covers the time from 10:00 A.M. to 6:00 P.M. The start time of the first and last RMF measurement intervals actually included in the report appear in the heading for the report.

EXITS Control Statement

The EXITS control statement specifies whether or not a user exit routine is to be executed during post processing. The syntax of the statement is:

```
EXITS/NOEXITS
```

When EXITS is specified, a user exit routine is executed. See "Report Writing by the Post Processor" in Chapter 3 for information on how to code a user exit routine for the post processor. NOEXITS indicates that no user exit routine is to be executed; NOEXITS is the default.

MAXPLEN Control Statement

The MAXPLEN control statement specifies the maximum number of lines of plotted data that can appear in a single plot report. The syntax of the statement is:

```
MAXPLEN( nnn )
```

where nnn is the number of lines. The maximum value allowed is 999. When you omit the MAXPLEN statement, the default number of lines is 50. When you explicitly specify MAXPLEN, you must specify the number of lines.

When a plot report exceeds one page, the plot lines run continuously from one page to the next to preserve the unity of the plotted data; there is no break or repetition of headings on each successive page.

PINTV Control Statement

The PINTV control statement specifies the length of time that is to elapse between each line of plotted data, that is, the length of the plot interval. The syntax of the statement is:

```
PINTV( hhmm )
```

where **hh** is the hour and **mm** is the minute (military time). Note that the time is the length of the plot interval, not the time of day when the plot reporting period begins.

When you omit the PINTV statement but indicate that plot reports are required by specifying the PLOTS control statemet, the post processor generates a line in a plot report for each RMF interval included in the reporting period. Thus, the default for the PINTV control statement is the length of the RMF measurement interval in effect during the reporting period. If you explicitly specify PINTV, you must explicitly specify a time value. Specifying PINTV without a time value causes a syntax error. Note that the PINTV statement is ignored when PLOTS is not specified.

In deciding the length of the plot interval, consider its relationship to the length of the RMF measurement interval. When you specify a length that is less than that of the measurement interval, the post processor substitutes the length of the measurement interval. When you specify a length that is greater than that of the measurement interval, the post processor combines data collected during all the measurement intervals that fall within the plot interval.

Thus, specifying a length less than the measurement interval has no effect. For most effective plot reporting, the plot interval should be either equal to or a multiple of the length of the RMF measurement interval. Specifying a plot interval that is a multiple of the measurement interval is useful when you want a very high-level plot of system activity.

PLOTS Control Statement

The PLOTS control statement specifies that plot reports are to be produced and identifies the plots that you require. The syntax of the statement is:

```
PLOTS( plot [ ,plot] , ... )
```

where **plot** can be any of the following:

BATCH	—	Maximum number of batch users
CAC[(nm)]	—	Channel activity rate, where **n** is the processor identifier and **m** is the channel identifier. When **nm** is omitted, plots are produced for all channels on all processors.
CH[(nm)]	—	Channel busy percentage, where **n** is the processor identifier and **m** is the channel identifier. When **nm** is omitted, plots are produced for all channels on all processors.
CPUID[(n)]	—	Processor busy percentage, where **n** is the processor identifier. When **n** is omitted, plots are produced for all processors (CPU 0 and CPU 1) .
CSV[(nm)]	—	Channel service time, where **n** is the processor identifier and **m** is the channel identifier.
		When **nm** is omitted, plots are produced for all channels on all processors.
DAC(cuu)	—	Device activity rate, where **cuu** is the device address of the device to be included in the report. When the device activity plot is requested, **cuu** must be specified to identify the device.
DSV(cuu)	—	Device service time, where **cuu** is the device address of the device to be included in the report. When the device service time plot is requested, **cuu** must be specified to identify the device.
DV(cuu)	—	Device busy percentage, where **cuu** is the device address of the device to be included in the report. When the device busy plot is requested, **cuu** must be specified to identify the device.
PAGE	—	Demand paging rate
SEV	—	Service rate
STC	—	Maximum number of started task and mount task users
SWA	—	Swap rate
TPAG	—	Total paging rate
TRA	—	Transaction rate
TSO	—	Maximum number of TSO sessions

Each type of plot is described in more detail in Chapter 5 under "Plot Reports."

When you omit the PLOTS statement, no plot reports can be produced. If you specify PLOTS, you must identify at least one plot type. No continuation statements are permitted for the PLOTS statement. When you require more plot types than can fit on one statement, specify the additional plot types by supplying additional PLOTS statements. There is no limit on the number of PLOTS statements. For example:

```
PLOTS( CAC,CSV,DV( 230 ),DV( 231 ) )
PLOTS( DSV( 350 ) )
PLOTS( STC,SEV )
PLOTS( PAGE,TPAG,SWA,CPUID )
```

PTOD Control Statement

The PTOD control statement specifies the starting and ending time of the reporting period for a plot report for each day in the reporting period. The syntax of the statement is:

```
PTOD( hhmm,hhmm )
```

where **hh** is the hour and **mm** is the minute (military time). The first time specifies the beginning of the reporting period and the second time specifies the end of the reporting period. The second time you specify must be later than the first, or a syntax error occurs.

When the PTOD statement is omitted, the default value is PTOD(0000,2400); that is, all times are reported. Thus, you would use this control statement when you want a reporting period for plot reports that is different from the default value.

Because the range of values allowed is from 0000 to 24000, it is not possible to define a reporting period that consists of a single block of time that spans more than one calendar day. Thus, you cannot define a reporting period that runs from 12 noon on one day to 12 noon on the next day. However, you can define a reporting period that consists of the same block of time over several days. For example, to produce a plot report using data collected form 8:00 A.M. to 4:00 P.M. for the week beginning on January 3, 1977, and ending on January 9, 1977, the required DATE and PTOD statements would be:

```
DATE( 77003,77009 )
PTOD( 0800,1600 )
```

REPORTS Control Statement

The REPORTS control statement specifies the reports to be generated by the post processor. This statement is required to generate duration reports or interval reports. Each report specified must be separated from any other reports by a comma or a blank. No continuation statements are permitted; however, you can use as many REPORTS statements as you require. The syntax of the statement is:

```
REPORTS( report [ ,report ] ,... )
```

where **report** can be any of the options described later in this section. ALL indicates that all reports are to be generated; the option is described in detail later in this section.

When you specify an option either alone or in combination with ALL, the reports generated depend on whether you have used the negative value or the positive value of the option. This concept can perhaps best be illustrated by the following examples:

- When you specify REPORTS(ENQ), the only report generated is the enqueue activity interval report.
- When you specify either REPORTS(NOENQ) or REPORTS(ALL,NOENQ), the post processor generates all interval reports except for enqueue activity.
- When you specify REPORTS(ALL,ENQ) or REPORTS(ALL), the post processor generates all interval reports.

Notes:

1. There is no additional overhead introduced when you specify REPORTS(ALL) when some system activities were not measured during the reporting period.

2. When the DINTV statement is present, all options except CPU, CHAN, DEVICE, WKLD, PAGESP, or PAGING are ignored. These options are described in the following list.

3. Regardless of the specification on the REPORTS statement, the post processor can generate a report on a system activity only when that activity was measured during the reporting period.

ALL

specifies that all reports are to be generated. Any user-supplied Monitor II background session reports are also included when ALL is specified. ALL can be combined with explicit specifications of other options. For example, specifying:

```
REPORTS( ALL, NOENQ, DEVICE( NOUNITR, NOCOMM ) )
```

would cause all of the reports to be generated, with the exception of enqueue activity and device activity for unit record devices and communication equipment.

When ALL is specified on the REPORTS statement and the DINTV statement is present, duration reports are produced for processor, channel, device, workload, page/swap data set, and paging activity.

ARD[(class,status,domain)]/NOARD

specifies whether or not the address space resource data report is to be generated, where the **class, status,** and **domain** operand fields specify the selection criteria for the address spaces to be included. The operand fields are positional; thus, any operand omitted, except the last, must be replaced by a comma. When you do not specify a value for **class, status,** or **domain,** the menu default, if present, is used; if there is no menu default, the value used to generate the SMF record is used to generate the printed report. The meaning of each operand field is:

class

A	specifies all address spaces
B	specifies batch, started task, and mount task address spaces
T	specifies TSO address spaces

status

A	specifies all address spaces
I	specifies address spaces that are active

domain

A	specifies all address spaces
nnn	specifies those address spaces in the domain identified by **nnn**

ARDJ[(jobname)]/NOARDJ

specifies whether or not the address space resource data by jobname report is to be generated, where **jobname** identifies a specific job for the report. When you omit **jobname,** an address resource data by jobname report is generated for each job for which address space resource data by jobname was collected.

ASD[(class,status,domain)]/NOASD

specifies whether or not the address space state data report is to be generated. The meaning and use of **class, status,** and **domain** are as described above under ARD.

ASDJ[(jobname)]/NOASDJ

specifies whether or not the address space state data by jobname report is to be generated, where **jobname** identifies a specific job for the report. When you omit **jobname,** an address space state data by jobname report is generated for each job for which address space state data by jobname was collected.

ASRM[(class,status,domain)]/NOASRM

specifies whether or not the address space SRM data report is to be generated. The meaning and use of **class, status,** and **domain** are as described above under ARD.

ASRMJ[(jobname)]/NOASRMJ

specifies whether or not the address space SRM data by jobname report is to be generated, where **jobname** identifies a specific job for the report. When you omit **jobname,** an address space SRM data by jobname report is generated for each job for which address space SRM data by jobname was collected.

CHAN/NOCHAN

specifies whether or not the channel activity report is to be generated. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

CPU/NOCPU

specifies whether or not the processor activity report is to be generated. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

DEVICE(list)/NODEVICE

specifies whether or not the I/O device activity report is to be generated and indicates the device classes to be included in the report. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

When DEVICE is specified, **list** must indicate the classes of devices for the report. Any or all of the following can be specified in the device list:

CHRDR/NOCHRDR	–	Character reader devices
COMM/NOCOMM	–	Communications equipment
DASD/NODASD	–	Direct access storage devices
GRAPH/NOGRAPH	–	Graphics devices
TAPE/NOTAPE	–	Magnetic tape devices
UNITR/NOUNITR	–	Unit record devices

When you omit DEVICE and specify ALL, the device classes underscored above are included in the report. When you specify DEVICE, you must include a list of device classes. When you specify a device class in the **list** field, the reports generated depend on whether you have used the negative value or the positive value of the option. If you use a negative option, you will get all the device reports with the exception of the option or options you specify. For example, DEVICE(NOTAPE) causes the post processor to generate all I/O device activity reports except the report on magnetic tape devices. If you use a positive option, you will get only the device report corresponding to that option. For example, DEVICE(TAPE) causes the post processor to generate the device activity report for magnetic tape devices; no other I/O device activity reports are printed.

ENQ/NOENQ

specifies whether or not the enqueue activity interval report is to be generated. The level of enqueue activity reporting depends on the level selected during the reporting period.

PAGESP/NOPAGESP

specifies whether or not the page/swap data set activity report is to be generated. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

PAGING/NOPAGING

specifies whether or not the Monitor I session paging activity report is to be generated. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

SRCS/NOSRCS

specifies whether or not the real storage/processor/SRM report is to be generated.

SPAG/NOSPAG

specifies whether or not the Monitor II session paging activity report is to be generated.

TRACE/NOTRACE

specifies whether or not the trace activity interval report is to be generated.

user-report[(operands)]

specifies that a user-supplied Monitor II session report is to be generated, where **user-report** is the name of the option used to collect data for the report and **operands** are any operands your installation established when the report was designed. When your report has operands but you do not specify any operands on the REPORTS control statement, the post processor uses the menu default, if present, for any omitted operand. When there is no menu default, the post processor takes the operand in effect when the data was collected.

See "Monitor II Session User Reports" in Chapter 3 for a description of how to add a user-supplied report to the post processor. After you have performed the steps that make your report available to the post processor, your report will be printed when you specify the name of the report or ALL on the REPORTS control statement.

WKLD ($\left\{ \begin{array}{l} \text{PERIOD} \\ \text{GROUP} \\ \text{SYSTEM} \end{array} \right\}$)/NOWKLD

specifies whether or not the system workload activity report is to be generated. When the DINTV statement is present, a duration report is produced; otherwise, an interval report is produced.

When you omit WKLD, and specify ALL, the default is WKLD(PERIOD). When you specify WKLD, you must specify the level of detail for the report by choosing one of the following:

PERIOD	–	Data is reported for each performance group period in the IPS.
GROUP	–	Data is reported for each performance group in the IPS.
SYSTEM	–	Requests a workload manager summary report.

RTOD Control Statement

The RTOD control statement specifies the starting time and ending time of the reporting period for interval or duration reporting for each day included in the reporting period. The syntax of the statement is:

```
RTOD( hhmm,hhmm )
```

where **hh** is the hour and **mm** is the minute (military time). The first time specifies the beginning of the reporting period and the second time specifies the end of the reporting period. The second time must be later than the first, or a syntax error occurs. When the RTOD statement is omitted, the default value is RTOD (0000,2400); that is, all times are reported. Thus, you would use this statement when you want a reporting period for interval or duration reports that is different from the default value.

Because the range of values allowed is from 0000 to 2400, it is not possible to define a reporting period that consists of a single block of time that spans more than one calendar day. Thus, for example, you cannot define a reporting period that runs from 12 noon on one day to 12 noon on the next day. However, you can define a reporting period that consists of the same block of time over several days. For example, to produce interval reports including data collected every morning from 8:00 A.M. to 1:00 P.M. for the week beginning on January 3, 1977, and ending on January 9, 1977, the required DATE and RTOD statements would be:

```
DATE( 77003,77009 )
RTOD( 0800,1300 )
```

SESSION Control Statement

The SESSION control statement specifies the particular Monitor II background session that created the SMF records to be included in the reports. The syntax of the statement is:

```
SESSION( session-id )
```

where **session-id** is the two-character alphameric session identifier of the particular session. If you explicitly specify SESSION, you must supply a session identifier.

When you omit the SESSION statement, all SMF records that fall within the reporting period and are pertinent to the types of reports specified on the REPORTS statement are included in the reports, regardless of the session that created them.

STOD Control Statement

The STOD control statement specifies the starting time and ending time of the reporting period for a summary report for each day in the reporting period.

The syntax of the statement is:

```
STOD( hhmm,hhmm )
```

where **hh** is the hour and **mm** is the minute (military time). The first time specifies the beginning of the reporting period and the second time specifies the end of the reporting period. The second time must be later than the first, or a syntax error occurs.

When the STOD statement is omitted, the default value is STOD(0000,2400); that is, all times are reported. Thus, you would use this control statement when you want a reporting period for a summary report that is different from the default value.

Because the range of values allowed is from 0000 to 2400, it is not possible to define a reporting period that consists of a single block of time that spans more than one calendar day. Thus, you cannot define a reporting period that, for example, runs from 12 noon on one day to 12 noon on the next day. However, you can define a reporting period that consists of the same block of time over several days. For example, to produce a summary report using data collected from 8:00 A.M. to 1:00 P.M. for the week beginning on January 3, 1977, and ending on January 9, 1977, the required DATE and STOD statements would be:

```
DATE( 77003,77009 )
STOD( 0800,1300 )
```

SUMMARY Control Statement

The SUMMARY control statement specifies whether or not a summary report is to be produced and indicates the type of summary data that you require. The syntax of the statement is:

```
SUMMARY( type )/NOSUMMARY
```

where type can be either or both of the following:

INT   –   indicating that one interval summary line is to be produced for each measurement interval that falls within the reporting period.

TOT   –   indicating that one total summary data line is to be produced for all the measurement intervals that fall within the reporting period.

Either INT or TOT, or both INT and TOT, can be specified. When both are specified, INT and TOT can appear in any order. When you explicitly specify SUMMARY, you must specify the type of summary data that you require. Specifying SUMMARY without type causes a syntax error. When When you omit the SUMMARY statement, the default is SUMMARY(INT,TOT). That is, a summary report is produced, and the report includes both interval summary data lines and a total summary data line.

When a summary report consists of more than one page, the headings are repeated for each page. When total summary data is requested, a total summary line is generated for the intervals on each page, and the last page of the report contains a total summary data line that reflects the contents of all pages in the report.

SYSID Control Statement

The SYSID control statement specifies the four-character system identifier of the system about which reports should be generated. The syntax of the statement is:

```
SYSID( cccc )
```

where cccc is the system identifier. When you exlicitly specify SYSID, you must supply the system identifier. Specifying the SYSID control statement causes the post processor to include in the reporting all pertinent SMF records that have a matching system identifier. Omitting SYSID causes the post processor to include in the reporting all SMF records, regardless of their system identifier. When more than one system identifier is encountered, the post processor produces separate reports for each system encountered.

SYSOUT Control Statement

The SYSOUT control statement specifies the SYSOUT class to which all formatted report output and post processor messages are to be directed. The syntax of the statement is:

```
SYSOUT( class )
```

where class is the desired SYSOUT class. When you explicitly specify SYSOUT, you must indicate a SYSOUT class. When you omit the SYSOUT statement, the default is SYSOUT class A.

Examples

The examples in this section show various uses of the post processor. All the examples include the DATE statement to illustrate how the value specified for DATE relates to the value specified for RTOD, PTOD, or STOD to define the reporting period. During actual execution of the post processor, your installation might find it more useful to control the dates included in the reports by controlling the contents of the input data set and omitting the DATE statement. Because the default for the DATE statement is a reporting period that encompasses all dates included in the SMF records in the input data set, omitting the DATE statement enables you to establish a set of control statements that can be used on a regular schedule without modification.

1. The post processor is to generate all interval reports except tracing. The reporting period runs from 8:00 A.M. to 12 noon for the 5-day business week from June 13, 1977, to June 17, 1977. Use the following control statements:

   ```
   DATE( 77164,77168 )
   REPORTS( ALL,NOTRACE )
   RTOD( 0800,1200 )
   NOSUMMARY
   ```

   Because the EXITS, SYSID, and SYSOUT statements are omitted and their defaults taken, no user exits are entered, all systems are included in the reports, and any report and message output is sent to SYSOUT class A.

2. The post processor is to generate plot reports of the maximum number of batch users, the processor busy percentage, and the device activity rate for an I/O device that has an address of 14E. The reporting period is the twelve-hour period beginning at 12:00 A.M. on June 23, 1977. Use the following control statements:

   ```
   DATE( 77174,77174 )
   MAXPLEN( 100 )
   PINTV( 0015 )
   PLOTS( BATCH,CPUID,DAC( 14E ) )
   PTOD ( 0000,1200 )
   NOSUMMARY
   ```

   Notes:

   - The MAXPLEN statement limits the number of plot lines to 100.
   - The PINTV statement sets the plot interval -- the time to elapse between lines in the plot report -- to 15 minutes. If the RMF interval length in effect during the reporting period was identical to the length desired for the plot interval, the PINTV statement could be omitted. The default for the PINTV statement is the length of the RMF measurement interval.
   - Because no processor identifier is specified on the CPUID plot request, a plot is produced for each processor encountered.

- Because the EXITS, SYSID, and SYSOUT statements are omitted and their defaults taken, no user exits are entered, all systems are included in the reports, and any report and message output is sent to SYSOUT class A.

3. The post processor is to generate duration reports for processor activity, channel activity, and I/O device activity for magnetic tape devices, direct access devices, and communications equipment. The reporting period is the twelve-hour period from 6:00 A.M. to 6:00 P.M. on June 22, 1977. The duration interval is six hours, causing two duration reports to be produced for each specified activity. Use the following control statements:

```
DATE( 77173,77173 )
DINTV( 0600 )
REPORTS( CPU,CHAN )
REPORTS( DEVICE( TAPE,DASD,COMM ) )
RTOD( 0600,1800 )
NOSUMMARY
```

Because the EXITS, SYSID, and SYSOUT statements are omitted and their defaults taken, no user exits are entered, all systems are included in the reports, and any reports, and message output is sent to SYSOUT class A.

4. To obtain a summary report, including both interval summary data and total summary data, based on SMF record data collected from 9:00 A.M. to 5:00 P.M. for the 5-day business week from June 13, 1977, to June 17, 1977, use the following control statements:

```
DATE( 77164,77168 )
SUMMARY( INT,TOT )
STOD( 0900,1700 )
```

Notes:

- The SUMMARY(INT,TOT) statement could be omitted because the default for the SUMMARY control statement is a summary report that includes both interval summary data and total summary data.
- Because the EXITS, SYSID, and SYSOUT statements are omitted and their defaults taken, no user exits are entered, all systems are included in the report, and any report and message output is sent to SYSOUT class A.

5. Assume that a single execution of the post processor is to generate the following types of reports:

- Interval reports for all Monitor I session activities except tracing. The reporting period is from 8:00 A.M. to 12 noon on June 20, 1977.

- Interval reports for address space state data, address space resource data, and address space SRM data. No other Monitor II session interval reports are required. The data for the reports is the data collected by the Monitor II session with the session identifier of

BB. The reporting period is from 8:00 A.M. to 12 noon on June 20, 1977. The reports are to reflect changed values; that is, the reports are to be in delta mode.

- Plot reports of the maximum number of batch users, the maximum number of started task and mount task users, and the maximum number of TSO sessions. The reporting period is from 8:00 A.M. to 12 noon on June 20, 1977. The plot interval is 30 minutes, and the maximum number of lines per plot is 20.

- A summary report covering each interval in the reporting period. The reporting period is from 8:00 A.M. to 12:00 noon on June 20, 1977.

The control statements required to obtain the output reports defined above are:

```
DATE( 77171,77171 ) - establishes date of reporting period
RTOD( 0800,1200 ) - establishes time of reporting period for
                    interval reports
REPORTS( ALL,NOTRACE,NOARDJ,NOASDJ )⎫
                                     ⎬  defines   interval
                                     ⎪  reports to be
                                     ⎪  generated
REPORTS( NOASRMJ,NOSRCS,NOSPAG )     ⎭
SESSION( BB )⎫
             ⎬  defines session and mode for Monitor II
             ⎪  session interval reports
DELTA        ⎭
PLOTS( BATCH,STC,TSO )⎫
PTOD( 0800,1200 )     ⎪
                      ⎬  defines plot reports
                      ⎪  to be generated
MAXPLEN( 20 )         ⎪
PINTV( 0030 )         ⎭
STOD( 0800,1200 )⎫
                 ⎬  defines summary report
                 ⎪  to be generated
SUMMARY( INT )   ⎭
```

Because the EXITS, SYSID, and SYSOUT statements are omitted and their defaults taken, no user exits are entered, all systems are included in the reports, and any report and message output is sent to SYSOUT class A.

RMF Operating Procedures: Reference Summary

This section provides a quick reference to the operator commands, Monitor I session options, Monitor II background session options, display commands, and menu items.

Operator Commands

```
• To initialize RMF without starting a Monitor I session:

  {START}
  {  S  } RMF [.id] , , , NOZZ

• To initialize RMF and start a Monitor I session when
  session options are specified in the parm field of the
  START command:

  {START}
  {  S  } RMF [.id] , , , [parm]

• To initialize RMF and start a Monitor I session when no
  session options are specified on the START command:

  {START}
  {  S  } RMF [.id]

• To display RMF status:

  {MODIFY}            {DISPLAY} [ ACTIVE     ]
  {  F   } [RMF.] id, {   D    } [ session-id ]
                                 [ ALL        ]

• To terminate RMF processing:

  {STOP}
  {  P } [RMF.] id

• To start a session:

  {MODIFY}            {START}
  {  F   } [RMF.] id, {  S  } session-id [,parm]

• To modify session options:

  {MODIFY}            {MODIFY}
  {  F   } [RMF.] id, {  F   } session-id [,parm]

• To stop a session:

  {MODIFY}            {STOP}
  {  F   } [RMF.] id, {  P  } session-id

  where:

  id
    The identifier assigned to RMF when it is initialized

  parm
    The session options, in the form
        option[(value)]
    and separated by a comma

  session-id
    The session identifier:
    ZZ  —  Monitor I session
    cc  —  Monitor II background session
           (any two characters)
    cuu —  Monitor II local 3270 session
           (3-character device address of a display
           station)
```

Monitor I Session Options

```
CHAN/NOCHAN
CPU/NOCPU
CYCLE(value)
DEVICE(list)/NODEVICE
      {DETAIL  }
ENQ( {SUMMARY}[,major name[,minor name] ] )/NOENQ
EXITS/NOEXITS
INTERVAL(value[M])
MEMBER(list)
NOZZ
OPTIONS/NOOPTIONS
PAGESP/NOPAGESP
PAGING/NOPAGING
RECORD/NORECORD
         {REALTIME}
REPORT( {DEFER   } )/NOREPORT
                 [M]
STOP(value[H])/NOSTOP
SYSOUT(class)
TRACE(field[,list] )/NOTRACE
      (PERIOD)
WKLD( {GROUP } )/NOWKLD
      (SYSTEM)
```

Monitor II Background Session Options

```
ARD[(c,s,d)]/NOARD
ARDJ(jobname)/NOARDJ
ASD[(c,s,d)]/NOASD
ASDJ(jobname)/NOASDJ
ASRM[(c,s,d)]/NOASRM
ASRMJ(jobname)/NOASRMJ
DELTA/NODELTA
MEMBER(list)
OPTIONS/NOOPTIONS
RECORD/NORECORD
         {REALTIME}
REPORT( {DEFER   } )/NOREPORT
SINTV(value)
SPAG/NOSPAG
SRCS/NOSRCS
                 [M]
STOP(value[H])/NOSTOP
SYSOUT(class)
USER/NOUSER

where
  c
    is the class of the address spaces to be included; either
    A, B, or T
  s
    is the status of the address spaces to be included;
    either A or I
  d
    is the domain of the address spaces to be included;
    either A or a domain number
```

Display Commands

mm [operands] — request a report

Rmm [operands] — recall the previous report

M - display the menu

D $\begin{Bmatrix} \underline{ON} \\ OFF \end{Bmatrix}$ — set delta mode

H $\begin{Bmatrix} \underline{ON} \\ OFF \end{Bmatrix}$ — set hardcopy mode

F — frame through a table report

P — print a report

Z — stop the session

where:

mm
    a menu item

operands
    any required operands

Menu items

ARD	c,s,d
ARDJ	jobname
ASD	c,s,d
ASDJ	jobname
ASRM	c,s,d,
ASRMJ	jobname
SPAG	
SRCS	
USER	

where:

c
    is the class of the address spaces to be included; either
    $\underline{A}$, B, or T

s
    is the status of the address spaces to be included;
    either A or $\underline{I}$

d
    is the domain of the address spaces to be included;
    either $\underline{A}$ or a domain number

Chapter 3: Procedures for Adding User Functions

Facilities in RMF allow you to gather and report data relevant to your installation.

During a Monitor I session, user exits are provided to enable you to sample data at each RMF cycle, collect this data and examine system indicators at each RMF interval, format and write your own SMF records, and format and write your own reports. You can also use the RMF trace facilities to trace the contents of any SQA, fixed CSA, or nucleus field that you require.

During a Monitor II session, defined interfaces enable you to gather and report your own data by coding your own data-gathering and data-reporting routines. RMF provides the USER option for a background session and the USER menu item for a display session. To generate one additional report, you replace module ERBGUS99 with your data gatherer and ERBRUS99 with your data reporter. Specifying USER then causes your own report to be generated. Should you want to obtain more than one user report, you must add an entry to the option list or menu list as well as supply a data-gathering and a data-reporting routine. Data gathered for your routine can be reported either during the session or during execution of the post processor.

Another user exit, applicable only to Monitor II TSO display sessions, enables your installation to verify that a terminal user is authorized to use RMF.

The following sections describe the procedures and restrictions for adding the user functions to RMF.

Monitor I Session User Reports

To gather and report data relevant to your installation during a Monitor I session, RMF provides both the EXITS option and user exits at various points during Monitor I session processing. When EXITS is specified, you can:

- Initialize for the other user exit routines
- Sample fixed CSA, SQA, or nucleus data at each RMF cycle
- Perform interval processing, for example, reduce sampled data, examine system state indicators, format SMF records to be written to the SMF data set or passed to your report writer
| - Write reports during a session
- Handle termination processing for the other user exits
| - Write reports during execution of the post processor.

In addition, you can use the Monitor I session tracing routines to trace the contents of a fixed SQA, CSA, or nucleus field regardless of whether or not EXITS is specified.

Guidelines

Each of the user functions is described in detail in the following sections. The following guidelines apply to all of the user exit routines:

- All of the user exit routines must be reenterable.
- All user-written exit routines receive control by a BALR or LINK instruction.
- The routines must save registers when they receive control and restore registers when they return control. Register 13 contains the address of the register save area; register 14 contains the return address; and register 15 contains the entry address.
- One input parameter that RMF passes to each user exit routine except the tracing routine and the post processor user exit is the address of a two-word area reserved for the use of your routines. Because these words provide a means of communication between your exit routines, their use should be controlled by conventions agreed upon by your installation.
- RMF passes a phase parameter to each user exit routine except the sampler, the tracing routine, and the post processor user exit. This phase parameter indicates which RMF phase is invoking the user exit.

RMF provides dummy routines for all Monitor I session exits that are not used.

Caution: Because all of the user exit routines except ERBMFRUR (the report writer) run in supervisor state with a key of 0, your installation must carefully control their use. Program errors that cause an exit routine to overlay system areas could bring down the system.

Initialization for Monitor I Session User Exit Routines

The initialization user exit is ERBMFIUC. It is called at the start of a
Monitor I session and whenever the Monitor I session options are modified.
Use this exit to perform any initialization the other user exits require, such
as building a control block structure.

ERBMFIUC is invoked by IGX00007. When the exit routine gets
control, register 1 points to a three-word address list. The first address
points to the two-word area reserved for use by your routines. This same
two-word area is passed to all the user exit routines and can be used for
communication between them. The second address points to the RMF
phase parameter, a full-word field that is always X'4', indicating that the
exit is called during Monitor I session initialization. The third address points
to a word that is relevant only when you are providing a routine to sample
data at each cycle; one of the functions your initialization routine will
perform is to put the address of the user sampler in this word. Figure 3-1
illustrates the input parameter structure.

When the initialization routine is entered, the system is in supervisor
state, and all interrupts are enabled. ERBMFIUC runs in key 0.

Special initialization procedures are required when your user routines
include a sampling routine to sample data at each cycle; see "Sampling Data
at Each Cycle." When you have a user sampler, your initialization routine
must do the following:

- The user sampling routine must be loaded and page fixed with the
  ASCBNSWP bit set on to ensure that the sampler remains in storage
  when the RMF address space is swapped out. You must use the
  PGFIX macro to page fix the user sampler routine. On return from
  the page fix routine, you must turn off the ASCBNSWP bit.

- The address of the user sampling routine must be placed in the third
  input parameter.

- All storage the sampler routine will require must be obtained; this
  storage must be obtained from SQA (subpool 245).

- The address of the SQA storage obtained must be placed in one of
  the two user words. The choice depends on the conventions
  established at your installation.

When you have completed the initialization required by all the user exits,
return control by branching on register 14.
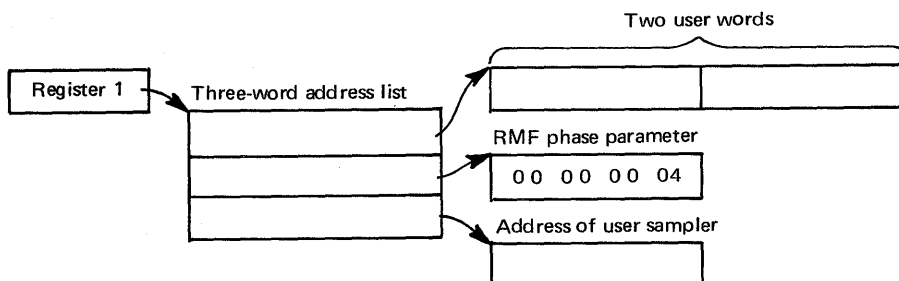
Figure 3-1. ERBMFIUC Input Parameter Structure

Sampling Data at Each Cycle

To sample data at each cycle, the steps described earlier for initialization must be performed to load and page fix the user sampler routine. A user sampler routine is activated at each cycle only when another measurement that includes a sampling routine is activated. These measurements include paging activity, page/swap data set activity, channel activity, device activity, and ASM/RSM/SRM tracing. At least one of these measurements must be specified to enable RMF to invoke your user sampler.

The user sampler is invoked by ERBMFEVT. When the sampler gets control, register 1 points to a two-word area. One of these words, selected by your installation, contains the address of the storage area obtained for the sampler by ERBMFIUC. Figure 3-2 illustrates the input parameter structure.

When the user sampler is entered, the system is in supervisor state, and all interrupts are disabled. The routine runs in key 0. It can sample any fixed data in CSA, SQA, or the nucleus; no other data areas can be sampled. The data sampled is placed in the storage area obtained by ERBMFIUC and passed to you when your routine is invoked. This storage area is always in SQA (subpool 245). At the end of the RMF interval, RMF passes the address of the storage area to the user interval processing routine. Should your routine cause a page fault, the Monitor I session terminates abnormally with an abend code of 0FE.

When your sampling is completed, return control by branching on register 14.
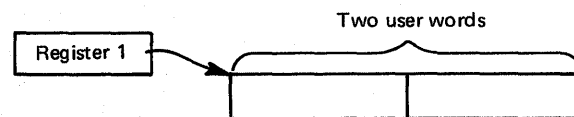
Figure 3-2. User Sampler Input Parameter Structure

Note: The user sampler must reside in SYS1.LPALIB. See "Adding Your Routines to RMF" later in this chapter.

Interval Processing

The interval processing user exit is ERBMFDUC. It is invoked at the start of the Monitor I session and at the end of each RMF interval.

The exit is invoked by IGX00022. When the exit gets control, register 1 points to a two-word address list. The first address points to the two-word area reserved for use by your routines. When these routines include a user sampler, one of these words, selected by your installation, will contain the address of the sampled data. The second address points to the RMF phase parameter. This parameter is a full word that contains X'4' when the exit is called during Monitor I session initialization X'8' when the exit is called at the end of an RMF interval. Figure 3-3 illustrates the input parameter structure.

When the interval processing exit routine is entered, the system is in supervisor state, and all interrupts are enabled. The routine runs in key 0. The routine can process the data generated by the user sampler. It can also collect its own data from system control blocks or system state indicators and format an SMF record. The SMF record can be written to the SMF data set; see OS/VS2 System Management Facilities (SMF), GC28-0706, for details on using the SMFWTM macro instruction to write a user SMF record.

The SMF record or a record your routine formats as agreed by convention between ERBMFDUC and ERBMFRUR (the report writer exit routine) can be printed by your report writer. Your routine can format SMF record output, report record output, or both. When your routine formats any records to be printed by your report writer, the address of the formatted records must be placed in the user word selected by your installation. Because the user words are passed to your report writer, the records can then be printed in a formatted report.

When your routine has completed processing, return control by branching on register 14.
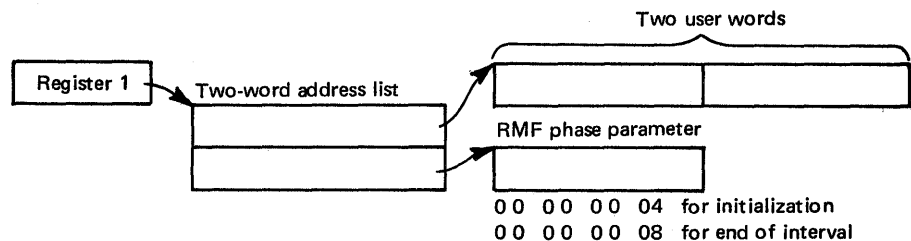
Figure 3-3. ERBMFDUC Input Parameter Structure

| Report Writing During Session Processing

The report writer exit is ERBMFRUR. It is called once during the Monitor I session report writing phase.

The exit is invoked by ERBMFRGM during the report writing phase of interval processing. When the exit gets control, register 1 points to a two-word address list. The first address points to the two-word area reserved for use by user routines. The second address points to the RMF phase parameter, which is always X'10' for the report writer. Figure 3-4 illustrates the input parameter structure.

When the report writer exit is entered, the system is in problem state, and all interrupts are enabled. The routine runs in the user key 8. The user word your installation selects contains the address of the formatted records built by ERBMFDUC. Because all of your installation's exit routines use these words, the report writer must not alter their contents. Report writer processing must obtain output space for the printed reports, then write the reports for subsequent printing. Before terminating, the routine must free the storage that contained the records formatted by ERBMFDUC.

When the report writer completes its processing, return control by branching on register 14.
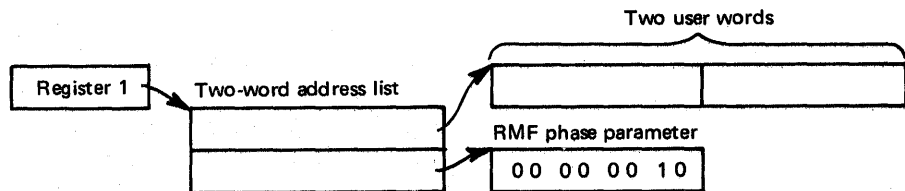
Figure 3-4. ERBMFRUR Input Parameter Structure

Termination

The termination exit is ERBMFTUR. It is called when the Monitor I session is terminated.

The exit is invoked by ERBMFTMA. When the exit gets control, register 1 points to a two-word address list. The first address points to a two-word area reserved for use by your routines. The second address points to the RMF phase parameter, which is always X'C' for termination. Figure 3-5 illustrates the input parameter structure.

When the termination routine is entered, the system is in supervisor state, and all interrupts are enabled. The routine runs in key 0. You would use this exit to page free any user samplers or data areas and to free any user SQA data areas obtained by the other exits, with one exception: during termination processing, ERBMFTUR gets control before the report writer exit (ERBMFRUR). Therefore, it must free only the SQA and global storage the other user routines obtained, but it must not free the storage the interval processing routine (ERBMFDUC) used to build records to be passed to the report writer. The address of this storage will be in the user word selected by your installation.

When the termination routine has completed processing, return control by branching on register 14.
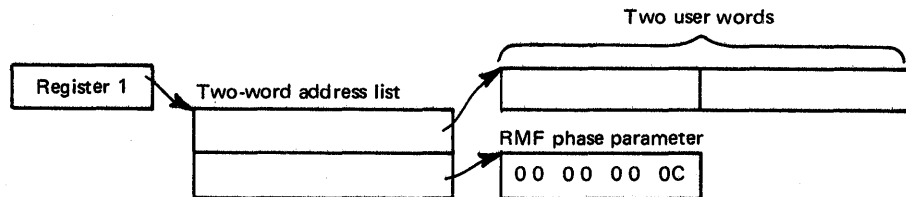
Figure 3-5. ERBMFTUR Input Parameter Structure

Tracing Your Own Field

Whenever the TRACE option is in effect during a Monitor I session, you can use the tracing routines to trace the contents of any SQA, CSA, or nucleus field that you require. The EXITS option, required to generate your own reports, is not required to use the trace facilities because the trace exit, ERBTRACE, is called whenever the TRACE option is in effect.

The field that you want to trace must be fixed in CSA, SQA, or the nucleus; it cannot contain negative values; and it must be from one to four bytes in length. Once you have selected your field, there are two steps required to enable RMF to trace the contents of the field. After you have performed these steps, you can then specify the name in the field name portion of the TRACE option. The steps can be performed in any order, but both must be done before you can use RMF to trace the field.

Step 1 -- Defining the Name to RMF

To define the name, you must add four fields to the RMF CSECT ERBMFTTB, which contains the names you must add RMF recognizes as valid for tracing. The fields you must add (starting at X'02A1') are:

1. The name of the field to be traced. The name can be from one to eight bytes long. It must not be the same as any name already recognized by RMF. When the name of the field is less than eight bytes long, it must be padded on the right with blanks to a length of eight bytes.

2. The length of the name. This field is one byte long; the value must be from 01 to 08.

3. A one-byte constant that always contains the value X'DC'.

4. The length of the field to be traced. This field is one byte long; the value must be from 01 to 04.

One byte of binary zeros must follow the last entry to be added; the byte of binary zeros indicates the end of the variable-length trace table.

Figure 3-6 shows an example of how to superzap ERBMFTTB to add a new name for tracing. The parenthesized numbers in the text refer to the parenthesized numbers in the figure. The example adds a nucleus field named MYDATA (1) that is two bytes in length (4) to the list of names valid for RMF tracing. The name is six bytes long (2), and the required constant is also supplied (3). A byte of binary zeros (5) indicates the end of the trace table.

Adding the name definition to ERBMFTTB causes RMF to pass the name to ERBTRACE during each tracing cycle. The four fields must be added for each name you want RMF to trace; only the last entry must be followed by the byte of binary zeros.

```
//ZAP        JOB         MSGLEVEL=1
//SS         EXEC        PGM=AMASPZAP
//SYSPRINT   DD          SYSOUT=A

//SYSLIB     DD          DSN=SYS1.LINKLIB,DISP=SHR
//SYSIN      DD          *
     NAME    ERBMFMFC         ERBMFTTB
     VER     02A1             0040D7C1
     REP     02A1             D4E8C4C1E3C14040     (1)
     REP     02A9        06   (2)
     REP     02AA        DC   (3)
     REP     02AB        02   (4)
     REP     02AC        00   (5)
/*
```

Figure 3-6. Example of Adding Name a to ERBMFTTB

Step 2 -- Replacing ERBTRACE

The tracing user exit is ERBTRACE. The function of ERBTRACE is to
return to RMF the address of a valid user field. It is called by the RMF
tracing routine whenever it encounters a trace name that is not the name of
a field in the SRM domain table. To trace your own field, you must replace
ERBTRACE with your own routine and link edit your ERBTRACE with
the RMF CSECT ERBMFITR.

When ERBTRACE gets control, register 1 points to a two-word address
list. The first address points to an eight-byte field that holds the name to be
validated. The second address points to a full word to be used by
ERBTRACE to return the address of the user field to RMF. Figure 3-7
illustrates the input parameter structure.

When ERBTRACE is entered, the system is in supervisor state, and all
interrupts are enabled. The routine runs in key 0. It must examine the field
name passed to it by RMF to determine if the name is a user field name.
When the name is a valid user name, place the address of the field to be
traced in the first parameter, set a return code of zero in register 15, and
return control. If the name is not one recognized as a valid user name,
always set a non-zero return code in register 15 before returning control.
The non-zero return code tells RMF to process the name.

When your processing is completed, return control by branching on
register 14.
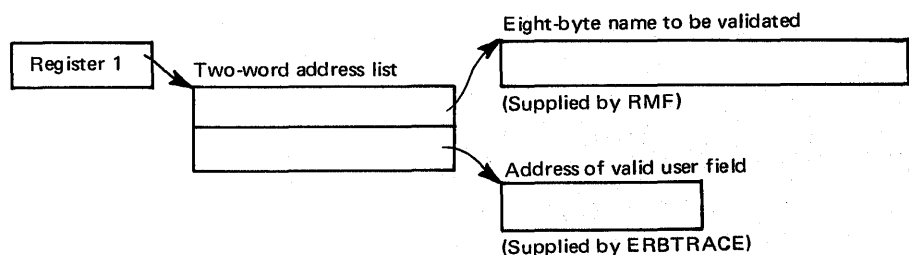
Figure 3-7. ERBTRACE Input Parameter Structure

Report Writing by the Post Processor

The post processor user exit is ERBMFPUS. It is called during post processing at the point when the post processor first encounters each SMF record.

The exit is invoked by ERBRMFPP, the post processor control routine, whenever the EXITS control statement is specified. When the exit gets control, register 1 points to a two-word address list. The first address points to a full word that contains the address of the SMF record to be processed. The second address points to a full word reserved for the use of your routine. The user word contains zeros the first time the exit is called, and the post processor does not modify its contents between invocations of the user exit routine. Thus, the word can be used to save information, such as the address of a DCB, that is needed by a subsequent invocation of the user exit routine. Figure 3-8 illustrates the input parameter structure.

When the post processor user exit is entered, the system is in problem state and all interrups are enabled. The routine runs in the user key 8.

Your routine examines the SMF record passed to you, performs any required processing, and set a return code in register 15. The return code depends on the action you want the post processor to take. A return code of 0 tells the post processor to continue processing the SMF record. A return code of 4 tells the post processor to ignore the SMF record; set a return code of 4 when the exit routine has, for example, processed the record or determined that it should not be processed. A return code of 8 indicates that the post processor should terminate.

The processing your exit performs can consist of formatting the data in the records the interval processing user exit routine (ERBMFDUC) generates into a printed report. Your exit could also screen the SMF records that the post processor encounters to determine which records are to be included in any reports generated by the post processor, or it could use the SMF records RMF generates as input to your own report. Because all SMF records are passed to the user exit, ERBMFPUS could also be used to incorporate any SMF data reduction routines used at your installation into the RMF post processing function.

When your routine has finished processing, set the appropriate return code in register 15 and return control to the RMF post processor by branching on register 14.
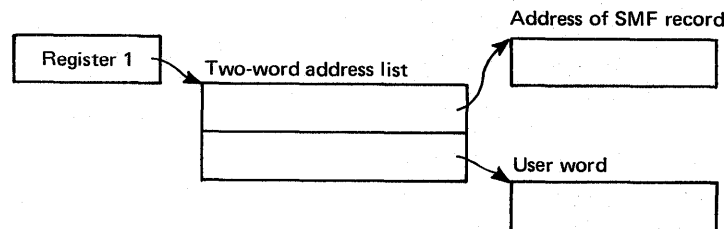
Figure 3-8. ERBMFPUS Input Parameter Structure

Adding Your Routines to RMF

Before your Monitor I session user exit routines can be tested and used, they must be assembled and link edited with the appropriate RMF modules. Figure 3-9 shows sample JCL for performing the required link edit for all user routines except the sampler routine. If you have a user sampler, a separate link edit is required; a sample is shown in Figure 3-10.

```
//LINKEXIT       JOB    MSGLEVEL=1
//STP            EXEC   PGM=IEWL,PARM='link edit parameters'
//SYSPRINT       DD     SYSOUT=A
//SYSLMOD        DD     DSN=SYS1.LINKLIB,DISP=(OLD,KEEP)
//SYSUT1         DD     UNIT=SYSDA,DISP=(,DELETE),
//                      SPACE=(TRK,(20,5))
//SYSLIN         DD     *
     (ERBMFIUC object deck)
     ENTRY    ERBMFIUC
     NAME     ERBMFIUC(R)
     (ERBMFDUC object deck)
     ENTRY    ERBMFDUC
     NAME     ERBMFDUC(R)
     (ERBMFRUR object deck)
     ENTRY    ERBMFRUR
     NAME     ERBMFRUR(R)
     (ERBMFTUR object deck)
     ENTRY    ERBMFTUR
     NAME     ERBMFTUR(R)
     (ERBTRACE object deck)
     INCLUDE  SYSLMOD(ERBMFITR)
     ENTRY    ERBMFITR
     NAME     ERBMFITR(R)
     (ERBMFPUS object deck)
     ENTRY ERBMFPUS
     NAME ERBMFPUS(R)
/*
```

Figure 3-9. Replacing User Exits

```
//LINKEXIT       JOB    MSGLEVEL=1
//STP            EXEC   PGM=IEWL,PARM='link edit parameters'
//SYSPRINT       DD     SYSOUT=A
//SYSLMOD        DD     DSN=SYS1.LPALIB,DISP=(OLD,KEEP)
//SYSUT1         DD     UNIT=SYSDA,DISP=(,DELETE),
//                      SPACE=(TRK,(20,5))
//SYSLIN         DD     *
     (user sampler object deck)
     ENTRY    entry name
     NAME     sampler name
/*
```

Figure 3-10. Adding a User Sampler

Monitor II Session User Reports

RMF generates a Monitor II session report by invoking a data-gathering module and a data-reporting module in response to either:

- a menu item identifying a display session report
- an option identifying a background session report

From an external viewpoint, the menu item and the option are different because they are used during different types of sessions, have slightly different syntax, and produce either display output or printed output. However, from an internal point of view, the menu item and the option are very similar. The valid menu items for a display session are listed in the RMF CSECT ERBFMENU. The valid options for a background session are listed in the RMF CSECT ERBBMENU. The formats of the entries in each list are identical. When an option or menu item is specified during a session, RMF uses the data entry for the report in the list appropriate for the session type to verify that the option or menu item is valid and to load the required data gatherer and data reporter modules.

Each list contains an entry called USER that enables you to add a single user report. When USER is specified, RMF loads modules ERBGUS99, the data gatherer for USER, and ERBRUS99, the data reporter for USER. By replacing these two modules with your own routines, you can add a single report to the Monitor II reports provided by RMF. This process is described later in this chapter under "Coding a User Report."

The data gathering module and the data reporting module communicate through a type 79 SMF record. The data gatherer formats the record and completes the required data fields. The data reporter uses the data in the record to generate a formatted report for printing or display. See "SMF Record Type 79."

To add more then one Monitor II session report, you must, in addition to providing a data gatherer and a data reporter, add an entry to ERBFMENU for a display session report and to ERBBMENU for a background session report. Then, when your option or menu item is specified during a session, RMF will load your data gatherer and data reporter to generate the report. The process to follow to add an entry to the option list and menu list is described later in this chapter under "Installing a User Report."

SMF Record Type 79

SMF record type 79 must be used to record data gathered by a user data gathering routine. Figure 3-11 shows the layout of the record sections that are common to all Monitor II data gatherers, whether coded by a user or provided by RMF. The figure illustrates the layout of these common sections by showing the expansion of the RMF mapping macro ERBSMF79.

The fields in the common section fall into three categories. Each category is indicated by a circled letter in the figure that corresponds to the circled letters in the following text:

Ⓐ The fields that the RMF routines fill in before the data gathering routine is invoked.

Ⓑ The fields that the data gathering routine must fill in during its processing. (See "Relocate Blocks" later in this section.)

Ⓒ The fields that the RMF routines will fill in when the RECORD option is in effect. RMF completes these fields after the data gatherer returns control but before the record is written to the SMF data set. During a display session or a background session when NORECORD is in effect, these fields are not completed because the record is not actually written to the SMF data set.

Before invoking the data gatherer, RMF calculates the length of the storage buffer required for the record, as described later under "Relocate Blocks," obtains a buffer for the record, and fills in some of the common section fields. The address of the SMF record buffer is passed to the data gatherer. The data gatherer fills in its fields in the common section and all of the data section of the record.

```
      8+SMF79HDR  DSECT
 © 9+SMF79LEN  DS     H -                    RDW RECORD LENGTH
 Ⓐ10+SMF79SEG  DS     H -                    RDW SEGMENT DESC
 ©11+SMF79FLG  DS     X -                    OPERATING ENVIRONMENT
 ©12+SMF79RTY  DS     X -                    RECORD TYPE = 79
   13+SMF79TME  DS     XL4 -                  TOD RECORD WRITTEN
   14+SMF79DTE  DS     CL4 -                  DATE RECORD WRITTEN
 ©15+SMF79SID  DS     CL4 -                  SYSTEM ID
   16+*
   17+*             COMMON HEADER FOR RMF PRODUCT
   18+*
   19+         DS     OH -
 Ⓐ20+SMF79SIZ  DS     H -                    SIZE OF COMMON HEADER
 ©21+SMF79IST  DS     CL4 -                  TOD INTERVAL 0HHMMSSF
 ©22+SMF79DAT  DS     CL4 -                  DATE OF INTERVAL 0YYDDDF
 ©23+SMF79INT  DS     CL4 -                  DURATION OF INTERVAL MMSSTTTF
   24+SMF79RV0  DS     CL2 -                  RESERVED
   25+SMF79RV2  DS     CL2 -                  RESERVED
   26+SMF79RV3  DS     CL4 -                  RESERVED
 ©27+SMF79MPV  DS     CL2 -                  RMF PRODUCT CODE
 ©28+SMF79SES  DS     CL2 -                  SESSION NAME
 ©29+SMF79RLS  DS     CL4 -                  OPERATING SYSTEM & LEVEL NNLL
   30+SMF79CYC  DS     CL4 -                  CYCLE TIME 0OCTTTTF
   31+*
   32+*             OFFSET POINTER ARRAY TO RELOCATE SECTIONS
   33+*
   34+         DS     OH
ⒶⒸ35+SMF79NRS  DS     H -                    NUMBER OF RELOCATE SECTIONS
   36+SMF79OS1  DS     XL4 -                  RESERVED OFFSET PTR
   37+SMF79OS2  DS     XL4 -                  RESERVED OFFSET PTR
 Ⓐ38+SMF79OS3  DS     XL4 -                  OFFSET PTR TO RECORD 79
   39+*                                       COMMON SECTION
 Ⓐ40+SMF79OS4  DS     XL4 -                  OFFSET PTR TO DATA FOR
   41+*                                       SUB TYPE X OF RECORD 79
   42+*
   43+*             RECORD 79 COMMON SECTION
   44+*
   45+*
   46+R79CHL    EQU    *                      COMMON RECORD 79 HEADER
 Ⓑ47+R79GTOD   DS     XL4 -                  DATA GATHERER CALL TOD
 Ⓑ48+R79RECST  DS     XL2 -                  RECORD SUBTYPE
   49+R79RECVN  DS     XL2 -                  RECORD VERSION NUMBER
   50+R79USER   DS     XL2 -                  USER FIELD
 ©51+R79RID    DS     CL8 -                  MEASUREMENT NAME
 ©52+R79CTXTL  DS     XL2 -                  LEN OF COMMAND TEXT
 ©53+R79CTEXT  DS     CL32 -                 COMMAND TEXT
 ©54+R79LTXTL  DS     XL2 -                  LEN OF DEFAULT DR TEXT
 ©55+R79DTEXT  DS     CL32 -                 DEFAULT DR TEXT
   56+R79RELOC  EQU    *                      START OF RELOCATE BLOCK
 Ⓑ57+R79NELM   DS     XL2                    NUMBER OF ELEMENTS
 Ⓑ58+R79SELM   DS     XL2                    SIZE OF ELEMENT
   59+R79DATA   EQU    *                      DATA ELEMENTS START HERE
   60          END
```

Figure 3-11. ERBSMF79 Mapping Macro Expansion

Relocate Blocks

The data section of SMF record type 79 is unique to each report. It is composed of one or more **relocate blocks**. A relocate block is the portion of the SMF record that contains the data for one report data line. A record for a row report has one relocate block. A record for a table report has multiple relocate blocks; for example, the SMF record for the address space state data report includes one relocate block for each address space included in the report.

The format of the data in the relocate block depends on the report you are generating. You set the format that best meets your needs. When you are generating a table report, the SMF record consists of multiple relocate blocks, and each relocate block must have the same length.

Relocate blocks are used by RMF to calculate the amount of storage to reserve for the SMF record the data gatherer is to complete. When you add a menu item to ERBFMENU or an option to ERBBMENU, the entry that describes the new report must include a field that specifies the length of the relocate block and the maximum number of possible relocate blocks. For information on how to add an entry to ERBFMENU or ERBBMENU, see 'Using the PICTURE Macro" later in this chapter. To determine the storage to allocate, RMF multiplies the length of the relocate block by the maximum number of relocate blocks and adds this value to the length of the common section. The result of this computation is the maximum possible length of the SMF record, and RMF allocates a buffer for the record that is equal in size to the maximum length.

To determine the actual length of the SMF record, the data gatherer must complete the fields in the common section that describe the actual length of the relocate block (R79SELM) and the actual number of relocate blocks used (R79NELM). After the data gatherer has completed its processing and returned control, RMF uses these values to determine the length of the SMF record to be written to the SMF data set, a calculation that is performed only when the RECORD option is in effect for a background session. Note that the value your routine sets in R79SELM and the value specified for RBLEN in the PICTURE macro for the report should be identical.

Other fields in the common section that the data gather completes are R79GTOD and R79RECST. R79GTOD must contain a packed decimal value that indicates the time when the data gatherer was invoked, in the form 0hhmmssF, where F is the sign. R79RECST can contain the subtype number of the SMF record that you are creating. You use this number as a unique identifier for each record subtype that you create; no subtype number should be less than 1000.

The maximum length of an SMF record is 32,756 bytes; any records that exceed this length are truncated before they are written to the SMF data set. Truncation, which can occur only during a background session when the RECORD option is in effect, occurs at the last relocate block boundary within the maximum length. When truncation occurs, RMF adjusts the field indicating the capacity of the buffer (SMF79NRS) to indicate the actual number of relocate blocks in the record. If no truncation occurs, RMF sets SMF79NRS equal to the value in R79NELM.

Coding a User Report

To add a Monitor II report, you must code your own data gatherer module and data reporter module. These modules can reside in SYS1.LINKLIB, SYS1.LPALIB, a steplib, a joblib, a tasklib, or a library in a linklist.

The primary means of communicating data between the gatherer and the reporter is the type 79 SMF record. The gatherer collects data from whatever areas it can access (it runs in problem state with a key of 8) and places the data in the SMF record. The reporter takes the data from the SMF record, formats it for output, and passes it to the RMF putline routine. During a Monitor II background session, the data reporter would be called when the REPORT option is in effect. When NOREPORT and RECORD are in effect, RMF writes out the SMF records that the data gatherer formats, and the data reporter is not invoked. Your data reporter can be invoked at a later time by the post processor.

A Monitor II session report can have operands that the report user specifies when he requests the report. Any operands specified when a report is requested are passed to both the data gatherer and the data reporter. The defaults established for each possible operand are specified in the option list or menu list entry for the report; these defaults are also passed to both the data gatherer and the data reporter. Your routines can also include hard-coded default operands.

Because the option list and menu item list are in different RMF control sections, you can set different default operands for a background session and a display session. Each list entry contains separate fields for the data gatherer default operands and the data reporter default operands; you can thus set different default operands for the data gatherer and the data reporter. For example, the default operands for the RMF address space state data gatherer module cause data to be gathered on all address spaces in the system; to limit the actual output produced, the defaults for the reporter cause only the active address spaces to be reported. "Using the PICTURE Macro" describes how to specify default operands.

RMF passes parameters to both the gatherer and reporter; these parameters include a subpool number that indicates the subpool from which the routines should obtain the storage they require, and two user words that can be used for communication between the data gatherer and the data reporter. Because the same two words are passed to both routines, use of these words must be governed by conventions established by your installation.

Note: A system status line precedes each display report supplied by IBM. RMF obtains the data for this line before it invokes the data gatherer for the report. RMF will generate the same system status line before each user-coded display report.

Data Gatherer

The data gatherer runs in problem state, with a key of 8. The data gatherer must be reenterable. It receives control by a BALR instruction and must save the registers when it recieves control and restore the registers when it returns control. Register 13 contains the address of the register save area; register 14 contains the return address; and register 15 contains the entry address.

Upon entry to the data gatherer, register 1 points to a contiguous list of seven addresses that point to seven input parameters. The first address points to the first parameter, the second address points to the second parameter, and so forth. The input parameters are:

First Parameter: A halfword entry code that must always be X'2'.

Second Parameter: The operands, if any, specified by the report user when he requested the report, in the form

LL	text

LL - a two-byte length field indicating the length of the following text (does not include the two bytes of LL)

text - a character string of up to 35 characters containing the input operands

When the report has no operands or the report request did not include operands, LL is set to zeros.

RMF determines the operands to be placed in text by scanning the report request. The first non-blank character after the report name is assumed to be the first character of the operand field. The next blank character is assumed to mark the end of the operand field.

Third Parameter: The default operands from ERBFMENU or ERBBMENU, in the form

LL	text

LL - a two-byte length field indicating the length of the following text (does not include the two bytes of LL)

text - a character string of up to 35 characters containing the default operands

When the report has no operands or no default operands, LL is set to zeros.

Fourth Parameter: The SMF record buffer where your routine is to place the data it gathers.

Fifth Parameter: The first of the two words reserved for the use of your routines.

Sixth Parameter: The second of the two words reserved for the use of your routines.

Seventh Parameter: The number of the subpool to use when you issue a GETMAIN to obtain the storage your routine requires.

The processing your data gathering routine performs is determined largely by the nature of the report for which you are gathering data. This processing should include a validation of the entry code in the first parameter to verify that it is X'2'. If it is not, set a return code of 8 in register 15 and return control.

If the report has operands that can be specified when the report is requested, check the second input parameter to determine if the request specified operands. If it did, validate the syntax of the operands; if the syntax is invalid, set a return code of 4 in register 15 and return control. If the request did not specify operands, verify the syntax of the default menu operands passed as the third input parameter; if the syntax is invalid, set a return code of 24 in register 15 and return control.

Your routine should complete the required fields in the SMF record common section (the 🅱 fields in Figure 3-11), using the RMF mapping macro ERBSMF79 to access the fields in the common section. The address of the storage buffer obtained for your record is passed in the fourth input parameter. Your routine would gather the data required and format the data section of the record as agreed upon by convention between the data gatherer and the data reporter. Should your routine locate no data that is applicable to the report requested, set a return code of 16 in register 15 and return control.

When your routine has finished processing, set a return code in register 15 and return to the caller by branching on the contents of register 14. Figure 3-12 shows the possible return codes, their meaning, and the action RMF takes in response. These return codes apply to both the data gatherer and the data reporter.

Note: If your report will be run only during a display session, you can perform both the data gathering function and the data reporting function in the data reporter module. In this case, your data gatherer's only function would be to set a return code of zero in register 15. However, if you choose to perform both functions in the data reporter module, your report cannot run during a Monitor II background session and, during a display session, you will not be able to use the recall command to re-display your report.

Code	Meaning	RMF Response (Display Session)	RMF Response (Background Session)
0	Successful completion	The session continues.	The session continues.
4	Invalid operand syntax	The command is displayed as entered.	Measage ERB409I is issued. The current measurement continues if the error was detected by the data reporter and RECORD is in effect; otherwise, the measurement is discontinued. The session continues. The operator can modify the session options.
8	Invalid entry code	Abend. The user code is 1402.	Abend. The user code is 1402.
12	I/O error	Messages ERB403I and ERB404I are displayed, including the SYNAD text.	Message ERB403I is issued. The current measurement continues when RECORD is in effect, but no subsequent reports are printed; otherwise, the measurement is discontinued. The session continues.
16	No data found	Message ERB405I is displayed.	Message ERB405I is issued. No report or SMF record is produced for this interval. All measurements continue.
20	ESTAE macro failed	Message ERB406I is displayed.	Message ERB406I is issued. The current measurement continues if the error was detected by the data reporter and RECORD is in effect; otherwise, the measurement is discontinued. The session continues.
24	Menu default operand syntax error	Message ERB407I is displayed, including the menu defaults and advice to retry the report, specifying all operands.	Message ERB407I is issued. The current measurement continues if the error was detected by the data reporter and RECORD is in effect; otherwise, the measurement is discontinued. The session continues.
>24	Unexpected	Message ERB408I is displayed.	Message ERB408I is issued. The current measurement continues if the error was detected by the data reporter and RECORD is in effect; otherwise, the measurement is discontinued. The session continues.

Figure 3-12. Return Codes from the Data Gatherer and Data Reporter

Data Reporter

The data reporter runs in problem state, with a key of 8. The data reporter must be reenterable. It receives control by a BALR instruction and must save the registers when it receives control and restore the registers when it returns control. Register 13 contains the address of the register save area; register 14 contains the return address; and register 15 contains the entry address.

The data reporter formats each line in the report, using the data placed in the type 79 SMF record by the data gatherer. The RMF putline routine is used to perform the actual output operation.

Because the putline routine handles the actual output operations, your data reporter can function identically during a background session, a display session, a display session in hardcopy mode, or an execution of the post processor. The putline routine writes the line to a logical screen buffer for a display session, to a logical screen buffer and an output data set for a display session in hardcopy mode, or to an output data set for a background session or an execution of the past processor. For a display session, the screen is updated to show the lines collected by the putline routine when your data reporter returns control. Note that RMF handles any framing required for the display session user to view all the frames in a multi-frame table report after the data reporter completes its processing.

The data reporter you code can generate either a row report or a table report. The maximum number of header lines is two.

A row report consists of one or two header lines and a single data line. For a row report, RMF invokes the data reporter twice: once to format the header line(s) and once to format the data line. When a row report is executed repetitively, RMF invokes the reporter to format the header line(s) for the first execution; for all subsequent executions, the reporter is invoked to format a data line.

A table report consists of one or two header lines and a variable number of data lines. For a table report, RMF invokes the data reporter once to format both the header line(s) and the data lines. The number of data lines must be less than or equal to the number of relocate blocks created in the SMF record by the data gatherer.

Upon entry to the data reporter, register 1 points to a contiguous list of eleven addresses that point to eleven input parameters. The first address points to the first parameter, the second address points to the second parameter, and so forth. The input parameters are:

First Parameter: A full word entry code that can be either X'1' or X'2'. X'1' indicates that the reporter is to format the header line(s) for a row report. X'2' indicates, for a row report, that the reporter is to format the single data line. For a table report, the entry code should always be X'2', indicating that the reporter is to format both the header line(s) and the data lines.

Second Parameter: A full word report mode indicator that can have either of the following values:

X'1' — total mode; the values in the report are to reflect session totals.

X'2' –   delta mode; the values in the report are to reflect changes
          since the last request for the report.

Third Parameter: The operands, if any, specified by the report user when
he requested the report, in the form

```
| LL | text |
```

LL –   a two byte length field indicating the length of the following
          text (does not include the two bytes of LL)

text –   a character string of up to 35 characters containing the report
          operands

When the report has no operands or the report request did not include
operands, LL is set to zeros.

Fourth Parameter: The default operands from ERBFMENU or
ERBBMENU, in the form

```
| LL | text |
```

LL –   a two byte length field indicating the length of the following
          text (does not include the two bytes of LL)

text –   a character string of up to 35 characters containing the
          default operands

When the report has no operands or no default operands, LL is set to
zeros.

Fifth Parameter: The current SMF record buffer; that is, the buffer
where the data gatherer has placed the data for the current execution of
the reporter.

Sixth Parameter: The previous SMF record buffer; that is, the buffer
where the data gatherer placed the data for the previous execution of the
report. When the report mode (the second parameter) indicates delta
mode, the data fields in the previous SMF record enable your data
reporter to calculate the changes that have occurred since the last request
for the report.

Seventh Parameter: The first of the two words reserved for the use of
your routines.

Eighth Parameter: The second of the two words reserved for the use of
your routines.

Ninth Parameter: The number of the subpool to use when you issue a
GETMAIN to obtain the storage your routine requires.

Tenth Parameter: The address of the RMF putline routine. When the
data reporter has formatted a report line, it calls the putline routine to
perform the actual output operation.

Eleventh Parameter: The control block address that your data reporter
must pass to the putline routine.

The processing your data reporting routine performs is determined largely
by the nature of the report for which you are formatting report lines. This
processing should include a validation of the entry code. If it is not a valid

code, set a return code of 8 in register 15 and return control. If your report is a row report, examining the entry code determines whether your routine has been invoked to format the header line(s) or the data line for the report.

If the report has operands that can be specified when the report is requested, check the third input parameter to determine if the request specified operands. If it did, validate the syntax of the operands; if the syntax is invalid, set a return code of 4 in register 15 and return control. If the request did not specify operands, verify the syntax of the menu default operands passed as the fourth input parameter; if the syntax is invalid, set a return code of 24 in register 15 and return control.

If your report contains fields that are affected by the session mode – either delta mode or total mode – check the second input parameter to determine which mode is in effect. When delta mode is in effect, use the data fields in the previous SMF record buffer (sixth parameter) and the data fields in the current SMF record buffer (fifth parameter) to calculate the changes that have occurred since the last report request.

When your routine has formatted a report line, it should invoke the RMF putline routine to perform the actual output operation. To use the putline routine, perform the following steps:

1. Set up the input parameters that the putline routine requires. To do this, set register 1 to point to a list of four addresses that point to the following four parameters:

   First Putline Parameter: The record you have formatted, preceded by a two-byte length field. The length specified **must not** include the two bytes of the length field. The maximum record length is 79 characters. Note that the 3270 field attribute bytes must **not** be included; RMF supplies these bytes.

   Second Putline Parameter: A two-byte field that tells the putline routine whether the record you have formatted is a header line or a data line. The field must contain one of the following:

      'HD' – indicates that the record is a header line

      'DT' – indicates that the record is a data line
   Header lines generally contain column headings. These lines are repeated when the terminal user frames forward through a multi-frame table report or when the hardcopy output crosses a page boundary.

   Third Putline Parameter: A one-byte field; its bits have the following meaning:

Bit	Meaning
0	Set to 1 if high intensity display is desired. Set to 0 if low intensity display is desired. (The bit is ignored during a background session.)
1-7	Reserved. These bits must be set to zeros.

   Fourth Putline Parameter: The control block address that RMF passed to your data gatherer in the eleventh input parameter.

2. Invoke the putline routine using standard linkage conventions. Set register 13 to point to your register save area, set register 15 to the

address of the putline routine (passed to your data reporter in the tenth parameter), and pass control to the putline routine by a BALR 14,15 instruction.

3. When the putline routine returns control to the data reporter, a return code is set in register 15. A return code of zero indicates successful completion. A return code of 4, indicates an uncorrectable I/O error; set a return code of 12 in register 15 and return control.

When your data reporter has finished processing, set a return code in register 15 and return control by branching on the contents of register 14. Figure 3-12 shows the possible return codes, their meaning, and the action RMF takes in response to each code.

Installing a User Report

Once your data gatherer and data reporter are coded, two steps are required to install the report:

1. Include an entry for the report in the option list for a background session and the menu list for a display session, depending on the type of session during which your report can be run.

   If data collected during a Monitor II background session is to be reported during execution of the post processor, a copy of the option list control section (ERBBMENU) that includes the entry for your report must be link edited with the post processor.

   RMF supplies the PICTURE macro to simplify the process of adding or changing an entry in the option list or menu list. See "Using the PICTURE Macro" later in this chapter. You can also superzap an entry to make changes when the length of the entry is not changed.

2. Link edit your data gatherer and data reporter with the RMF routines and test your report.

The option list or menu list consists of a set of variable-length entries, each describing a valid report. The option list appears the in the RMF control section ERBBMENU; the menu list appears in ERBFMENU. Two separate control sections are provided to allow for a report that will run only during a background session or only during a display session. Also, the two different control sections allow different sets of default operands to be established for display sessions and background sessions. For example, you might want the display defaults to specify a limited set of possible data, while the background defaults specify all possible data.

The steps required to add an entry to the list, are:

1. Determine whether the USER entry supplied by RMF is appropriate for your report. The USER entry contains specifications for a table report (RPTTYP=T) with a single relocate block (MAXRBS=1) that is four bytes long (RBLEN=4). The report title is 'USER PICTURE'. If the entry is not appropriate for your report, replace the entry with a new entry for USER.

2. If you are changing the USER entry or adding a new entry, make a copy of ERBFMENU for a display report or ERBBMENU for a background session — or both — from the source code data set.

3. In the copy you have made, either replace the USER entry or insert a new PICTURE macro. For a new display report, insert the PICTURE macro where you want the new report to appear in the menu frame. See "Using the PICTURE Macro" later in this section for details.

4. Assemble ERBFMENU for a display report and ERBBMENU for a background report.

5. Link edit the menu list or option list CSECT(s) that you have assembled into the RMF load modules. A sample of the control statements required is:

```
//SYSLIN    DD  *
      ( ERBFMENU object deck )
      ( ERBBMENU object deck )
      INCLUDE DD ( ERBMFMFC )
      ENTRY ERBMFMFC
      ALIAS ERBMFMPR
      SETCODE AC( 1 )
      NAME ERBMFMFC( R )
      ( ERBFMENU object deck )
      INCLUDE DD ( RMFMON )
      ENTRY ERBMFTSO
      NAME RMFMON( R )
      ( ERBBMENU object deck )
      INCLUDE DD ( ERBRMFPP )
      ENTRY ERBRMFPP
      NAME ERBRMFPP( R )
/*
```

Notes:

- If your report will run only during a TSO display session, the change to ERBMFMFC is not required.
- The change to ERBRMFPP is required only when your report will be printed during execution of the RMF post processor.

To install your report, you must link edit your data gatherer and data reporter with the RMF routines.

If you are using the USER entry, name your gatherer routine ERBGUS99; name your reporter routine ERBRUS99. Replace the dummy RMF modules that have these names with your own routines. The link edit control statements required are:

```
( ERBGUS99 object deck )
ENTRY ERBGUS99
NAME ERBGUS99( R )
( ERBRUS99 object deck )
ENTRY ERBRUS99
NAME ERBRUS99( R )
```

If you are not using the USER entry, give your data gatherer and data reporter modules names that match the names you are specifying in the PICTURE macro for the report that you are adding. Link edit the modules as shown in the above control statements, replacing ERBGUS99 with the name of your data gatherer and ERBRUS99 with the name of your data reporter.

Once your modules have been link edited, you are ready to test your report. You might find it simpler to test your new report on TSO before

making it available to other RMF users at your installation. Perform the following steps:

1. Use a testing tasklib, a special partitioned data set (for example, TESTLIB.LOAD). Place your data gatherer, data reporter, and the RMFMON load module that includes the new menu list in the testing tasklib.

2. You can then test the new report by entering:

   ```
   CALL TESTLIB(RMFMON)
   ```

   The new menu should appear on the screen in response to this command. You can then invoke your report by specifying its menu item name.

If your report routine terminates abnormally, you can obtain a dump by replying 'STOP' to the messages describing the abnormal termination.

Using the PICTURE Macro

The PICTURE macro describes a Monitor II session report to RMF. Use the PICTURE macro to replace the USER description or add or replace any entry in either ERBBMENU or ERBFMENU. The PICTURE macro is located in SYS1.RMFMAC01.

The syntax of the macro and the meaning of each operand are as follows.

```
[name]  PICTURE ID=name,
                GATHER=gathername,
                REPORT=reportname,
                RBLEN=length,
                RPTTYP={R|T}
                [,TITLE='title']
                [,DGTEXT='drdefaults']
                [,DRTEXT=drdefaults']
                [,MAXRBS=nn]
```

ID=name
The option or menu item that will identify the report.

The name must consist of one to eight alphameric characters. The first character must not be 'R'; RMF takes 'R' to be a request to recall a report. For a display report, this name will appear on the menu frame.

GATHER=gathername
The name of the module RMF is to invoke to gather data for the report.

REPORT=reportname
The name of the module RMF is to invoke to format the header lines and data line(s) for the report.

RBLEN=length
The length of the relocate block generated by the data gatherer for each line in the report.

RPTTYP={R|T}
The type of report. T indicates a table report; R indicates a row report.

TITLE='title'

An optional report title. The title specified appears in the menu frame for a display session. The title must be enclosed in single quotes. Use two quotes to represent any quote used in the title. The title can contain up to 50 printable characters. However, a maximum of 35 characters can be printed or displayed; therefore, a title longer than 35 characters will be truncated to fit into the menu frame.

DGTEXT='dgdefaults'

The default operands that are passed to the data-gathering routine for the report. This field is optional; it is used when the report requires operands. The text must be enclosed in single quotes, and the maximum length of the text is 32 characters. Any characters are valid between the quotes. Use two quotes to represent any quote used in the text. When more than 32 characters are specified, the text is truncated.

DRTEXT='drdefaults'

The default operands that are passed to the data-reporting routine for the report. This field is optional; it is used when the report requires operands. The text must be enclosed in single quotes. Use two single quotes to represent any quotes used in the text. Any characters are valid between the quotes. When more than 32 characters are specified, the text is truncated.

MAXRBS=nnn

The maximum number of relocate blocks. This number is equivalent to the maximum number of data lines in the report. The field is optional; when it is omitted, the default is 1 when RPTTYP=R is specified, indicating a row report. When RPTTYP=T is specified, indicating a table report, the field defaults to zero; however, enough storage is provided to allow a relocate blcok for each address space possible in the system. The maximum value possible for MAXRBS is 32,767.

Example

The following example shows how to use the PICTURE macro to add a menu item to ERBFMENU. The menu item for the report is ANL, the data gatherer is ANLDG, the data reporter is ANLRP, the length of the relocate block is 32, and the report is a table report. The title of the report is USER ANALYSIS, the default operands for the gatherer and the reporter are 1,1,1. The maximum number of relocate blocks is 128.

```
ANLPIC PICTURE ID=ANL,GATHER=ANLDG,REPORT=ANLRP,RBLEN=32,
               RPTTYP=T,TITLE='USER ANALYSIS',DGTEXT='1,1,
               DRTEXT='1,1,1'MAXRBS=128
```

TSO Terminal User Authorization

All the data collected and reported by RMF during a Monitor II TSO display session is obtained from commonly addressable storage that is not fetch protected. However, if your installation wants to limit the use of the RMFMON command that starts an RMF session under TSO, one method available is to replace the RMF control section ERBTSOCK with your own module. Your routine will then be invoked as part of the RMF response to the RMFMON command.

ERBTSOCK runs in problem state, with a key of 8. When ERBTSOCK gets control, register 1 points to a two-word address list. The first address points to the seven-byte userid of the user who has issued the RMFMON command. The second word points to the PSCB. Figure 3-13 illustrates the input parameter structure.
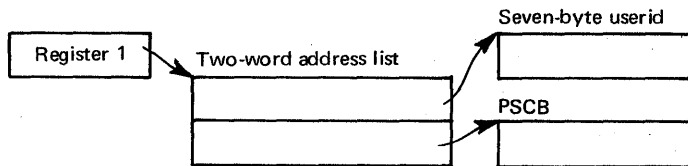
Figure 3-13. ERBTSOCK Input Parameter Structure

The module that you code to replace ERBTSOCK must be reenterable. It receives control by a BALR instruction and must save the registers when it receives control and restore the registers when it returns control. Register 13 contains the address of the register save area; register 14 contains the return address; and register 15 contains the entry address.

The processing your module performs depends on the method you choose to validate the user. Possible methods include issuing a RACHECK, prompting the user for a password, or checking the userid against a list of valid userids. Information on the TSO services available to perform these functions, such as TGET or TPUT, can be found in **OS/VS2 TSO Guide to Writing a Terminal Monitor Program or a Command Processor.**

You can also use the PSCB bits defined for user use. This field (PSCBATR2 in the PSCB) comes form the UADS and can be updated by the USERDATA keyword of the ADD and CHANGE subcommands of the ACCOUNT command. See **OS/VS2 System Programming Library: TSO** for further information.

When your routine has completed its processing, set a return code of 0 in register 15 to indicate to RMF that the user is authorized to issue RMFMON. Set a return code of 4 in register 15 to indicate to RMF that the user is not authorized to issue RMFMON. In response to this return code, RMF will display message ERB217I at the display station. No session will be started. After setting the appropriate return code, return control by branching on the contents of register 14.

The user authorization exit routine (ERBTSOCK) is part of the RMF load module that contains the RMFMON command. This module resides in SYS1.LINKLIB as load module ERBMFTSO; its alias name is RMFMON. Before your authorization routine can execute, you must link edit it with RMFMON; the control statements required are:

```
( ERBTSOCK object deck )
INCLUDE DD( RMFMON )
ENTRY ERBMFTSO
NAME RMFMON( R )
```

Chapter 4: Support Procedures

The Resource Measurement Facility is maintained through the distribution of program temporary fixes (PTFs), which are distributed by the Program Information Department (PID) to branch offices.

Problem Diagnosis

RMF should not cause the MVS operating system to fail and will attempt to recover from any failure it receives. Program failures are indicated to the operator on the system console and to the system programmer responsible for RMF on the output listing.

The errors you encounter while running RMF can be indicated by one or more of the following:

- Abend - either a three-digit system completion code or a four-digit user completion code.
- Message - either an RMF message (ERB prefix) or a system message.
- Program Check - a three-digit interruption code in the Program Status Word (PSW).
- Invalid output - either a wrong or missing report or incorrect derived or manipulated data.

Figure 4-1 shows the various error indications listed above and the steps to take when attempting to diagnose the problem.

APAR Requirements

To report any difficulties in the use of RMF, and to obtain a correction, an Authorized Program Analysis Report (APAR) should be submitted. The following are required to fulfill APAR documentation on a problem:

- Input data set (for example, the appropriate SMF records) in machine readable form (if available).
- A dump of the problem occurrence.
- The user outputs (printed).
- The SMF record (printed).
- A list of any new or recently modified operating procedures (if applicable).
- A detailed description of how to recreate the problem (if applicable).

Note: In most cases the specific APAR requirements are listed with the messages and codes for convenience.

Begin Problem Diagnosis

User Ucde ABEND ? — No → System Scde ABEND ? — No → RMF (ERB) Message ? — No → System Message ? — No → Program Check ? — No → Invalid Output ? — No → B

User Ucde ABEND ? — Yes → See "User Codes" in this Pub → C

System Scde ABEND ? — Yes → See "System Codes" in this Pub → RMF System Code ? — No → See OS/VS2 System Codes, GC38-1008

RMF System Code ? — Yes → C

See OS/VS2 System Codes, GC38-1008 → A → RMF Problem ? — No → C

RMF Problem ? — Yes → B

RMF (ERB) Message ? — Yes → See "RMF Messages" in this Pub → C

System Message ? — Yes → See OS/VS2 System Messages, GC38-1002 → A → RMF Component ? — No → See Component's P.D. Manuals for APAR Submittal → C → Still a Problem ? — No → C

RMF Component ? — Yes → B → Collect Data and Make List[1] → C → End Problem Diagnosis

Still a Problem ? — Yes → Identify Report Mode (DEFER or REALTIME) → B

Program Check ? — Yes → Identify Module and Component

Invalid Output ? — Yes → Wrong or Missing Report ? — No → Incorrect Derived Data* ? — No

Wrong or Missing Report ? — Yes → Check Input and See "Input Merge" in this Pub[2]

Incorrect Derived Data* ? — Yes → Write APAR and Supply Data[3] → C → Incorrect Manipulated Data** ? — No → B

Incorrect Manipulated Data** ? — Yes → See "Data Fields" Section for Report in Error[4] → C

[1] Send as many of the following as possible:
● SMF Records (if available)
● Console sheet
● Dump of problem occurrence
List any new or recently modified operating procedures.
List in detail how to recreate problem.

[2] Check START command parameters, PARM field on EXEC statement and parmlib member.

[3] See the Data Origin Section for the component, write your APAR against that component, and supply the material requested by the component.

[4] Read "Data Fields" section for the report in error to determine how calculations were made. Send report, SMF record, and, if available, input data values (dump, etc.).

*Data copied unaltered from other component control blocks.

**Averages, sums, and other data arrived at through RMF calculations.

Figure 4-1. Diagnostic Flow Diagram

Chapter 5: Formatted Reports

This chapter describes the contents of each report generated by RMF. Each entry in each report is described, including a field definition, its use, the range of values, and the field heading. All calculated numeric values in all reports are rounded to the nearest printable value, unless otherwise noted in the individual report descriptions. All data fields in the reports are obtained directly from the corresponding SMF record image unless otherwise indicated. Those data fields that are not obtained directly are calculated from fields in the SMF record image.

This chapter consists of three sections:

- "Monitor I Session Reports"
- "Monitor II Session Reports"
- "Post Processor Reports"

The first section describes the interval reports that can be produced during a Monitor I session, in the following order:

- ASM/RSM/SRM trace activity
- channel activity
- CPU (processor) activity
- enqueue activity
- I/O device activity
- page/swap data set activity
- paging activity
- workload activity

At least one sample of each type of report is included.

The second section describes the Monitor II session reports in the following order:

- address space resource data
- address space resource data by jobname
- address space SRM data
- address space SRM data by jobname
- address space state data
- address space state data by jobname
- paging
- real storage/processor/SRM

Sample reports are given, and the meaning of each field in each report, as well as the contents, is described.

These first two sections describe the interval reports for each measurement activity. Interval reports can be obtained during RMF processing or at the end of RMF processing, or they can be generated at a later time by the post processor.

The third section of this chapter describes the reports that can be generated **only** by the post processor. These reports are:

- duration reports
- summary reports
- plot reports

Duration reports summarize some areas of system activity over a specified length of time. Summary reports present an overview of the activity of the system over a specified length of time. A summary report can contain a line of data for each interval, a line of data for all intervals, or both. Plot reports present a graphic overview of many areas of system activity over a specified length of time. Each type of post processor report is described in detail under "Post Processor Reports."

Monitor I Session Reports

All Monitor I session reports contain the following heading information:

- OS/VSn - the type of operating system, where n is the system indicator obtained from the system indicator field in the SMF record.
- RELEASE nn.ll - the release number and level of the operating system, where nn is the number and ll is the level.
- DATE mm/dd/yy - the date of the beginning of the interval for which the measurement was gathered, where mm is the month, dd is the day, and yy is the year.
- INTERVAL mm.ss.ttt - the length of the interval at which unique sets of measurements are gathered for input to the report generators, where mm is the minutes, ss is seconds, and ttt is thousandths of seconds.
- report title - the identification of the type of measurement data.
- PAGE nnnn - the page number of the report (generated by the report program), where nnnn is the page number.
- SYSTEM ID cccc - the four-character SMF identifier associated with this system at system generation, where cccc is the identifier.
- RPT VERSION nn - the two-digit report level, where nn is the level (02 for Version 1 of RMF or 03 for Version 2).
- TIME - the time the interval began in the format hh.mm.ss.
- CYCLE s.ttt - the length of the cycle at which data is sampled, where s is seconds and ttt is thousandths of seconds. This field appears in the heading for each report that includes sampled data.

The following sections describe each report in detail.

ASM/RSM/SRM Trace Activity Report

The ASM/RSM/SRM trace activity report provides information about certain fields of the Paging Vector Table (PVT), the Auxiliary Storage Manager Vector Table (ASMVT), the System Resource Management Data Areas, and SRM Domain Tables. The fields that RMF can trace are listed in "Monitor I Session Options" in Chapter 2. In addition to these fields, you can add other fields to the report, as described in "Monitor I Session User Reports" in Chapter 3.

The trace report shows snapshots of each of the specified field values along with timing information. One important use of the trace report is to monitor the SRM multiprogramming level (MPL) adjustment. You can monitor the contention SRM detects and see the actions SRM takes as a result of contention by tracing the following fields in the SRM data area and domain table: RCVUICA, RCVCPUA, RCVASMQA, RCVPTR, RCVTOTDF, DMDTMPLT, DMDTRUA, and DMDTCMPL.

Tracing the domain variables enables you to trace the multiprogramming target level over the interval and compare it with the current multiprogramming level that SRM is aiming at for each domain. Thus, by tracing the domain fields, you can determine whether the domain setting in the IPS is correct.

The options that can be selected for a given report on a given traceable item include:

MIN   -   the minimum value of the field over the period of sampling.

MAX   -   the maximum value of the field over the period of sampling.

AVG   -   the average value of the field.

STD.DEV   -   the standard deviation of the values sampled.

END   -   a snapshot of the last value in the sampling period.

The number of lines in the report is based on the cycle and interval values specified when the session is started. For example, if CYCLE(250) and INTERVAL(60M) are specified, approximately 14,400 samples are taken. Based on a constant 60 samples/set, and 1 line/set, the report contains 240 lines of data for each field.

The number of samples per set is determined by a constant located in the first halfword of CSECT ERBMFTTB in load module ERBMFMFC (in SYS1.LINKLIB). Any value in the range 1 to 32,767 is valid and can be zapped by the system programmer. If zapped to zero, RMF overrides it with 1. If zapped to a value less than 0 (a negative number), RMF defaults to 32,767(X'7FFF').

Data Fields

In addition to the report headers that are common to all reports, the trace activity report contains:

- seconds/set - amount of elapsed time covered by one line of output
- cycles/sample - number of cycles in a sample
- number of samples - total samples over the interval
- samples/set - number of samples taken for each line of output except the last line: it can contain fewer samples
- number of sets - number of output lines

TIME	The approximate calculated time when the sampling for
MM.SS.TT	that line of data ended (minutes, seconds and thousandths of a second).
MINIMUM	The smallest value sampled for the period covered by that output line.
END	The last value sampled for the period covered by that output line.
AVERAGE	The average of the values collected for the period covered by that output line.
MAXIMUM	The largest value sampled for the period covered by that output line.
STD.DEV	The standard deviation of the values collected for the period covered by that line of output.

Notes:

- RMF trace treats values collected as unsigned binary integers.
- The actual minimum and maximum values might occur at a time when RMF is not sampling.
- Domain tracing ends on a SET IPS operator command and will not restart unless the session options are modified to respecify domain tracing or the Monitor I session is stopped and restarted. **ENDED** appears on the report for the domain.
- RMF limits the maximum number of sets per interval to 32,767. If the values specified for cycle, interval, and samples per set would result in the number of sets exceeding this limit, RMF suspends trace sampling for the remainder of the interval.

See Figure 5-1 for an example of a trace activity report.

```
                                            T R A C E   A C T I V I T Y
                                                                                                              PAGE    1
            OS/VS2                    SYSTEM ID 6668              DATE   2/15/77           INTERVAL 15.01.578
            RELEASE 03.70             RPT VERSION  03             TIME  11.50.55           CYCLE 0.250 SECONDS

      SECONDS/SET=  15.00   CYCLES/SAMPLE=  1      NUMBER OF SAMPLES=  3606    SAMPLES/SET=    60    NUMBER OF SETS=  61

     TIME  *                      RCVPTR                         *                             RCVASMQA                  *
   MM.SS.TT * MINIMUM   AVERAGE   MAXIMUM      END STD. DEV. *  MINIMUM   AVERAGE   MAXIMUM      END STD. DEV. *
```

TIME MM.SS.TT	MINIMUM	AVERAGE	RCVPTR MAXIMUM	END STD. DEV.	MINIMUM	AVERAGE	RCVASMQA MAXIMUM	END STD. DEV.
51.10.00	6	6.43	7	6 4.997E-01	3	3.56	4	4 4.997E-01
51.25.00	6	6.00	6	6 0.000E+00	4	4.00	4	4 0.000E+00
51.40.00	6	6.00	6	6 0.000E+00	3	3.48	4	3 5.039E-01
51.55.00	6	6.00	6	6 0.000E+00	3	3.00	3	3 0.000E+00
52.10.00	6	6.00	6	6 0.000E+00	3	4.35	6	6 1.505E+00
52.25.00	6	6.00	6	6 0.000E+00	6	6.00	6	6 0.000E+00
52.40.00	3	4.80	6	3 1.482E+00	1	4.00	6	1 2.470E+00
52.55.00	3	3.00	3	3 0.000E+00	1	1.00	1	1 0.000E+00
53.10.00	3	3.70	5	5 9.620E-01	1	1.00	1	1 0.000E+00
53.25.00	5	5.00	5	5 0.000E+00	1	1.00	1	1 0.000E+00
53.40.00	5	5.00	5	5 0.000E+00	1	1.60	3	3 9.243E-01
53.55.00	5	5.00	5	5 0.000E+00	3	3.00	3	3 0.000E+00
54.10.00	3	4.50	5	3 8.733E-01	2	2.75	3	2 4.367E-01
54.25.00	3	3.00	3	3 0.000E+00	2	2.00	2	2 0.000E+00
54.40.00	3	3.91	8	8 1.951E+00	2	2.91	7	7 1.951E+00
54.55.00	8	8.00	8	8 0.000E+00	7	7.00	7	7 0.000E+00
55.10.00	5	7.60	8	5 1.028E+00	1	6.20	7	1 2.057E+00
55.25.00	5	5.00	5	5 0.000E+00	1	1.00	1	1 0.000E+00
55.40.00	5	5.00	5	5 0.000E+00	1	1.08	2	2 2.787E-01
55.55.00	5	5.00	5	5 0.000E+00	2	2.00	2	2 0.000E+00
56.10.00	4	4.98	5	4 1.291E-01	2	2.03	4	4 2.582E-01
56.25.00	4	4.00	4	4 0.000E+00	4	4.00	4	4 0.000E+00
56.40.00	4	4.00	4	4 0.000E+00	4	4.00	4	4 0.000E+00
56.55.00	4	8.83	9	9 9.051E-01	3	3.03	4	3 1.810E-01
57.10.00	9	9.00	9	9 0.000E+00	3	3.00	3	3 0.000E+00
57.25.00	5	5.40	9	5 1.210E+00	3	3.00	3	3 0.000E+00
57.40.00	5	5.00	5	5 0.000E+00	3	3.00	3	3 0.000E+00
57.55.00	5	6.70	7	7 7.202E-01	3	3.00	3	3 0.000E+00
58.10.00	7	7.00	7	7 0.000E+00	3	3.00	3	3 0.000E+00
58.25.00	5	5.43	7	5 8.309E-01	3	3.00	3	3 0.000E+00
58.40.00	5	5.00	5	5 0.000E+00	3	3.00	3	3 0.000E+00
58.55.00	3	3.53	5	3 8.919E-01	0	0.80	3	0 1.338E+00
59.10.00	3	3.00	3	3 0.000E+00	0	0.00	0	0 0.000E+00
59.25.00	3	5.73	7	7 1.876E+00	0	1.36	2	2 9.382E-01
59.40.00	7	7.00	7	7 0.000E+00	2	2.00	2	2 0.000E+00
59.55.00	5	5.76	7	5 9.806E-01	0	0.76	2	0 9.806E-01
00.10.00	5	5.00	5	5 0.000E+00	0	0.00	0	0 0.000E+00
00.25.00	5	5.56	6	6 4.997E-01	0	2.26	4	4 1.999E+00
00.40.00	6	6.00	6	6 0.000E+00	4	4.00	4	4 0.000E+00
00.55.00	5	5.50	6	5 5.042E-01	2	3.00	4	2 1.008E+00
01.10.00	5	5.00	5	5 0.000E+00	2	2.00	2	2 0.000E+00
01.25.00	5	6.35	8	8 1.505E+00	2	2.45	3	3 5.017E-01
01.40.00	8	8.00	8	8 0.000E+00	3	3.00	3	3 0.000E+00
01.55.00	8	8.76	10	10 9.806E-01	3	3.38	4	4 4.903E-01
02.10.00	10	10.00	10	10 0.000E+00	4	4.00	4	4 0.000E+00
02.25.00	10	11.00	13	13 1.426E+00	4	4.33	5	5 4.754E-01
02.40.00	13	13.00	13	13 0.000E+00	5	5.00	5	5 0.000E+00
02.55.00	13	13.28	14	14 4.544E-01	5	5.85	8	8 1.363E+00
03.10.00	14	14.00	14	14 0.000E+00	8	8.00	8	8 0.000E+00
03.25.00	10	13.13	14	10 1.662E+00	8	8.00	8	8 0.000E+00

Figure 5-1. ASM/RSM/SRM Trace Activity Report (Part 1 of 2)

```
                                       T R A C E   A C T I V I T Y
                                                                                                   PAGE     2
              OS/VS2                        SYSTEM ID 6668            DATE  2/15/77           INTERVAL 15.01.578
              RELEASE 03.70                 RPT VERSION  03           TIME 11.50.55           CYCLE 0.250 SECONDS

     SECONDS/SET=  15.00   CYCLES/SAMPLE=  1      NUMBER OF SAMPLES=  3606     SAMPLES/SET=    60    NUMBER OF SETS=  61

     TIME   *                    RCVPTR                        *                       RCVASMQA                    *
   MM.SS.TT *  MINIMUM   AVERAGE  MAXIMUM      END STD. DEV.  *  MINIMUM   AVERAGE   MAXIMUM      END STD. DEV.  *

   03.40.00 *      10     10.00      10        10 0.000E+00 *       8      8.00        8        8 0.000E+00 *
   03.55.00 *      10     12.33      24        24 5.262E+00 *       8     11.66       30       30 8.268E+00 *
   04.10.00 *      24     24.00      24        24 0.000E+00 *      30     30.00       30       30 0.000E+00 *
   04.25.00 *      12     22.80      24        12 3.630E+00 *       5     27.50       30        5 7.563E+00 *
   04.40.00 *      12     12.00      12        12 0.000E+00 *       5      5.00        5        5 0.000E+00 *
   04.55.00 *      12     12.05      13        13 2.198E-01 *       3      4.90        5        3 4.396E-01 *
   05.10.00 *      13     13.00      13        13 0.000E+00 *       3      3.00        3        3 0.000E+00 *
   05.25.00 *      13     13.00      13        13 0.000E+00 *       3      3.00        3        3 0.000E+00 *
   05.40.00 *       9      9.06      13         9 5.164E-01 *       3      4.96        5        5 2.582E-01 *
   05.55.00 *       9      9.00       9         9 0.000E+00 *       5      5.00        5        5 0.000E+00 *
   06.10.00 *       9      9.00       9         9 0.000E+00 *       5      5.00        5        5 0.000E+00 *

     MAXIMUM*      24     24.00      24        24            *      30     30.00       30       30            *
     MINIMUM*       3      3.00       3         3            *       0      0.00        0        0            *
     AVERAGE*    6.96      7.62     8.34      7.67           *     3.47      4.30      5.08     4.29          *
```

Figure 5-1. ASM/RSM/SRM Trace Activity Report (Part 2 of 2)

Standard Deviation Output

The trace activity report gives an account of standard deviation as an E-format (exponential) number. This number expresses the standard deviation for a set (sub-interval) as a number between 0.000 and 9.999, times a power of ten.

Example 1

```
1.123E +01 is the same as 1.123 X 10¹ or 11.23
```

Note: The signed number following the E represents a power of 10 and indicates that the decimal point should be shifted either to the left or right. In this example, the decimal point is moved one place to the right.

Example 2

```
2.903E -03 or .002903
```

Note: In this example -03 is the same as 10^{-3}. The decimal point is moved three places to the left.

Example 3

```
6.031E +00 or 6.031
```

Note: In this example +00 is the same as 10^0, which is equal to 1. Therefore, the decimal point should not be shifted at all.

Domain Table Tracing

Tracing the domain table fields causes the domain numbers to be appended to an abbreviation of the field name on the report:

Field Specified	Field Reported
DMDTINCU	DMINUxxx
DMDTOUTU	DMOUTxxx
DMDTMPLT	DMTARxxx
DMDTRUA	DMRUAxxx
DMDTCMPL	DMMPLxxx

Each field name specified is traced and reported for all domains that were active when RMF was initialized. For instance, if domains 0, 1, 46, and 245 are active when RMF starts, and DMDTINCU is the field requested, the following names are presented for the options requested:

DMINU000
DMINU001
DMINU046
DMINU245

Channel Activity Report

The channel activity report provides information about physical and logical channel utilization for all channels in the system that have been online during at least one observation cycle. The report consists of two sections: physical channel activity and logical channel activity.

The physical channel activity section is preceded by the total number of samples taken during the interval. The heading is PHYSICAL CHANNEL ACTIVITY. The report identifies each channel by giving the number of the processor to which it is attached as well as the number and type of the channel. For each channel, the report includes the activity rate, the percentage of time during the report interval that each channel was busy while the processor was in the wait state, and the average service time. Following the individual reports for each channel attached to a processor, a processor summary line appears; the heading is TOTAL/ANY/AVE.

Data is not formatted for channels that were offline at the end of the reporting interval or that had any VARY activity during the interval. Channels for which data is not printed have one of the following messages in the first data field:

NOW ONLINE   -   varied online during the interval and still online at the end of the interval.

NOW OFFLINE   -   varied offline during the interval and still offline at the end of the interval.

OFFLINE   -   offline for the entire interval.

Duration Report: When you request a duration report for channel activity, the identifier of each channel that had any VARY activity during the reporting period is followed by a single asterisk (*).

The logical channel activity section heading is LOGICAL CHANNEL ACTIVITY. For each logical channel, the report includes the request rate, queue length information, average number of enqueued requests, percentage of requests that were deferred and the reasons for the deferral, and the frequency of the busy changing conditions, broken down into physical busy and logical busy. When a logical channel has no activity during the interval, that channel is omitted from the report for that interval.

The information about channel activity, used in conjunction with the information on I/O device activity, can indicate performance bottlenecks associated with the physical and logical channels. For example, if a logical channel to a device showed excessive queuing, you could take steps to minimize the contention, such as defining additional paths to the device, reconfiguring physical channels, or altering the physical and logical channel environment by introducing a different job mix to produce better performance.

Figures 5-2 and 5-3 show sample printed reports for channel activity. Figure 5-2 shows the physical channel activity section, and Figure 5-3 shows the logical channel activity section. Each data field is described in the following text.

```
                                           CHANNEL ACTIVITY
                                                                                                              PAGE    1
              OS/VS2                        SYSTEM ID 6668              DATE  2/15/77           INTERVAL 15.01.578
              RELEASE 03.70                 RPT VERSION  03             TIME 11.50.55           CYCLE 0.250 SECONDS


TOTAL SAMPLES =        3,606
PHYSICAL CHANNEL ACTIVITY

        CHANNEL             CHANNEL         PERCENT        PERCENT        ACTIVITY        AVERAGE
        NUMBER              ACTIVITY        CHANNEL        CHAN BUSY      PER             SERVICE
CPU     AND TYPE            COUNT           BUSY           & CPU WAIT     SECOND          TIME


  0     0   BYTE MPX          57,392                                       63.657
        2   SELECTOR          15,782        30.17          1.22            17.504         0.017
        3   SELECTOR           9,052        19.08          1.03            10.040         0.018
        4   SELECTOR           9,326        11.92          0.44            10.344         0.011

        5   BLOCK MPX         33,886        44.26          1.28            37.585         0.011
        6   BLOCK MPX         17,733        24.71          0.72            19.668         0.012
        7   BLOCK MPX         20,085        21.60          0.72            22.277         0.009
        8   BLOCK MPX          1,444         2.41          0.17             1.601         0.014

        A   BLOCK MPX          8,293        11.67          0.39             9.198         0.012
        B   BLOCK MPX          8,840         3.24          0.03             9.805         0.003

TOTAL/ANY/AVE              181,833          82.89          2.55           201.683         0.012
```

Figure 5-2. Physical Channel Activity Section of a Channel Activity Report

CHANNEL ACTIVITY

PAGE   2

OS/VS2   SYSTEM ID 6668   DATE   2/15/77   INTERVAL 15.01.578
RELEASE 03.70   RPT VERSION   03   TIME 11.50.55   CYCLE 0.250 SECONDS

TOTAL SAMPLES =   3,606
LOGICAL CHANNEL ACTIVITY

LOG CHN	PHYS CHN	CPU ID	-% PHYS BUSY	CHAN-PARTIAL BUSY	REQ PER SECOND	- % QLENGTH DISTRIBUTION - 0	1	2	3	4+	AVG Q LNGTH	% REQ DEFER	-% REQ DEFER PHYS BUSY	DISTRI-LOG BUSY	-% FREQ PHYS BUSY	OF COND-LOG BUSY
0	0	0	0.00	0.00	63.778	96.4	3.2	0.4	0.0	0.0	0.04	0.82	100.00	0.00	8.68	0.00
1	2,3	0	12.34	24.57	27.247	21.9	50.3	18.8	8.1	0.9	1.16	27.22	99.54	0.46	30.06	0.72
2	3	0	19.08	0.00	0.361	99.7	0.3	0.0	0.0	0.0	0.00	7.67	100.00	0.00	0.58	0.00
3	4	0	11.92	0.00	10.346	57.8	29.2	7.8	4.3	1.0	0.61	59.57	99.60	0.40	24.65	0.47
4	5,A	0	5.38	45.17	29.228	8.5	12.5	30.5	29.9	18.7	2.44	87.33	6.86	93.14	25.98	97.45
5	5	0	44.26	0.00	8.420	95.6	3.6	0.5	0.1	0.1	0.05	40.82	99.68	0.32	39.10	0.19
6	6,9	0	0.00	24.71	19.724	78.8	19.3	1.6	0.2	0.1	0.23	35.15	82.47	17.53	65.89	12.23
7	7,9	0	0.00	21.60	22.347	81.3	12.3	4.2	1.6	0.5	0.28	31.78	34.31	65.69	31.31	33.53
8	8,9	0	0.00	2.41	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
9	8	0	2.41	0.00	1.601	94.2	3.9	1.8	0.2	0.0	0.08	34.35	94.15	5.85	10.15	0.53
10	A,B	0	0.53	13.87	3.720	100.0	0.0	0.0	0.0	0.0	0.00	1.07	100.00	0.00	0.94	0.00
11	A	0	11.67	0.00	5.764	93.1	4.1	1.8	0.8	0.2	0.11	31.83	5.86	94.14	2.44	14.23
12	B	0	3.24	0.00	9.528	80.2	19.8	0.0	0.0	0.0	0.20	73.46	0.03	99.97	0.06	7.21

Figure 5-3. Logical Channel Activity Section of a Channel Activity Report

Data Fields

PHYSICAL CHANNEL ACTIVITY

CPU

A number in the range of 0 to 15 that indicates the internal address of the processor to which the channel is attached.

CHANNEL
NUMBER
AND TYPE

The hexadecimal representation of the external channel address (0 through F) and either BYTE MPX, SELECTOR, or BLOCK MPX for byte multiplexor, selector, or block multiplexor, respectively. This field identifies the channel and associates it with a processor. If the type is unknown, the channel type field contains INVALID.

CHANNEL
ACTIVITY
COUNT

The number of requests serviced by the channel; that is, the number of successful Start I/Os issued to the channel during the reporting interval. "Sense" Start I/Os are not counted; however, redundant successful Start I/O Fast Release instructions (condition code zero) are counted. Six significant digits are printed (the range is 0 through 999,999 million). A scale factor of M (millions) can be printed after the number. The processor summary line contains the sum of the channel activity counts for all channels attached to the processor.

PERCENT
CHANNEL
BUSY

The percentage of time during the reporting interval when the channel was busy. The range of values is from 0 to 100 percent; the field does not appear when the channel type is BYTE MPX or INVALID. The percentage is derived by sampling techniques. At each sample, a TCH instruction is issued to each channel. When the condition code indicates burst mode, the channel is considered busy. At the end of the interval, the percentage is computed. The calculation used is

$$P = 100 \times (SB/N)$$

The percent channel busy equals 100 times the channel busy samples divided by the total number of samples taken.

The processor summary line contains the percentage of time during the interval when any channel attached to the processor was busy. The calculation used is

$$P = 100 \times (SB/N)$$

The percentage any channel was busy equals 100 times the number of channel busy observations divided by the total number of samples taken.

PERCENT
CHAN BUSY
& CPU WAIT

The percentage of time during the reporting interval when the channel was busy while the processor was waiting. The range of values is from 0 to 100 percent; the field does not appear when the channel type is BYTE MPX or INVALID. The percentage is derived by sampling techniques. At each sample, a TCH instruction is issued to each channel to determine the busy state, as described above for PERCENT CHANNEL BUSY. At the same time, the processor is tested for the WAIT condition. For each channel found to be busy while the processor is in the WAIT state, RMF increases its count of channel/CPU overlap observations.

The calculation used is

$$C = 100 \times (SC/N)$$

The percentage equals 100 times the number of observations of channel busy while processor is waiting, divided by the number of samples taken.

The processor summary line contains the percentage of time during the interval when any channel was found to be busy while the processor was in the WAIT state. The calculation used is

$$C = 100 \times (SC/N)$$

The percentage equals 100 times the number of observations of any channel busy while the processor is waiting, divided by the number of samples taken.

ACTIVITY
PER
SECOND

A calculated rate in seconds representing the number of successful Start I/O instructions issued to the channel per second. A consistently high activity rate can indicate that the channel is overcommitted.

The calculation used is

$$R = AC/T$$

The channel activity rate in seconds equals the channel activity count divided by the length of the reporting interval.

The processor summary line contains the total activity rate for all the channels attached to the processor. The calculation used is

$$TR = TAC/T$$

The total channel activity rate equals the total channel activity count divided by the length of the reporting interval.

AVERAGE
SERVICE
TIME

The average number of seconds the channel required to complete each I/O operation. This field does not appear when the channel type is BYTE MPX or INVALID.

The calculation used is

$$ST = (SB/N \times T)/AC$$

where SB is the number of channel busy observations, N is the number of samples, T is the length of the reporting interval, and AC is the channel activity count.

The processor summary line contains the average number of seconds required by all channels — excluding byte multiplexor channels — attached to the processor to complete an I/O operation. The calculation used is

$$AST = \sum_{i=1}^{n} \left(\frac{SB(i) * T}{N} \right) /TAC$$

where n is the number of channels, i is the channel, SB(i) is the number of busy observations, N is the number of samples, T is the length of the reporting interval, and TAC is the total channel activity count for all channels except the byte multiplexor.

LOGICAL CHANNEL ACTIVITY

LOG
CHN

A decimal number in the range of 0 through 255 that identifies each unique logical channel path.

PHYS
CHN

One or more hexadecimal numbers in the range of 0 through F that indicate the addresses of the physical channels that make up each logical channel path. The one or two physical channels that make up each logical channel are defined during system generation.

CPU
ID

A number, 0 or 1, that indicates the internal address of the processor to which the logical channel path is attached.

If you change the processor configuration during the interval, you must restart the channel activity report to obtain the latest processor status.

-% PHYS CHAN -

BUSY   PARTIAL
**   BUSY**

The percentage of time during the interval when the physical channels that make up the logical channel were busy. Two values are reported:

BUSY   Indicates the percentage of time when all of the physical channels were busy.

PARTIAL   Indicates the percentage of time when at least one
BUSY   physical channel but not all physical channels were busy.

The value is based on measurements performed at each cycle; thus the value reported is an approximate value based on sampling that shows the busy status of the physical channels and provides information about physical channel overlap within a logical channel.

The calculation used is

$$PB = 100 \times (B/N)$$

The percentage equals 100 times the number of busy or partial busy samples divided by the total number of samples.

REQ
PER
SECOND

The rate per second at which I/O requests are started or queued to the logical channel. When this rate is consistently very high, the logical channel might be overloaded.

At each cycle, RMF counts the number of requests started or queued to the logical channel. The rate per second is computed at the end of the reporting interval. The calculation used is

$$R = Q/T$$

The request rate equals the number of requests started or queued during the interval divided by the length of the interval.

- % QLENGTH DISTRIBUTION -
**   0 1 2 3 4+**

The percentage of time during the interval when the length of the I/O queue for the channel was zero, one, two, three, or four or more. The values are derived statistically from samples taken at each cycle. RMF uses five accumulators — one for each reported queue length. At each cycle, one accumulator is updated to reflect the size of the queue at that cycle.

At the end of the interval, the distribution is computed. The calculation used for each queue length is

$$QD = 100 \times (AC/N)$$

The percentage of time during the interval when queued requests were zero, one, two, three, or four or more equals 100 times the value in the accumulator for each queue length divided by the total number of samples taken.

AVG Q
LNGTH

The average number of requests that are chained on the logical channel queue and waiting for service. A consistently high number could be caused by a lack of balance between physical channels, control units, devices, and logical paths.

At each cycle, RMF keeps a count of the number of requests on the queue. At the end of the reporting interval, the average number of requests is computed. The calculation used is

$$A = QL/N$$

The average number of requests equals the total number of waiting requests divided by the number of samples taken.

% REQ
DEFER

The percentage of the total number of requests that were deferred. The delays could be caused by physical busy, such as physical channels, control unit, or device busy. Or, the delays could be caused by logical busy because of UCB busy indications, such as device not ready, or because another task is using the required path.

At each cycle, RMF accumulates the total number of requests and the total number of deferred requests. At the end of the reporting interval, the calculation used is

$$P = 100 \times D/T$$

The percentage of deferred requests equals 100 times the number of deferred requests divided by the total number of requests (includes both deferred and successful requests).

-% REQ DEFER DISTRI -
PHYS   LOG
BUSY   BUSY

The percentage of requests deferred because of either a physical busy condition or a logical busy condition. A physical busy condition occurs when a channel or control unit or device is tested and found to be busy. A logical busy condition occurs as a result of testing the UCBFLA for device busy conditions, a test that is performed before the system attempts to find a path to a device; logical busy is thus a software rather than a hardware busy condition.

At each cycle, RMF accumulates the total number of deferred requests, the total number of requests deferred for a logical busy condition, and the total number of requests deferred for a physical busy condition. At the end of the reporting interval, the percentage for each reason is computed. The calculation used for each value is

$$P = 100 \times R/T$$

The percentage equals 100 times the number of requests deferred for physical busy or logical busy divided by the total number of deferred requests. (The total number of deferred requests includes both requests deferred because of a physical busy condition and requests deferred because of a logical busy condition.)

-    % FREQ OF   COND -

PHYS   LOG

BUSY   BUSY

The percentage of times during the reporting interval when the busy condition changed because of either a physical busy change or a logical busy change. The values reported represent the deferred status during the measurement interval.

At each cycle, RMF tests the physical busy condition counter and the logical busy condition counter. If the test indicates a change, the corresponding frequency counter is updated. At the end of the reporting interval, RMF computes the percentages for frequency of condition changes for logical busy reasons and physical busy reasons. The calculation used is

$$P = 100 \times (FC/N)$$

The percentage of times the busy condition changed equals 100 times the value in the corresponding changing frequency counter divided by the total number of samples.

CPU Activity Report

The processor (CPU) activity report provides information about the utilization of the processor unit(s) and a section headed SYSTEM ADDRESS SPACE ANALYSIS that provides overall system address space utilization information.

The processor utilization section is preceded by two fields:

- SU's — which identifies the selectable units applied to the system
- CPU MODEL — which identifies the processor by model number

RMF reports the total processor wait time during an interval for each processor. This wait time is also expressed as a percentage of the duration of the interval. Entries are included for each processor that was online at the end of at least one interval. However, data is not formatted for processors that are offline during the the entire interval or had any VARY activity during the interval. Processors for which data is not printed have one of the following messages in the first data field:

NOW ONLINE	-	varied online during the interval and still online at the end of the interval
NOW OFFLINE	-	varied offline during the interval and still offline at the end of the interval
OFFLINE	-	offline for the entire interval

Duration Report: When you request a duration report for processor activity, the identifier of each processor that had any VARY activity during the reporting period is followed by a single asterisk (*).

The heading for the address space analysis section includes the field SAMPLES, which describes the total number of samples taken during the RMF reporting interval. The data analyzes the following types of address spaces: in storage and ready to execute, in storage, out of storage and ready to execute, out of storage and not ready to execute. Data on the number of address spaces used by batch users, by started tasks and mount tasks, and by TSO users is also presented. Examining the data can indicate when a backlog of address spaces are waiting to use the processor.

Figure 5-4 shows an example of a CPU activity interval report. Each data field is described in the following section.

```
                                               CPU  ACTIVITY
                                                                                                    PAGE    1
              OS/VS2                      SYSTEM ID 6668              DATE  2/15/77            INTERVAL 15.01.578
              RELEASE 03.70               RPT VERSION  03             TIME 11.50.55            CYCLE 0.250 SECONDS


     SU'S = 0,1,3,4,5,7,8,10,11,12,15,17,19,20

     CPU MODEL     0168

     CPU                       WAIT TIME               WAIT TIME              CPU SERIAL
     NUMBER                    HH.MM.SS.TTT            PERCENTAGE             NUMBER


     0                         00.00.15.009            1.66                   090044


     AVERAGE                                           1.66



     SYSTEM ADDRESS SPACE ANALYSIS            SAMPLES =  3,606
```

TYPE	NUMBER OF ASIDS MIN	MAX	AVG	0	1	2	DISTRIBUTION OF QUEUE LENGTHS (%) 3	4	5	6	7-8	9-10	11-12	13-14	14+
IN READY	0	16	4.4	2.4	6.4	13.9	18.9	18.1	13.3	8.4	10.2	4.5	2.5	0.8	0.0

				0	1-2	3-4	5-6	7-8	9-10	11-15	16-20	21-25	26-30	31-35	35+
IN	11	26	16.9	0.0	0.0	0.0	0.0	0.0	0.0	32.0	60.1	7.6	0.1	0.0	0.0
OUT READY	0	9	2.4	7.7	45.9	38.1	7.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OUT WAIT	33	49	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	99.8
BATCH	12	16	14.1	0.0	0.0	0.0	0.0	0.0	0.0	97.7	2.2	0.0	0.0	0.0	0.0
STC	7	12	9.6	0.0	0.0	0.0	0.0	10.2	71.4	18.3	0.0	0.0	0.0	0.0	0.0
TSO	38	41	38.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100

Figure 5-4. CPU Activity Report

Data Fields

CPU NUMBER

A number within the range of 0 to 15 that indicates the interval address of the processor for which values are being reported.

WAIT TIME
HH.MM.SS.TTT

The amount of time the operating system identifies when the processor resource was not required by any user currently in the system or by the operating system itself. The value is expressed in hours, minutes, seconds, and thousandths of seconds.

WAIT TIME
PERCENTAGE

The percentage of the reporting interval that the value in the WAIT TIME column represents. The calculation used is

$$P = 100 \times W/T$$

The wait time percentage equals 100 times the wait time divided by the length of the interval.

Note: A value greater than 100 in this field is probably caused by the operator having entered a SET CLOCK command to reset the TOD clock after the RMF session was started.

Following the data lines for each processor, the average wait time for all processors included is reported. This line is identified by the label AVERAGE in the CPU number column. The AVERAGE value is the average of all wait time percentages reported.

CPU SERIAL
NUMBER

The six-digit number that coincides with the physical serial number stamped on the processor and that, in conjunction with the model number, uniquely identifies the processor.

ADDRESS SPACE ANALYSIS SECTION

TYPE

The following types of address spaces are analyzed:

IN READY — address spaces that are in real storage and ready to execute.

IN — address spaces that are in real storage.

OUT READY — address spaces that are out of real storage and ready to execute.

OUT WAIT — address spaces that are out of real storage and not ready to execute.

BATCH — address spaces used for batch jobs.

STC — address spaces used for started tasks or mount tasks.

TSO — address spaces used for TSO users.

Note: The address space types IN, OUT READY, and OUT WAIT correspond to the SRM in, out, and wait queues.

NUMBER OF ASIDS

Number indicating the quantity of ASIDs of each type detected during the reporting interval, reported as:

MIN — the minimum number of address spaces for each type

MAX — the maximum number of address spaces for each type

AVG — the average number of address spaces for each type

DISTRIBUTION OF QUEUE LENGTHS (%)

The percentage of samples during the reporting interval when the number of address spaces of a particular type fell within a certain range of values. The range of values is indicated in the subheadings.

Enqueue Activity Report

The enqueue activity report provides information about resources that periodically build up queues of one or more requestors waiting to use the resource. Because the amount of time that a requestor must spend waiting for a resource can seriously affect system throughput, the information in this report can be very helpful in locating resources that consistently cause bottlenecks. Contention is reported for those resources to which access is controlled by jobs that issue ENQ and DEQ macro instructions.

Once you have defined a critical resource, such as a serially-reusable resource that can be requested on either an exclusive or shared basis, your installation can improve the situation in a variety of ways. You could change the hardware configuration to release device bottlenecks, change data set placement or reschedule jobs to improve throughput, or respecify the installation tuning parameter ERV (enqueue residence value) to give more processor time to the holder of the resource.

The report can be requested on two levels: summary and detail. The summary report includes all resources for which contention has occurred during the reporting interval, a description of the contention time for each resource, a queue length distribution and average queue length for each resource, information on the type of requests made (either exclusive or shared), and the total number of enqueue contention events that occurred. A resource for which contention is still occurring at the end of the interval will be indicated by an asterisk following the resource name.

The detail report includes additional information: (1) the total number of jobs that own the resource and the names of one or two jobs that own the resource and (2) the total number of jobs that are waiting for the resource and the names of one or two jobs that are waiting for the resource. The job names are selected during the period of maximum contention within the interval. RMF determines the point when the queue of waiting jobs was longest and reports the names of the first two jobs in the queue. This information can be of great help in balancing your workload to minimize resource contention.

The data gathering technique used to compile the information presented in the report differs from the techniques used for the other reports in that samples are taken only when an enqueue system event (ENQHOLD or ENQRLSE) occurs. This technique greatly increases the accuracy of the data, as measurements are taken only when an event — a contention event — occurs that affects the resource contention activity.

The report, in addition to the summary level and the detail 1 level that show lines of data for all resources for which contention occurs, can also be requested for a specific resource by major name, with or without a minor name. Various combinations of the reporting options can give you a complete picture of both critical resources and the jobs that are impacting system throughput by monopolizing a specific resource.

The data fields for the summary and detail reports are identical, with one exception: the job names causing maximum contention are printed only when the detail level is requested. Therefore, the fields are discussed only once, and the field that is provided only at the detail level is noted. The data fields are preceded by ENQUEUE SUMMARY ACTIVITY for a summary report or ENQUEUE DETAIL ACTIVITY for a detail report.

Figure 5-5 shows a sample enqueue summary report; Figure 5-6 shows a sample enqueue detail report. Each data field is described in the following section.

```
                                         ENQUEUE ACTIVITY

                                                                                          PAGE


          OS/VS2                       SYSTEM ID C168            DATE   6/15/76        INTERVAL 60.00.524
          RELEASE 03.70                RPT VERSION 03            TIME   09.50.40


ENQUEUE SUMMARY ACTIVITY

-NAME-                        ----- CONTENTION TIME -----    -%QLEN DISTRIBUTION-   AVG Q --REQUEST TYPE-   TOTAL
MAJOR                         MIN     MAX     TOT     AVG      1    2     3    4+    LNGTH -EXCL-   -SHARE-   EVENT
  MINOR                                                                                  MIN MAX MIN MAX


SYSDW
  SYS1.SVCLIB

                              0.012  0.421   2.805   0.701   75.0 25.0 00.0 00.0    1.25   0   2   0   2      4

  SYS1.PROCLIB(SYSTEMS)

                              0.133  4.001   6.302   2.102   98.2 00.3 00.2 00.0    1.08   1   2   0   3      3

SYSIEFSD
  Q7

                              0.201  0.102   2.803   0.701   40.2 20.3 20.7 10.0    1.82   1   1   0   5      3
```

Figure 5-5. Enqueue Activity Summary Report

```
                                        ENQUEUE ACTIVITY
                                                                          PAGE

            OS/VS2                  SYSTEM ID C168           DATE   6/15/76       INTERVAL   60.00.524
            RELEASE 03.70           RPT VERSION 03           TIME  09.50.40


ENQUEUE DETAIL ACTIVITY


-NAME-   ----- CONTENTION TIME -----   -- JOBS AT MAXIMUM CONTENTION -   -%QLEN DISTRIBUTION- AVG Q -REQUEST TYPE - TOTAL
MAJOR    MIN    MAX    TOT    AVG       ----- OWN ----- ----- WAIT -----    1    2    3    4+  LNGTH - EXCL- -SHAR - EVENT
  MINOR                                 TOT     NAME    TOT    NAME                                  MIN MAX MIN MAX


SYSDW
  SYS1.SVCLIB

         0.012  0.421  2.805  0.701     2   CKPERFOM(S)  2   CREATDS (E)  75.0 25.0 00.0 00.0   1.25   0   2   0   2    4
                                            SRATCH  (S)      DELETDS (S)

  SYS1.PROCLIB(SYSTEMS)

         0.133  4.001  6.302* 2.102     1   SORTSMF (E)  1   CATALOG (S)  98.2 00.3 00.2 00.0   1.08   1   2   0   3    3
SYSIEFSD
  Q7

         0.201  0.102  2.803  0.701     1   *MASTER*(E)  3   SCRATCH (E)  40.2 20.3 20.7 10.0   1.82   1   1   0   5    3
                                                             LISTIO  (E)
```

Figure 5-6. Enqueue Activity Detail Report

Data Fields

-NAME
MAJOR
  MINOR

The name of a resource that has one or more requestors waiting for it. The major name is one to eight characters in length; the minor name can be from 1 to 255 characters, but only 44 characters will be printed. When the name exceeds 44 characters, it will be truncated in the report, and an asterisk (*) will indicate that it has been truncated. A resource with a scope of 'SYSTEMS' will be followed by (SYSTEMS); a resource with a scope of 'SYSTEM' will have no indication; and a resource with a scope of 'STEP' will not be included in the report.

-- CONTENTION TIME -
MIN MAX TOT AVG

The contention time observed for the resource during the RMF reporting interval. The maximum, minimum, total, and average contention times are reported. The time reported can be 0.000; this indicates a contention time of less than one-thousandth of a second and is most likely to appear as a minimum value.

The contention time is calculated by subtracting the time the delay began (when the first ENQHOLD was issued) from the time the contention was ended (when the last ENQRLSE was issued) by the freeing of the resource. An asterisk(*) following the total contention time indicates that the contention extended beyond the end of the measurement interval.

The calculation used to determine the average contention time is

$$A = T/E$$

The average contention time in seconds equals the total contention time for the resource during the interval divided by the total number of contention events that occurred during the interval.

-- JOBS AT MAXIMUM CONTENTION -
----- OWN ----- ----- WAIT ---
TOT   NAME   TOT NAME

Reported only when the enqueue activity detail report is requested, this field describes the total number of resource owners and the total number of jobs waiting to use the resource. In addition, the names of one or two owners and one or two names of waiting jobs are reported. RMF selects the names during the period of maximum contention for each resource. Within this period of maximum contention, RMF determines the point when the queue of waiting jobs was longest and reports the names of the first two jobs on the queue. Each name is followed by an (E) if that job requested exclusive use of the resource or an (S) if that job requested shared use of the resource. This information can help you to determine which jobs were contributing most heavily to the contention for the resource.

-%QLEN

DISTRIBUTION

1 2 3 4+

The percentage of contention events during the interval when the number of requestors queued to the resource was one, two, three, or four or more. The samples are taken during the period when contention was occurring; at each such sample, an accumulator for the observed length is updated. At the end of the measurement interval, the percentage for each queue length is computed.

The calculation used for each queue length is

$$P = 100 \times A/E$$

The percentage for each queue length equals 100 times the contents of the accumulator for that queue length divided by the total number of enqueue contention events occurring during the interval.

AVG Q

LNGTH

The average length of the queue of requestors waiting for the resource over the duration of the reporting interval. A consistently high number here indicates that the use of the resource is seriously out of balance.

The calculation used is

$$A = R/E$$

The average number of waiting requestors is equal to the total number of requestors waiting during the interval divided by the total number of contention events occurring during the interval.

-REQUEST TYPE

-EXCL- -SHARE

MIN MAX MIN MAX

The type of the requests — either exclusive or shared — waiting for use of the resource. The requestor would require exclusive use of the resource if the job expects to modify the resource or if the resource is by nature only serially reusable. Other requests would be for shared use of the resource. Both the minimum number and maximum number of waiting shared requests and waiting exclusive requests are reported.

TOTAL

EVENT

The total number of resource contention events occurring during the measurement interval.

Messages

During the measurement of enqueue activity, RMF can encounter situations when no reporting can be done. When such a situation occurs, RMF replaces the report with a message describing the reason no report could be formatted. The possible messages are:

NO CONTENTION OCCURRED

During the interval, no contention activity occurred for the resource or resources being measured. Enqueue activity measurement and reporting continue as specified. This message would appear most frequently when you are requesting the enqueue activity report for a specific resource.

INTERNAL TABLE FULL-TRY SPEC MAJOR/MINOR NAME

During the RMF interval, a period of such high contention activity occurred that the internal working table was filled. As a result, no further enqueue reporting could be done for the interval. The interval report will contain the data gathered before the internal table was filled, followed by the message. Enqueue activity measurement and reporting resume at the start of the next interval. When the message occurs, you could reduce the length of the RMF interval, or, if you want to ensure that the contention activity for a specific resource is reported, you can request enqueue activity reporting for the specific critical resource.

TERMINATE DUE TO DATA EVENT ERROR – TRY RERUN

During the interval, the enqueue measurement routines encountered invalid data while processing a contention event. All enqueue measurement activity is terminated for the session; that is, the recovery from the error includes modifying the enqueue activity option to NOENQ. Because the error encountered might not be a permanent error, you can modify the session options to respecify enqueue measurement and reporting. If the message occurs again and there are no other indicators of a system problem, report the message to the RMF license holder at your installation.

BAD CPU CLOCK OCCURRED – FIX CPU CLOCK AND RERUN

During an interval, the enqueue activity measurement routines detected an error in the CPU clock function. All enqueue measurement activity for the season is terminated; that is, the recovery from the error includes modifying the enqueue activity option to NOENQ. Note that this message is probably one of many indicators that there is a problem with the CPU clock. After the clock has been fixed, re-IPL the system and run the session again, specifying the enqueue activity measurements that you require.

I/O Device Activity Report

The I/O device activity report provides information about I/O device utilization for all devices in each class you select. In addition to device activity measurements, the report includes detailed information about contention for the device, including the reasons why requests for the device are being deferred. This detailed information can help you to identify bottlenecks caused by a particular device and to pinpoint the reason for the difficulty so that it can be corrected to improve system performance. By examining the report, you can determine whether the delay is caused by contention for the device or contention for any hardware unit in the path to the device.

The standard report heading appears on every page, along with the field:

```
CYCLE=n.nnn SECONDS
```

where *n.nnn* indicates the length of the cycle at which the channel/control unit/device contention information was sampled.

Each I/O device activity report begins on a new page, and the class of devices included in the report is indicated by one of the following titles:

```
DIRECT ACCESS DEVICE ACTIVITY
UNIT RECORD DEVICE ACTIVITY
GRAPHICS DEVICE ACTIVITY
COMMUNICATION EQUIPMENT ACTIVITY
MAGNETIC TAPE DEVICE ACTIVITY
CHARACTER READER DEVICE ACTIVITY
```

Device entries are included for each device that has been online at least once since Monitor I session initialization. However, data is not reported for devices that were offline at the end of the reporting interval or had any VARY activity or dynamic device reconfiguration during the interval. Devices that have these status values are identified under DEV ADR by one of the following messages in the first data field:

NOW ONLINE   -   varied online during this interval and still online at the
                      end of the interval.
NOW OFFLINE   -   varied offline during this interval and still offline at the
                      end of the interval.
OFFLINE   -   offline for the entire interval.

Note that, under communication equipment activity, channel-to-channel unit statistics are not provided.

Figures 5-7, 5-8, and 5-9 show sample reports for direct access device activity, magnetic tape activity, and communication equipment activity, respectively. The information presented for graphics device activity, unit record device activity, and character reader device activity is the same as that shown for communication equipment activity in Figure 5-9.

Each data field in the I/O device activity report is described in the following section.

Duration Report: When you request a duration report for I/O device activity, the identifier of each I/O device that had any VARY activity during the duration interval is followed by a single asterisk (*). The data recorded for such a device is partial; that is, no data was collected during one or more of the measurement intervals included in the duration report because the device was varied during a measurement interval.

The calculations the post processor performs to generate a duration report make no adjustments for RMF measurement intervals when no data was collected for a device. Thus, any VARY activity can cause the data for the device to appear to be inconsistent. For example, the percentages reported for the QLENGTH DISTRIBUTION field do not equal 100% when data for the device is partial.

At the beginning of a Monitor I session, all devices that are online are known to RMF; that is, an entry in the type 74 SMF record is created for each device. In contrast, any device that is offline at the beginning of the session is unknown to RMF, and no entry in the SMF record is built. When an unknown device is varied online, it becomes known to RMF, and an entry in the SMF record is then built for the device.

When a duration report combines data collected during two or more separate Monitor I sessions, the status of a device can change (for example, from offline to online or from unknown to online). Thus, the following conditions can occur:

- A device was known to RMF but offline during the first Monitor I session and online during subsequent Monitor I sessions but was not varied during a measurement interval included in the duration report. In this case, the data is partial and the device identifier is not followed by an asterisk.

- A device was offline for one or more measurement intervals and unknown to RMF during all other measurement intervals included in the duration report. In this case, the device identifier is followed by an asterisk, OFFLINE appears in the first data field, and no data is formatted for the device.

- A device was unknown to RMF during a Monitor I session and online for subsequent Monitor I sessions but was not varied during a measurement interval included in the duration report. In this case, the data is partial and the device identifier is followed by an asterisk.

```
                                      D I R E C T   A C C E S S   D E V I C E   A C T I V I T Y
                                                                                                              PAGE    1
              OS/VS2                      SYSTEM ID 6668            DATE  2/15/77            INTERVAL 15.01.578
              RELEASE 03.70               RPT VERSION  03           TIME 11.50.55           CYCLE 0.250 SECONDS


TOTAL SAMPLES =  3,606

                                                                     --%REQ DEFER--
                   DEVICE  DEVICE                                    DISTRIBUTION   %     %     %     %    AVG          %
DEV VOLUME LOG ACTIVITY ACTIVITY --% QLNGTH DISTRIBUTION-- AVG Q     DEV   PATH    DEV   CU   RESV  DEV   DS    %      MT
ADR SERIAL CHN COUNT    RATE       0    1    2    3    4+  LNGTH     BUSY  BUSY    BUSY DELAY DELAY RESV  OPEN ALLOC  PEND
```

DEV ADR	VOLUME SERIAL	LOG CHN	DEVICE ACTIVITY COUNT	DEVICE ACTIVITY RATE	--% 0	QLNGTH DISTRIBUTION-- 1	2	3	4+	AVG Q LNGTH	DEV BUSY	PATH BUSY	% DEV BUSY	% CU DELAY	% RESV DELAY	% DEV RESV	AVG DS OPEN	% ALLOC	% MT PEND
5A0	SPOOL1	4	1,642	1.821	99.2	0.8	0.0	0.0	0.0	0.01	23.33	76.67	5.55	0.00	0.0	8.3	3.0	100.0	0.0
5A1	SDA604	4	22,471	24.924	8.5	12.5	31.0	30.0	18.1	2.42	99.62	0.38	95.98	0.00	0.0	6.8	19.8	100.0	0.0
5A2	IMSTV1	4	995	1.104	99.7	0.3	0.0	0.0	0.0	0.00	8.33	91.67	3.47	0.00	0.0	10.7	3.0	100.0	0.0
5A3	TST002	4	1,182	1.311	99.2	0.7	0.0	0.0	0.0	0.01	20.69	79.31	3.08	0.03	0.0	7.9	42.6	100.0	0.0
5A4	SRT602	4	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	2.0	100.0	0.0
5A5	FEHQ02	4	1	0.001	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.03	0.00	0.0	0.0	0.8	100.0	0.0
5A6	FSSWK4	4	8	0.009	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.03	0.00	0.0	0.0	0.0	100.0	0.0
5A7	DLIB01	4	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5C0	MVSX01	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5C1	PIMS33	5	61	0.068	99.6	0.4	0.0	0.0	0.0	0.00	0.00	100.00	0.22	0.36	0.4	0.3	0.3	100.0	0.0
5C2	PIMS54	5	231	0.256	99.8	0.2	0.0	0.0	0.0	0.00	0.00	100.00	2.33	0.17	0.0	0.0	1.0	100.0	0.0
5C3	SDA701	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5C4	DLIBV1	5	219	0.243	99.8	0.2	0.0	0.0	0.0	0.00	0.00	100.00	1.03	0.08	0.0	0.0	0.1	100.0	0.0
5C5	SRT701	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5CA	RTS001	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5CB	MVSA02	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5CC	SRT703	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5CD	PTSP02	5	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
5F0	DRUM02	5	0	7.848	96.6	2.7	0.5	0.1	0.1	0.04	0.00	100.00	26.48	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,010	1.120	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	6.74	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,008	1.118	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	6.85	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,008	1.118	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	7.04	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,016	1.127	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	6.60	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,007	1.117	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	6.49	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,014	1.125	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	6.43	0.00	0.0	0.0	0.0	100.0	0.0
5F0	DRUM02	5	1,013	1.124	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	7.43	0.00	0.0	0.0	0.0	100.0	0.0
650	SHR304	6	696	0.772	99.9	0.1	0.0	0.0	0.0	0.00	40.00	60.00	2.00	0.00	0.0	0.0	2.8	100.0	0.0
651	MVSC06	6	4,266	4.732	97.7	2.3	0.1	0.0	0.0	0.02	50.00	50.00	9.82	0.11	0.0	8.5	6.0	100.0	0.0
652	SPOOL2	6	1,910	2.119	99.1	0.9	0.0	0.0	0.0	0.01	0.00	100.00	10.76	0.08	0.0	0.0	0.0	100.0	0.0
653	IMS011	6	1,275	1.414	99.7	0.3	0.0	0.0	0.0	0.00	30.00	70.00	4.13	0.00	0.0	0.0	13.0	100.0	0.0
654	FEHQ01	6	48	0.053	100.0	0.0	0.0	0.0	0.0	0.00	0.00	100.00	0.22	0.00	0.0	0.2	2.0	100.0	0.0
655	GUY001	6	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
656	SRT604	6	110	0.122	99.9	0.1	0.0	0.0	0.0	0.00	0.00	100.00	0.36	0.03	0.0	0.0	0.0	100.0	0.0

Figure 5-7. Direct Access Device Activity Report

```
                                  M A G N E T I C   T A P E   D E V I C E   A C T I V I T Y
                                                                                                                      PAGE    1
                OS/VS2                        SYSTEM ID 6668                DATE  2/15/77                INTERVAL 15.01.578
                RELEASE 03.70                 RPT VERSION  03               TIME 11.50.55               CYCLE 0.250 SECONDS


TOTAL SAMPLES =  3,606

                                                                            --%REQ DEFER--
                  DEVICE   DEVICE                                           DISTRIBUTION    %     %      %      AVG          %     %
DEV VOLUME LOG  ACTIVITY  ACTIVITY --% QLNGTH DISTRIBUTION-- AVG Q            DEV    PATH   DEV   CU     DEV    DS    %      MT    NOT
ADR SERIAL CHN  COUNT     RATE      0    1     2    3    4+  LNGTH           BUSY    BUSY  BUSY  DELAY  RESV   OPEN ALLOC  PEND  READY
```

DEV ADR	VOLUME SERIAL	LOG CHN	DEVICE ACTIVITY COUNT	DEVICE ACTIVITY RATE	%QLNGTH 0	1	DISTRIBUTION 2	3	4+	AVG Q LNGTH	%REQ DEFER DEV BUSY	PATH BUSY	% DEV BUSY	% CU DELAY	% DEV RESV	AVG DS OPEN	% ALLOC	% MT PEND	% NOT READY
2C0		1	420	0.466	64.9	35.1	0.0	0.0	0.0	0.35	1.90	98.10	1.30	0.00	0.0	0.7	68.4	36.0	67.6
2C1	003751	1	2,646	2.935	79.5	20.5	0.0	0.0	0.0	0.20	15.16	84.84	9.29	0.00	0.0	0.7	79.2	16.8	37.5
2C2	021518	1	147	0.163	99.8	0.2	0.0	0.0	0.0	0.00	0.00	100.00	0.19	0.00	0.0	1.0	100.0	0.0	0.0
2C3	019302	1	286	0.317	99.8	0.2	0.0	0 0	0.0	0.00	0.00	100.00	0.72	0.00	0.0	1.0	100.0	0.0	0.0
2C4	021764	1	147	0.163	99.9	0.1	0.0	0.0	0.0	0.00	0.00	100.00	0.22	0.00	0.0	1.0	100.0	0.0	0.0
2C5	030607	1	5,608	6.220	84.7	15.3	0.0	0.0	0.0	0.15	0.18	99.82	19.16	0.00	0.0	1.0	100.0	11.0	11.0
2C6	022824	1	6,008	6.664	84.1	15.9	0.0	0.0	0.0	0.16	0.00	100.00	17.30	0.00	0.0	1.0	100.0	12.6	12.6
2C7	015834	1	5,245	5.818	73.2	26.8	0.0	0.0	0.0	0.27	47.20	52.80	35.94	0.00	0.0	1.0	100.0	11.4	11.4
2C8	'R	1	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	100.0	0.0	0.0
2C9	009055	1	239	0.265	99.9	0.1	0.0	0.0	0.0	0.00	0.00	100.00	0.69	0.00	0.0	1.0	100.0	0.0	0.0
2CB	009751	1	2,699	2.994	98.7	1.3	0.0	0.0	0.0	0.01	0.00	100.00	9.07	0.00	0.0	1.0	100.0	0.0	0.0
2CC	022704	1	728	0.807	99.6	0.4	0.0	0.0	0.0	0.00	0.00	100.00	2.25	0.00	0.0	1.0	100.0	0.0	0.0
2CD	019795	1	335	0.372	99.9	0.1	0.0	0.0	0.0	0.00	0.00	100.00	1.03	0.00	0.0	1.0	100.0	0.0	0.0
440	015600	3	2,448	2.715	89.3	10.7	0.0	0.0	0.0	0.11	0.00	100.00	7.96	0.00	0.0	0.5	53.2	2.4	49.3
441		3	2,232	2.476	76.3	23.7	0.0	0.0	0.0	0.24	8.54	91.46	10.59	0.00	0.0	0.5	53.2	13.7	60.5
442	015531	3	783	0.868	95.8	4.2	0.0	0.0	0.0	0.04	0.00	100.00	2.05	0.00	0.0	0.5	53.2	2.9	49.7
443	015419	3	535	0.593	97.2	2.8	0.0	0.0	0.0	0.03	0.00	100.00	1.16	0.03	0.0	0.5	53.2	3.1	49.9
444		3	26	0.029	82.4	17.6	0.0	0.0	0.0	0.18	0.31	99.69	0.22	0.00	0.0	0.2	21.0	19.7	55.4
445		3	3,080	3.416	98.1	1.9	0.0	0.0	0.0	0.02	70.00	30.00	3.22	0.00	0.0	0.8	82.0	0.0	18.0
TOTAL			33,612																

Figure 5-8. Magnetic Tape Device Activity Report

COMMUNICATION EQUIPMENT ACTIVITY

OS/VS2   SYSTEM ID 6668   DATE 2/15/77   INTERVAL 15.01.578
RELEASE 03.70   RPT VERSION 03   TIME 11.50.55   CYCLE 0.250 SECONDS

TOTAL SAMPLES = 3,606

DEV ADR	VOLUME SERIAL	LOG CHN	DEVICE ACTIVITY COUNT	DEVICE ACTIVITY RATE	--% QLNGTH 0	1	DISTRIBUTION-- 2	3	4+	AVG Q LNGTH	--%REQ DEFER-- DISTRIBUTION DEV BUSY	PATH BUSY	% DEV BUSY	% CU DELAY	% DEV RESV	AVG DS OPEN	% ALLOC	% MT PEND	% NOT READY
010		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
011		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
012		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
013		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
014		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
015		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
016		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
017		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
018		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
019		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01A		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01B		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01C		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01D		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01E		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
01F		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
020		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
021		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
022		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
023		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
024		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
025		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
026		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
027		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
028		0	739	0.820	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	57.82	0.00	0.0	100.0		0.0
029		0	960	1.065	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	66.25	0.00	0.0	100.0		0.0
02A		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
02B		0	10,775	11.951	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	89.68	0.00	0.0	100.0		0.0
02C		0	11,760	13.044	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	91.21	0.00	0.0	100.0		0.0
02D		0	12,770	14.164	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	92.85	0.00	0.0	100.0		0.0
07E		0	8,136	9.024	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	9.96	0.00	0.0	100.0		0.0
080		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0
081		0	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0		0.0

Figure 5-9. Communication Equipment Activity Report

Data Fields

DEV
ADR

The three-character unique hexadecimal device address that identifies a physical I/O device.

VOLUME
SERIAL

The six-character volume serial number (for direct access and magnetic tape reports) of the volume mounted on the device at the end of the reporting interval.

LOG
CHN

A hexadecimal number in the range of 0 through F, indicating the logical channel associated with the device.

DEVICE
ACTIVITY
COUNT

The number of requests serviced by the device; that is, the number of successful Start I/Os issued to the device during the report interval. "Sense" Start I/Os are not counted; however, redundant successful Start I/O Fast Release instructions (condition code zero) are counted. Six significant digits are printed and a scale factor of millions (M) can be printed after the value. The range is from 0 to 999,999 million. The device summary includes the device activity counts summed across all devices in the device class.

DEVICE
ACTIVITY
RATE

The rate per second at which successful Start I/O instructions were issued to the device. This field, in the line of data for the base exposure of a multiple exposure device, reflects the rate for the entire device. Note that the data line for the base exposure is followed by data lines for each exposure.

The value is calculated by dividing the total number of successful Start I/Os for the interval by the number of seconds in the interval.

--%QLENGTH DISTRIBUTION
0 1 2 3 4+

The percentage of time during the interval when the number of requests queued to the device was zero, one, two, three, or four or more. The values are calculated from samples taken during each RMF cycle. RMF uses five accumulators — one for each queue length. At each cycle, one accumulator is updated to reflect the size of the queue at that cycle.

At the end of the interval, the percentage of time during the interval when the queue length was zero, one, two, three, or four or more is calculated for each length. The calculation for each of the five lengths is

$$QD = 100 \times AC/N$$

The percentage equals 100 times the value of the accumulator divided by the total number of samples.

**AVG Q
LNGTH**

The average number of requests that are enqueued and waiting to be serviced on this device. This is a measure of hardware contention at any of the hardware units (channel, control unit, device) in the path to the device. The calculation used is

$$A = QL/N$$

The average queue length equals the requests enqueued against the device at each cycle divided by the number of samples taken. The range of values is from 0 through 99.99.

**--% REQ DEFER
DISTRIBUTION
DEV   PATH
BUSY BUSY**

The percentage of deferred requests during the interval that were delayed because the device itself was busy (DEV BUSY) or because the logical path to the device was busy (PATH BUSY).
At each cycle, RMF tests the device busy bit and the control unit busy bit and checks to see if any requests are waiting for the device. When requests are being deferred and either the device is not busy or the device and the control unit are both busy, RMF assumes that the requests are being deferred because the logical path to the device is busy; either the control unit or another processor is causing the delay. A count is kept of all requests that are deferred because the device is busy.

At the end of the interval, the percentages are computed for the number of deferred requests waiting because the device is busy and the number of deferred requests waiting because the path is busy. The same calculation is used for both values. The calculation is

$$P = 100 \times C/N$$

The percentage equals 100 times the count of requests waiting for device busy or path busy divided by the total number of deferred requests.

**%
DEV
BUSY**

The percentage of time during the interval when the device was found to be busy while the control unit was not busy, indicating a device end pending. For a multiple exposure device, such as the IBM 2305 Fixed Head Storage Device, a busy count is kept for each exposure as well as for the entire device. The percentage for the entire device is reported in the data line for the base exposure, while a separate value is reported for each individual exposure except the base exposure. Because the busy time for the base exposure is usually zero or a minimal value, it is kept in the SMF record but is not included in the printed report.

To compute the device-busy percentage, RMF checks at each cycle to see if the device is busy while the control unit is not and keeps a count of all such samples. At the end of the interval, the percentage is computed. The calculation used is

```
P = 100 x C/N
```

The device busy percentage equals 100 times the number of samples when the device is busy while the control unit is not, divided by the total number of samples. For a multiple exposure device, the entire device-busy percentage equals 100 times the number of samples when at least one exposure of the device was busy while the control unit was not, divided by the total number of samples.

% CU DELAY

The percentage of time during the interval when the control unit was busy and could not transfer data to the device. Because the value reflects only the time when the control unit was delaying requests and because some undetermined portion of control unit busy time is contained in channel busy time, the value does not reflect the total time the control unit was busy.

At each cycle, RMF determines if the control unit is busy and keeps a count of such samples. At the end of the interval, the percentage of time during the interval when the control unit was busy is determined; the calculation used is

```
P = 100 x C/N
```

The percentage equals 100 times the count of control unit busy samples divided by the total number of samples.

% RESV DELAY

The percentage of time during the interval when a shared direct access device was reserved by another processor. This field is reported for direct access devices only. A shared device is assumed to be reserved by another processor when the device busy bit and control unit busy bit are on concurrently, a condition that can also occur with string switching.

At each cycle, RMF keeps a count of the number of times the shared device was reserved by another processor. At the end of the interval, the percentage of time when the device was reserved by another processor is computed. The calculation used is

```
P = 100 x C/N
```

The percentage equals 100 times the count of reserved samples divided by the total number of samples.

% DEV RESV

The percentage of time during the report interval when a shared device was reserved by the processor on which RMF was started.
At each RMF cycle, RMF checks to see if a device is reserved, and a counter is kept of all such samples. At the end of the interval, the percentage is computed. The calculation used is

$$P = 100 \times C/N$$

The percentage of time during the interval when the device is reserved equals 100 times the number of device-reserved samples divided by the total number of samples.

AVG
DS
OPEN

The average number of DCBs concurrently open on a volume. Certain system data sets that do not go through the normal OPEN procedure are not included in the value reported. This field is reported only for direct access storage devices and magnetic tape devices.

At each RMF cycle, a counter is increased to reflect the number of data sets concurrently open. At the end of the interval, the average is calculated by dividing the total number of open data sets for all samples by the total number of samples.

%
ALLOC

The percentage of time during the reporting interval when the device was allocated to one or more data sets. Permanently mounted direct access devices show a 100% allocation, regardless of whether or not a data set was actually allocated.

To determine the value, RMF keeps a count at each cycle of whether or not the device was allocated or permanently resident. At the end of the interval, the percentage is computed. The calculation used is

$$P = 100 \times C/N$$

The percentage equals 100 times the number of allocated samples divided by the total number of samples.

%
MT
PEND

The percentage of time during the interval when a mount was pending for the device. This field is reported only for direct access devices and magnetic tape devices.

At each cycle, RMF updates a counter when it detects a mount pending condition. At the end of the interval, the percentage is computed. The calculation used is

$$P = 100 \times C/N$$

The mount pending percentage equals 100 times the value in the counter, divided by the total number of samples.

%
NOT
READY

The percentage of time during the reporting interval when the device was not ready for use, as, for example, when a tape has just been mounted but is not yet ready to be used by the system. This field is not reported for direct access devices; however, the value is recorded in the corresponding field of the SMF record, should your installation need the information.

At each RMF cycle, a counter is updated when the status of the device indicates that it is not ready. At the end of the interval, the percentage is computed. The calculation used is

```
P = 100 x C/N
```

The not ready percentage equals 100 times the count of not ready samples, divided by the total number of samples.

Page/Swap Data Set Activity Report

The page/swap data set activity report provides information about page/swap data set use for each individual data set. The slot utilization is sampled and reported as minimum, maximum, and average values for the interval. Other information in the report gives the time when ASM considered the data set to be busy and the average number of concurrent requests for each use.

The information in the page data set section of the report can be used, for example, to determine whether the optimum size has been allocated for each data set. If the maximum number of slots used is consistently below the number of slots allocated, you might consider reducing the size of the data set to conserve space on the device. Use caution when reducing the size of the PLPA and common data sets, because overflow cannot occur from these data sets to the local data sets.

Use the swap data set section of the report to evaluate your allocation of swap sets. When you analyze the information on swap data sets, note that the swap set is the unit of measurement in the report. A swap set consists of twelve contiguous groups of 4096-byte slots. If the minimum and maximum swap sets consistently equal the allocated swap sets, then you might require more swap space.

The page/swap data set activity report has two major headings:

```
PAGE DATA SET USAGE
SWAP DATA SET USAGE
```

See Figures 5-10 and 5-11 for examples of the page/swap data set report.

Because most of the fields for these two sections are identical, they are defined together in the following section. Any differences are noted.

Duration Report: Certain fields in the page/swap data set activity duration report (DEV ADR, VOLUME SERIAL, DEVICE TYPE, SLOTS ALLOC, and SWAP SETS ALLOC) might change during a lengthy duration interval. When such a change occurs, it is not reflected in the duration report; these fields are set according to the contents of the first type 75 SMF record encountered.

```
                              P A G E / S W A P   D A T A   S E T   A C T I V I T Y                          PAGE    1
          OS/VS2                              SYSTEM ID 6668              DATE  2/15/77              INTERVAL 15.01.578
          RELEASE 03.70                       RPT VERSION  03             TIME 11.50.55             CYCLE 0.250 SECONDS


NUMBER OF SAMPLES =   3,606                              PAGE DATA SET USAGE
                                                         ------------------------


PAGE                                                                 %     AVG
SPACE   VOLUME  DEV  DEVICE  SLOTS  ---- SLOTS USED ---  BAD          IN    NUM
TYPE    SERIAL  ADR  TYPE    ALLOC   MIN    MAX    AVG   SLOTS        USE   REQ   DATA SET NAME

PLPA    MVSC06  651  3330-1   2030  1106   1106   1106      0        2.88   1.0   SYS1.MVSC06.PLPAPAGE

COMMON  DRUM02  5F0  2305-2    286   160    162    161      0        0.36   3.8   DRUMCOMM

LOCAL   DRUM02  5F0  2305-2   2184  2019   2184   2165      0       29.06   3.9   DRUMPAGE

LOCAL   SPOOL2  652  3330-1  23200   965   1444   1168      0       11.67   1.0   SP2PAGE

LOCAL   MVSC07  7FD  3330-1  14500   799   1279   1032      0       15.03   1.0   VSPAGE2
```

Figure 5-10. Page Data Set Section of Page/Swap Data Set Activity Report

```
                                    P A G E  /  S W A P    D A T A S E T    A C T I V I T Y                            PAGE    2
            OS/VS2                            SYSTEM ID 6668              DATE   2/15/77        INTERVAL 15.01.578
            RELEASE 03.70                     RPT VERSION  03            TIME  11.50.55        CYCLE 0.250 SECONDS


                                                     SWAP DATA SET USAGE
                                                     ---------------------------

PAGE                           SWAP                            BAD      %     AVG
SPACE   VOLUME  DEV  DEVICE    SETS   -- SWAP SETS USED--      SWAP     IN    NUM
TYPE    SERIAL  ADR  TYPE      ALLOC    MIN   MAX    AVG       SETS     USE   REQ    DATA SET NAME


SWAP    SWAP1   151  3330       72      4     7      5          0      0.40  2.0    SYS1.SWAP1

SWAP    SWAP2   553  3330       72      1     4      2          0      0.34  2.0    SYS1.SWAP2
```

Figure 5-11. Swap Data Set Section of Page/Swap Data Set Activity Report

Data Fields

PAGE
SPACE
TYPE
>This field appears in both sections of the report. It indicates the page space type, which can be PLPA, COMMON, DUPLEX, LOCAL, or SWAP.

VOLUME
SERIAL
>This field appears in both sections of the report. It indicates the volume serial number of the volume on which the data set resides.

DEV
ADR
>This field appears in both sections of the report. It indicates the address of the device on which the data set resides.

DEVICE
TYPE
>This field appears in both sections of the report. It indicates the device type on which the data set resides. The possibilities are:

```
2305-1   2305 fixed-head disk storage (Model 1)
2305-2   2305 fixed-head disk storage (Model 2)
2314     2314/2319 direct-access storage facility
3330     3330 disk storage drive Model 1 or 3333 disk
         storage and control Model 1
3330-1   3330 disk storage drive Model 11 or 3333
         disk storage and control Model 11
3340     3340/3344 disk storage drive
3350     3350 direct-access storage
```

SLOTS
ALLOC
>This field appears only in the page data set section of the report. It indicates the total number of slots each page data set contains.

SWAP
SETS
ALLOC
>This field appears only in the swap data set section of the report. It indicates the total number of swap sets each swap data set contains.

----SLOTS USED-
MIN   MAX   AVG
>These fields appear only in the page data set section of the report. They indicate the number of slots that were being used for pages. These values are sampled and reported as minimum, maximum, and average.

>*Note:* The actual minimum and maximum values might occur at a time when RMF is not sampling.

----SWAP SETS USED
MIN MAX   AVG
>These fields appear only in the swap data set section of the report. They indicate the number of swap sets that were being used for pages. These values are sampled and reported as minimum, maximum and average.

Note: The actual minimum and maximum values might occur at a time when RMF is not sampling.

BAD
SLOTS
> This field appears only in the page data set section of the report. It indicates the number of slots that encountered permanent I/O errors.

BAD
SWAP
SETS
> This field appears only in the swap data set section of the report. It indicates the number of swap sets that encountered permanent I/O errors.

%
IN
USE
> This field appears in both sections of the report. It indicates the percentage of time during the reporting interval when the data set was considered busy by the Auxiliary Storage Manager (ASM).
> At each cycle, RMF tests the busy bit in the IORB(s) for each data set. When at least one busy bit is on, RMF adds one to a counter.
> At the end of the interval, the percentage is computed. The calculation used is

$$P = 100 \times C/N$$

> The in use percentage equals 100 times the count of busy samples divided by the total number of samples.

AVG
NUM
REQ
> This field appears in both sections of the report. It indicates the average number of simultaneous requests for the data set.
>
> For most page data sets, this value is always 1. However, when the data set resides on a multiple exposure device, there are four IORBs associated with the data set. Therefore, there could be up to four simultaneous requests.
>
> Most swap data sets have two IORBs. Thus, the value is usually between 1 and 2. However, when the data set resides on a multiple exposure device, there are four IORBs associated with the data set. Therefore, there could be up to four simultaneous requests.
>
> At each cycle, RMF accumulates the number of simultaneous requests for each data set. At the end of the interval, the average number of requests is computed. The calculation used is

$$A = C/N$$

> The average number of simultaneous requests equals the accumulated number of requests divided by the total number of samples.

DATA SET NAME

This field appears in both sections of the report. It indicates the name of the page or swap data set being monitored. A data set name longer than 41 characters will be truncated to 41 characters in the report (the entire name appears in the SMF record).

Notes:

- If a data set was dynamically introduced during the interval, its data set name is preceded by an asterisk (*).

- When the operating system has detected errors in a data set that prevents its further use, RMF can no longer monitor the data set. The name of the data set no longer being used is preceded by two asterisks (**).

Paging Activity Report

The paging activity report provides information about the demands made on the system paging facilities, and the utilization of real storage and external page storage during the interval. It also provides swapping statistics for the interval. The paging rates monitored are:

- page reclaim rates
- non-swap page-in rates
- swap page-in rates
- total page-in rates
- non-swap page-out rates
- swap page-out rates
- total page-out rates

All of the above paging data rates appear for one or more of the following:

- pageable system areas used for non-VIO data
- address space pages used for VIO data
- address space pages used for non-VIO data

The system paging counts included in the report are:

- pageable main storage page frames, categorized by LPA/CSA, private area, unused, and total
- fixed main storage page frames, categorized by SQA, LPA/CSA, private area, and total
- nucleus frames
- total online system frames
- total local page data set page slots
- auxiliary slots used for VIO data set pages
- auxiliary slots used for non-VIO private area pages
- unused auxiliary slots
- bad auxiliary slots(unavailable)

The swap information includes a count of swap sequences and a swap sequence rate calculated for the user. The following swap-out reasons are itemized and totaled in the report:

- input terminal wait
- output terminal wait
- long wait
- detected wait
- unilateral
- exchange on recommendation value
- ENQ exchange
- requested
- auxiliary storage shortage
- real pageable storage shortage

Note: The swap sequence count is not necessarily equal to the swap out reason total or the swap counts in the workload report.

The data in the paging activity report can be used in a variety of ways to analyze your system's performance. For example, you can determine the non-swap, non-VIO page fault rate by adding the number of page-ins to the number of reclaims. If this is excessively high, it can be the result of an

overcommitment of real storage, perhaps because of a specification in the IPS of minimum multiprogramming levels that are too high for the system configuration and current workload mix.

Other problems to look for are a high pageable system area non-swap page-in rate, which could be caused by a poor pack list or a large number of fixed LPA modules. A period of high VIO slot use could be a sign that a specific job is making excessive use of VIO. And, of course, always be alert for bad slots because they can cause executing jobs to terminate abnormally.

Paging activity is formatted in five sections, each with a separate subheading:

```
MAIN STORAGE PAGING RATES PER SECOND
MAIN STORAGE FRAME COUNTS
LOCAL PAGE DATA SET SLOT COUNTS
SWAP OUT COUNTS
SWAP SEQUENCE COUNTS
```

Data Fields

MAIN STORAGE PAGING RATES PER SECOND

CATEGORY
The identification of the component parts of paging rates identifying these basic components:

- pageable system area, non-VIO data
- address space, VIO data
- address space, non-VIO data

PAGEABLE SYSTEM AREAS
Areas of main storage that are not associated with a single address space include:

- pageable link pack area
- link pack area directory
- link pack area extension
- pageable BLDL list
- common storage area

ADDRESS SPACES
Areas of main storage that are associated with individual address spaces. This major category consists of the following subcategories:

VIO   -   all values are reported except for swaps.

NON VIO   -   all values are reported.

SUM   -   sum of address space VIO and non-VIO.

TOTAL SYSTEM

A major category consisting of the sum of system pageable areas and address space values and with the same subcategories:

VIO   - consists only of address space VIO values.

NON VIO - sum of system pageable areas non-VIO and memory non-VIO values.

SUM   - sum of system pageable areas sum and address space sum. (The computer system grand total for paging rates.)

PAGE RECLAIMS

RATE - The per-second rate of page frames that are disconnected (stolen) from a memory or the system pageable area, but retrieved for reuse before being reallocated. The reclaim rate shows the number of non-initial-reference page faults or logical GETs that do not require reading from auxiliary storage. Non-VIO reclaims result from a request for a page because of a page fault, PGLOAD, or PGFIX that is satisfied without starting a new page-in. VIO reclaims result from a request for a real storage data set page that was satisfied without page-in by means of the explicit VIO reclaim interface. The range of values is 0.00 to 999,999.

PERCENT OF TOTAL SUM - The percentage of the total reclaim rate for each part of the total. The total here is reflected in the SUM subcategory under TOTAL SYSTEM. The range of values is 0 to 100 percent.

PAGE IN

SWAP - The per-second rate of pages read into real storage as a result of address space swap-ins. The range of values is 0.00 to 999,999.

NON SWAP - The per-second rate of pages read into real storage from auxiliary storage exclusive of address space swap-ins. Non-VIO paging occurs as a result of a page fault, PGLOAD, or PGFIX. When there are concurrent requests for the same page, the first generates a page-in; all the rest are considered reclaims. VIO paging occurs as a result of a page fault or PGLOAD on a VIO window (logical GETs). VIO pages that are swapped in are not included. The range of values is 0.00 to 999,999 pages per second.

TOTAL RATE - The per-second rate of the total system pages read into main storage. The rate is the sum of the non-swap page-in rate and the swap page-in rate. The range of values is from 0.00 to 999,999.

PERCENT OF TOTAL SUM - The percentage of the total page-in rate for each part of the total. The total here is reflected in the subcategory SUM under TOTAL SYSTEM. The range of values is 0 to 100 percent.

PAGE OUT

SWAP - The per-second rate of pages written to auxiliary storage as a result of address space swap outs. The range of values is 0.00 to 999,999.

NON SWAP - The per-second rate of pages written to auxiliary storage (forced out) independent of address space swap outs. Non-VIO paging results from a PGOUT (including page stealing and other RSM-generated page-outs). VIO paging results from a PGOUT (including stealing and other RSM-generated page-outs) on a VIO window page (logical PUTs).

VIO pages transferred as a result of a swap-out are not included. The range of values is 0.00 to 999,999.

TOTAL RATE - The per-second rate of total system pages written to auxiliary storage. The rate is the sum of the non-swap page-out rate and the swap page-out rate. The range of values is from 0.00 to 999,999.

PERCENT OF TOTAL SUM - The percentage of the total page-out rate for each part of the total. The total here is reflected in the subcategory SUM under TOTAL SYSTEM. The range of values is 0 to 100 percent.

Figure 5-12 shows an example of the main storage paging rates section of a paging activity report.

PAGING ACTIVITY

OS/VS2   SYSTEM ID 6668   DATE 2/15/77   INTERVAL 15.01.578
RELEASE 03.70   RPT VERSION 03   TIME 11.50.55   CYCLE 0.250 SECONDS

MAIN STORAGE PAGING RATES PER SECOND

CATEGORY	PAGE RECLAIMS		PAGE IN				PAGE OUT			
	RATE	PERCENT OF TOTAL SUM	SWAP	NON SWAP	TOTAL RATE	PERCENT OF TOTAL SUM	SWAP	NON SWAP	TOTAL RATE	PERCENT OF TOTAL SUM
PAGEABLE SYSTEM AREAS (NON VIO)	0.04	3		0.88	0.88	5		0.07	0.07	0
ADDRESS SPACES VIO	0.02	1		0.06	0.06	0		0.25	0.25	1
NON VIO	1.49	96	11.07	5.79	16.86	95	16.84	1.20	18.04	98
SUM	1.51	97	11.07	5.85	16.92	95	16.84	1.45	18.29	100
TOTAL SYSTEM VIO	0.02	1		0.06	0.06	0		0.25	0.25	1
NON VIO	1.53	99	11.07	6.67	17.74	100	16.84	1.27	18.11	99
SUM	1.55	100	11.07	6.73	17.80	100	16.84	1.52	18.36	100

Figure 5-12. Main Storage Paging Rates from a Paging Activity Report

MAIN STORAGE FRAME COUNTS

PAGEABLE FRAMES

This data is sampled and presented as MIN (minimum), MAX (maximum), and AVG (average) values. This particular category of main storage is further broken down into LPA/CSA, PRIVATE AREA, UNUSED, and TOTAL PAGEABLE. Note that the TOTAL PAGEABLE value is not a summation of the previous three categories at the end of the interval, but is derived by adding the three categories during each sample and later reporting the MIN sum, MAX sum, and AVG sum for the set of samples. Figure 5-13 shows how these values are determined.

Note: The actual maximum or minimum value of a field might occur at a time when RMF is not sampling.

Pageable Frame Categories	Samples					
	1	2	3	4	5	AVG
LPA/CSA	76	35	MIN 29	84	MAX 107	66
Private Area	202	MAX 301	76	MIN 32	125	147
Unused	MIN 39	58	92	MAX 137	66	78
Total	317	MAX 394	197	MIN 253	298	291

Figure 5-13. Determining MIN, MAX, and AVG

FIXED FRAMES

This data is sampled and presented as MIN, MAX, and AVG values. This category is further broken down into SQA, LPA/CSA, PRIVATE AREA, and TOTAL FIXED. Note that the TOTAL FIXED value is not a summation of the previous three categories at the end of the interval but is derived as shown in Figure 5-13. This section of the paging activity report also provides end-of-interval values for nucleus frames and total online system frames.

NUMBER OF SAMPLES

The number of samples taken in this interval.

LOCAL PAGE DATA SET SLOT COUNTS

This data is sampled and presented as MIN, MAX, and AVG values as described previously. This category of storage is further broken down into:

AVAILABLE SLOTS

The number of page slots that do not contain any data pages and that are available for use.

VIO SLOTS

The number of local page data set slots that contain pages for VIO data sets.

NON-VIO SLOTS

The number of local page data set slots that contain pages that belong to address-space virtual storage.

BAD SLOTS

The number of local page data set slots that do not contain any data pages and are unavailable for use because of permanent I/O errors.

TOTAL SLOTS

This value is not a summation of the previous four categories at the end of the interval; it is derived as shown in Figure 5-13.

Figure 5-14 shows an example of the main storage frame counts and the local page data set slot counts sections of the paging activity report.

```
                                                                                                             ___
  MAIN STORAGE FRAME COUNTS             NUMBER OF SAMPLES          LOCAL PAGE DATA SET SLOT COUNTS
-----------------------------------     -----------------  ------------------------------------------------
                                             3,606

                  MIN     MAX     AVG                                          MIN       MAX       AVG
PAGEABLE FRAMES                                            AVAILABLE SLOTS    34,986    36,070    35,517
  LPA/CSA         290     609     539
  PRIVATE AREA    277     880     528                      VIO SLOTS             427       646       514
  UNUSED            0     473     181
                -----   -----   -----                      NON-VIO SLOTS       3,387     4,375     3,851
  TOTAL PAGEABLE 1,156   1,302   1,249
                                                           BAD SLOTS               0         0         0
FIXED FRAMES                                                                  --------- --------- ---------
  SQA             134     134     134                      TOTAL SLOTS        39,884    39,884    39,884
  LPA/CSA         200     207     201
  PRIVATE AREA    283     429     336
                -----   -----   -----
  TOTAL FIXED     619     765     671

NUCLEUS FRAMES AT END OF INTERVAL        127

TOTAL ONLINE SYSTEM FRAMES AT END OF INTERVAL    2,048
```

Figure 5-14. Main Storage Frame and Local Page Data Set Slot Counts from a Paging Activity Report

SWAP OUT COUNTS

SWAP OUT
CATEGORY

The following ten swap-out reasons are itemized and totaled by count (SWAP OUT COUNT), rate (RATE PER SECOND), and percent (PERCENT OF TOTAL):

INPUT TERMINAL WAIT - Number of swap-outs that occur because of a terminal waiting for input.

OUTPUT TERMINAL WAIT - Number of swap-outs that occur because of a terminal waiting for output buffers.

LONG WAIT - Number of swap-outs that occur because of user-requested long waits. Swap-outs of address spaces that were swapped in, executed, and entered a wait state before SRM received control are also counted.

DETECTED WAIT - Number of swap-outs that occur because of user address spaces that have not issued a WAIT,LONG=YES macro but have gone without executing for more than 8 seconds.

UNILATERAL - Number of swap-outs that occur because the multiprogramming level for a domain became higher than the target multiprogramming level specified for that domain.

EXCHANGE ON RECOMMENDATION VALUE - Number of swap-outs that occur because one user in a domain must be swapped out to allow another user (with a higher workload level) in the same domain to be swapped in.

ENQ EXCHANGE - Number of swap-outs that occur to make room for users enqueued upon a system resource that is required by other users.

REQUESTED - Number of swap-outs that occur because the program properties table (PPT) indicated that a job or step is non-swappable. The address space is swapped out, and its LSQA is swapped into non-reconfigurable storage. This field also includes the number of swap outs caused by a VARY STOR,OFFLINE command.

AUXILIARY STORAGE SHORTAGE - Number of swap-outs that occur because 70% of all local page slots are allocated. Note that the swappable user address spaces acquiring auxiliary storage page slots at the greatest rate are swapped out.

REAL PAGEABLE STORAGE SHORTAGE - Number of swap-outs that occur because of a shortage of real pageable frames. Note that the swappable users that have acquired the most fixed pages are swapped out.

SWAP SEQUENCE COUNTS

The following categories have single values and are defined as the label of the value implies:

TOTAL SWAPS

The number of storage swap sequences: a swap-out and a swap-in of an address space. The range of values is 0 to 9,999,999.

Note: This value is not necessarily equal to the swap out reason total, or the swap counts in the workload report.

SWAPS PER

SECOND

A calculated rate representing the average number of swap sequences for each second of the interval.

AVERAGE

PAGES PER

SWAP OUT

The average number of pages swapped out for each storage swap-out. The range of values is 0 to 4,096 pages or 0 to 16,777,216 bytes.

AVERAGE

PAGES PER

SWAP IN

The average number of pages swapped in for each storage swap-in. The range of values is 0 to 4,096 pages or 0 to 16,777,216 bytes.

Figure 5-15 shows an example of the swap-out counts and swap sequence counts sections of the paging activity report.

```
                               P A G I N G   A C T I V I T Y
                                                                                                    PAGE    2
         OS/VS2                      SYSTEM ID 6668          DATE  2/15/77           INTERVAL 15.01.578
         RELEASE 03.70               RPT VERSION  03         TIME 11.50.55           CYCLE 0.250 SECONDS




                     SWAP OUT COUNTS                                             SWAP SEQUENCE COUNTS
         ------------------------------------------------                       ---------------------------


                                      SWAP    RATE    PERCENT                    TOTAL SWAPS         770
         SWAP OUT                     OUT     PER     OF
         CATEGORY                     COUNT   SECOND  TOTAL
                                                                                SWAPS PER
                                                                                SECOND              0.85
         INPUT TERMINAL WAIT           474    0.53     62

         OUTPUT TERMINAL WAIT          130    0.14     17                        AVERAGE
                                                                                PAGES PER
         LONG WAIT                       5    0.01      1                        SWAP OUT            20

         DETECTED WAIT                 120    0.13     16
                                                                                AVERAGE
         UNILATERAL                     12    0.01      2                        PAGES PER
                                                                                SWAP IN             13
         EXCHANGE ON RECOMMENDATION VALUE  23  0.03     3

         ENQ EXCHANGE                    1    0.00      0

         REQUESTED                       0    0.00      0

         AUXILIARY STORAGE SHORTAGE      0    0.00      0

         REAL PAGEABLE STORAGE SHORTAGE  0    0.00      0

                                      ------  ------  ------

         TOTAL                         765    0.85    100
```

Figure 5-15. Swap-Out and Swap Sequence Counts from a Paging Report

Workload Activity Report

The workload activity report provides information about the utilization of each performance group period (PGP), defined in the Installation Performance Specification (IPS). The data can be collected at three different levels of detail:

- performance group period - most detail
- performance group - intermediate detail
- system summary - least detail

The following eight types of sub-reports can be produced:

1. By performance group period within performance group - the most detailed report. Gives information on each performance group period. A summary for each performance group immediately follows the information for all performance group periods in the performance group; however, this summary is not produced if all performance group periods have zero interval service.

2. By performance group - summarizes the data for all performance group periods within the performance group.

3. By performance objective in a range of performance groups - summarizes the data by performance objective within a range of ten performance groups.

4. By domain in a range of performance groups - summarizes the data by domain number within a range of ten performance group numbers.

5. By performance group range - summarizes the data within a range of ten performance group numbers.

6. By performance objective for entire system - summarizes the data by performance objective for the entire system.

7. By domain for entire system - summarizes the data by domain for the entire system.

8. For entire system - summarizes the data for the entire system.

Figure 5-16 indicates which of the sub-reports are included for each option.

Option	Sub-Report Type							
	1	2	3	4	5	6	7	8
PERIOD	x		x	x	x	x	x	x
GROUP		x	x	x	x	x	x	x
SYSTEM						x	x	x

Figure 5-16. Sub-Report Types Included by Option

You can assign unique performance group numbers and domain numbers to a particular user or set of users. This enables you to use the performance group period report to obtain individual workload reporting for users such as subsystems, monitor programs, groups of users, or batch initiator classes.

The information given in the service definition coefficients and the IOC, CPU, and MSO interval service fields can be used to determine the actual number of countable EXCP instructions, the task processor (CPU) time, and the approximate storage use for each performance group. The basic formula for determining the processor, I/O, or storage service is:

$$\left\{\begin{matrix} CPU \\ IO \\ MSO \end{matrix}\right\} \text{Service Units} = \frac{\left\{\begin{matrix} CPU \\ IOC \\ MSO \end{matrix}\right\} \text{service}}{\left\{\begin{matrix} CPU \\ IOC \\ MSO \end{matrix}\right\} \text{service definition coefficient}}$$

See **OS/VS2 System Programming Library: Initialization and Tuning Guide**, for more details.

The number of swaps in the workload activity report can be cross-checked with the paging report swap-out counts to point out the group period where the swap activity is occurring. This information is useful when you are trying to eliminate unnecessary swapping.

Data Fields

In addition to the report headers that are common to all reports, the workload activity report contains:

- the IPS identification number
- the sub-report title (one of the eight types listed above)
- the values for the IOC, CPU, and ERV parameters as specified in the IEAOPTnn member (or SRM defaults)
- the values for the IOC, CPU, and MSO service definition coefficients as defined in the IPS specification

The remainder of the data fields are described on a performance group period level. Differences for the performance group and system summary levels are identified when appropriate.

Duration Report: When you request a workload activity duration report, the message IPS CHANGED DURING DURATION INTERVAL will appear at the end of every sub-report if the IPS changed during the duration of time covered in the report. The message indicates that, because of the change in the IPS, the values reported can be misleading.

Performance

GROUP

NUMBER

The identification of the performance group that describes the rate at which service is to be allocated to the user. A range of PG numbers can be shown to eliminate printing of consecutive lines of zeros. The range of values is 1 to 255.

GROUP

PERIOD

The identification of the performance group period that is a portion of the elapsed transaction time, such as the average service used by a transaction during the first 10 seconds of a total transaction time of 30 seconds. A range of PGP numbers can be shown to eliminate printing of consecutive lines of zeros. The range of values is 1 to 8.

OBJ
NUMBER
> The identification of the performance objective associated with a performance group during a period. The range of values is 1 to 64.

DOMAIN
NUMBER
> The identification of the domain associated with the performance group during a performance group period. The range of values is 1 to 128.

INTERVAL SERVICE
(TOTAL, BY TYPE
AND PER SECOND)
> This category is made up of five distinct data values:

> **IOC=** The total amount of input/output service received. For type 1 sub-reports, this is the I/O service received in one period. For all other types, it is the sum of the I/O service received by all periods being summarized.

> **CPU=** The total amount of processor service received. For type 1 sub-reports, this is the processor service received in one period. For all other types, it is the sum of the processor service received by all periods being summarized.

> **MSO=** The total amount of main storage service received. For type 1 sub-reports, this is the main storage service received in one period. For all other types, it is the main storage service received by all periods being summarized.

> **TOT=** The total amount of service received. For type 1 sub-reports, this is the total service received in one period. For all other types, it is the sum of the total service received by all periods being summarized.

> **PER SEC=** The rate at which service is provided in units of service per second. For type 1 sub-reports, this is the total period service divided by the RMF interval time. For all other types, it is the sum of the total service for all periods being summarized, divided by the RMF interval time.

AVERAGE
ABSORPTION
RATE
> The rate at which service is used while transactions are resident in real storage. For type 1 sub-reports, this is the total period divided by the transaction active time in storage in the period. For all other types, it is the sum of the total service in the periods being summarized, divided by the sum of the transaction active time in storage for all the periods being summarized.

**AVERAGE
TRANS
SERVICE RATE**

The rate at which service is used by transactions that are active but not necessarily in storage. For type 1 sub-reports, this is the total period service, divided by the transaction active time in the period. For all other types, it is the sum of the total service in the periods being summarized, divided by the sum of the transaction active time for all the periods being summarized.

**WORKLOAD
LEVEL**

The average SRM recommendation value given to users based on service usage and IPS objective specifications. For type 1 sub-reports, it is the value of the workload level for the period. For all other types, it is the sum of the products of the workload level and the total service for each period being summarized, divided by the sum of the total service for each period being summarized.

**NUMBER
OF
SWAPS**

Identifies the total number of swaps. For type 1 sub-reports, it is the number of swaps in the period. For all other types, it is the sum of the number of swaps in all periods being summarized.

Note: The swaps for domain 0 (an internal domain for Program Properties Table privileged users) are not counted here. Therefore, this count will differ from the paging activity report SWAP OUT COUNTS total and SWAP SEQUENCE COUNTS total fields.

**AVERAGE
TRANS
ACTIONS**

The average number of transactions active in the interval. For type 1 sub-reports, this is the transaction active time for the period, divided by the RMF interval time. For all other types, it is the sum of the transaction active time for all periods being summarized, divided by the RMF interval time.

ENDED

TRANS

ACTIONS

The number of transactions that ended in the interval. For type 1 sub-reports, this is the number of transactions that ended in the period. For all other types, it is the total number of transactions that ended in all the periods being summarized.

AVE TIME OF

ENDED TRANS

HHH.MM.SS.TTT

The average elapsed time of ended transactions. For type 1 sub-reports, this is the elapsed time of ended transactions for the period, divided by the number of ended transactions for the period. For all other types, it is the sum of the elapsed time of ended transactions for all periods being summarized, divided by the sum of the number of ended transactions for all periods being summarized.

Figure 5-17 shows an example of a type 1 workload activity sub-report. Figure 5-18 indicates how the various data fields are presented for the different sub-report types. The other types of workload reports are shown in Figures 5-19, 5-20, 5-21, 5-22, 5-23, and 5-24.

```
                                  W O R K L O A D   A C T I V I T Y
                                                                                                    PAGE    1
            OS/VS2                        SYSTEM ID 6668            DATE   2/23/77          INTERVAL 05.27.335
            RELEASE 03.70                 RPT VERSION  03           TIME 14.01.47           IPS = IEAIPS02

         SYSTEM TUNING PARAMETERS                  REPORT BY PERFORMANCE GROUP      SERVICE DEFINITION COEFFICIENTS
         IOC = 0.1  CPU = 0.1  ERV = 000001                PERIOD                  IOC =   5.0  CPU = 10.0  MSO =  3.0

 **** PERFORMANCE ****  DOMAIN  INTERVAL SERVICE  AVERAGE     AVERAGE                NUMBER  AVERAGE   ENDED    AVE TIME OF
 GROUP  GROUP  OBJ      NUMBER  (TOTAL, BY TYPE   ABSORPTION  TRANS       WORKLOAD   OF      TRANS-    TRANS-   ENDED TRANS
 NUMBER PERIOD NUMBER           AND PER SECOND)   RATE        SERV RATE   LEVEL      SWAPS   ACTIONS   ACTIONS  HHH.MM.SS.TTT
```

GROUP NUMBER	GROUP PERIOD	OBJ NUMBER	DOMAIN NUMBER	INTERVAL SERVICE (TOTAL, BY TYPE AND PER SECOND)		AVERAGE ABSORPTION RATE	AVERAGE TRANS SERV RATE	WORKLOAD LEVEL	NUMBER OF SWAPS	AVERAGE TRANS-ACTIONS	ENDED TRANS-ACTIONS	AVE TIME OF ENDED TRANS HHH.MM.SS.TTT
001	1	11	011	IOC= CPU= MSO= TOT= PER SEC=	6,225 12,755 3,913 22,893 69	37	36	32.20	22	1.92	4	000.01.55.726
001	2	12	012	IOC= CPU= MSO= TOT= PER SEC=	24,456 52,292 15,531 92,279 281	92	84	1.00	27	3.32	3	000.04.44.146
001	ALL	ALL	ALL	IOC= CPU= MSO= TOT= PER SEC=	30,681 65,047 19,444 115,172 351	71	66	7.20	49	5.25	7	000.03.07.906
002	1	22	020	IOC= CPU= MSO= TOT= PER SEC=	2,865 17,960 2,404 23,229 70	32	24	57.60	303	2.92	300	000.00.01.017
002	2	22	022	IOC= CPU= MSO= TOT= PER SEC=	3,715 22,527 4,064 30,306 92	66	68	53.20	136	1.35	74	000.00.09.931
002	3	23	023	IOC= CPU= MSO= TOT= PER SEC=	795 10,596 2,420 13,811 42	89	80	44.00	40	.52	20	000.00.38.187
002	4	24	024	IOC= CPU= MSO= TOT= PER SEC=	530 7,784 2,279 10,593 32	39	37	25.57	21	.86	8	000.00.55.672
002	5	25	025	IOC= CPU= MSO= TOT= PER SEC=	18,896 39,419 25,145 83,460 254	93	91	1.00	27	2.79	4	000.01.38.525

Figure 5-17. Workload Activity Report by Performance Group Period

	Sub-Report Type							
Data Field	1	2	3	4	5	6	7	8
PERFORMANCE GROUP NUMBER	E	E	B	B	B	C	C	C
GROUP PERIOD	E	C	C	C	C	C	C	C
OBJECT NUMBER	D	C	E	C	C	E	C	C
DOMAIN NUMBER	D	C	C	E	C	C	E	C
INTERVAL SERVICE	A	A	A	A	A	A	A	A
AVERAGE ABSORPTION RATE	A	A	A	A	A	A	A	A
AVERAGE TRANS SERV RATE	A	A	A	A	A	A	A	A
WORKLOAD LEVEL	A	A	A	A	A	A	A	A
AVERAGE TRANSACTIONS	A	A	A	A	A	A	A	A
ENDED TRANSACTIONS	A	A	A	A	A	A	A	A
AVG TIME OF ENDED TRANS	A	A	A	A	A	A	A	A

A The data is provided unless all data for the entry is zero; in this case 'ZEROS' appears in the service in interval area and all other entries are blank.
B A range of ten performance groups is given.
C 'ALL' is printed rather than a specific number.
D A value is printed when it is unique; when the value is not unique, 'ALL' is printed.
E A range of values can be produced if all performance group periods that make up the range have no interval service.

Figure 5-18. Data Fields Per Sub-Report Type

```
                              W O R K L O A D   A C T I V I T Y
                                                                                                     PAGE    4
          OS/VS2                        SYSTEM ID 6668              DATE  2/23/77         INTERVAL 05.27.335
          RELEASE 03.70                 RPT VERSION  03             TIME 14.01.47         IPS = IEAIPS02

       SYSTEM TUNING PARAMETERS                 RANGE SUMMARY BY PERFORMANCE    SERVICE DEFINITION COEFFICIENTS
       IOC = 0.1  CPU = 0.1  ERV = 000001            OBJECTIVE                  IOC =   5.0  CPU = 10.0  MSO =  3.0

**** PERFORMANCE ****  DOMAIN   INTERVAL SERVICE  AVERAGE    AVERAGE                   NUMBER  AVERAGE  ENDED    AVE TIME OF
GROUP    GROUP  OBJ    NUMBER   (TOTAL, BY TYPE   ABSORPTION TRANS          WORKLOAD   OF      TRANS-   TRANS-   ENDED TRANS
NUMBER   PERIOD NUMBER          AND PER SECOND)   RATE       SERV RATE LEVEL           SWAPS   ACTIONS  ACTIONS  HHH.MM.SS.TTT


001-010 ALL    01-10   ALL      ZEROS

001-010 ALL    11      ALL      IOC=     6,225     37         36    32.20            22     1.92      4   000.01.55.726
                                CPU=    12,755
                                MSO=     3,913
                                TOT=    22,893
                                PER SEC=     69

001-010 ALL    12      ALL      IOC=    24,456     92         84     1.00            27     3.32      3   000.04.44.146
                                CPU=    52,292
                                MSO=    15,531
                                TOT=    92,279
                                PER SEC=    281

001-010 ALL    13-21   ALL      ZEROS

001-010 ALL    22      ALL      IOC=     6,580     45         38    55.11           439     4.27    374   000.00.02.781
                                CPU=    40,487
                                MSO=     6,468
                                TOT=    53,535
                                PER SEC=    163

001-010 ALL    23      ALL      IOC=       795     89         80    44.00            40      .52     20   000.00.38.187
                                CPU=    10,596
                                MSO=     2,420
                                TOT=    13,811
                                PER SEC=     42

001-010 ALL    24      ALL      IOC=       530     39         37    25.57            21      .86      8   000.00.55.672
                                CPU=     7,784
                                MSO=     2,279
                                TOT=    10,593
                                PER SEC=     32

001-010 ALL    25      ALL      IOC=    18,896     93         91     1.00            27     2.79      4   000.01.38.525
                                CPU=    39,419
                                MSO=    25,145
                                TOT=    83,460
                                PER SEC=    254

001-010 ALL    26-64   ALL      ZEROS

011-020 ALL    01-64   ALL      ZEROS

021-030 ALL    01-49   ALL      ZEROS
```

Figure 5-19. Workload Activity Range Summary by Performance Objective

```
                                   W O R K L O A D   A C T I V I T Y
                                                                                                              PAGE    7
          OS/VS2                        SYSTEM ID 6668             DATE  2/23/77           INTERVAL 05.27.335
          RELEASE 03.70                 RPT VERSION  03            TIME 14.01.47           IPS = IEAIPS02

        SYSTEM TUNING PARAMETERS                    RANGE SUMMARY BY DOMAIN        SERVICE DEFINITION COEFFICIENTS
        IOC = 0.1  CPU = 0.1  ERV = 000001                                        IOC =  5.0  CPU = 10.0  MSO =  3.0

**** PERFORMANCE ****  DOMAIN  INTERVAL SERVICE  AVERAGE      AVERAGE                    NUMBER  AVERAGE   ENDED     AVE TIME OF
GROUP    GROUP  OBJ    NUMBER  (TOTAL, BY TYPE   ABSORPTION  TRANS        WORKLOAD       OF      TRANS-    TRANS-    ENDED TRANS
NUMBER   PERIOD NUMBER          AND PER SECOND)   RATE        SERV RATE   LEVEL          SWAPS   ACTIONS   ACTIONS   HHH.MM.SS.TTT


001-010 ALL    ALL    001-010 ZEROS

001-010 ALL    ALL    011     IOC=     6,225       37           36      32.20            22      1.92        4    000.01.55.726
                               CPU=    12,755
                               MSO=     3,913
                               TOT=    22,893
                               PER SEC=     69


001-010 ALL    ALL    012     IOC=    24,456       92           84       1.00            27      3.32        3    000.04.44.146
                               CPU=    52,292
                               MSO=    15,531
                               TOT=    92,279
                               PER SEC=    281


001-010 ALL    ALL    013-019 ZEROS

001-010 ALL    ALL    020     IOC=     2,865       32           24      57.60           303      2.92      300    000.00.01.017
                               CPU=    17,960
                               MSO=     2,404
                               TOT=    23,229
                               PER SEC=     70


001-010 ALL    ALL    021     ZEROS

001-010 ALL    ALL    022     IOC=     3,715       66           68      53.20           136      1.35       74    000.00.09.931
                               CPU=    22,527
                               MSO=     4,064
                               TOT=    30,306
                               PER SEC=     92


001-010 ALL    ALL    023     IOC=       795       89           80      44.00            40       .52       20    000.00.33.187
                               CPU=    10,596
                               MSO=     2,420
                               TOT=    13,811
                               PER SEC=     42


001-010 ALL    ALL    024     IOC=       530       39           37      25.57            21       .86        8    000.00.55.672
                               CPU=     7,784
                               MSO=     2,279
                               TOT=    10,593
                               PER SEC=     32


001-010 ALL    ALL    025     IOC=    18,896       93           91       1.00            27      2.79        4    000.01.33.525
                               CPU=    39,419
                               MSO=    25,145
                               TOT=    83,460
                               PER SEC=    254
```

Figure 5-20. Workload Activity Range Summary by Domain

```
                                    W O R K L O A D   A C T I V I T Y
                                                                                              PAGE   10
          OS/VS2                        SYSTEM ID 6668            DATE  2/23/77        INTERVAL 05.27.335
          RELEASE 03.70                 RPT VERSION  03           TIME 14.01.47        IPS = IEAIPS02

       SYSTEM TUNING PARAMETERS              RANGE SUMMARY BY PERFORMANCE   SERVICE DEFINITION COEFFICIENTS
       IOC = 0.1  CPU = 0.1  ERV = 000001             GROUP            IOC =  5.0  CPU = 10.0  MSO =  3.0

 **** PERFORMANCE ****  DOMAIN   INTERVAL SERVICE  AVERAGE     AVERAGE                NUMBER  AVERAGE  ENDED    AVE TIME OF
 GROUP    GROUP  OBJ    NUMBER   (TOTAL, BY TYPE    ABSORPTION  TRANS       WORKLOAD  OF      TRANS-   TRANS-   ENDED TRANS
 NUMBER   PERIOD NUMBER          AND PER SECOND)    RATE        SERV RATE  LEVEL      SWAPS   ACTIONS  ACTIONS  HHH.MM.SS.TTT

 001-010 ALL    ALL    ALL     IOC=     57,482       67          61        17.14      576     13.71    413      000.00.09.585
                               CPU=    163,333
                               MSO=     55,756
                               TOT=    276,571
                               PER SEC=     844

 011-020 ALL    ALL    ALL     ZEROS

 021-030 ALL    ALL    ALL     IOC=          0       62          47         6.57       19      2.38      0      000.00.00.000
                               CPU=     19,043
                               MSO=     18,252
                               TOT=     37,295
                               PER SEC=     113

 031-040 ALL    ALL    ALL     ZEROS
 041-050 ALL    ALL    ALL     ZEROS
 051-060 ALL    ALL    ALL     ZEROS
 061-070 ALL    ALL    ALL     ZEROS
 071-080 ALL    ALL    ALL     ZEROS
 081-090 ALL    ALL    ALL     ZEROS
 091-100 ALL    ALL    ALL     ZEROS
 101-110 ALL    ALL    ALL     ZEROS
 111-120 ALL    ALL    ALL     ZEROS
 121-130 ALL    ALL    ALL     ZEROS
 131-140 ALL    ALL    ALL     ZEROS
 141-150 ALL    ALL    ALL     ZEROS
 151-160 ALL    ALL    ALL     ZEROS
 161-170 ALL    ALL    ALL     ZEROS
 171-180 ALL    ALL    ALL     ZEROS
 181-190 ALL    ALL    ALL     ZEROS
 191-200 ALL    ALL    ALL     ZEROS
```

Figure 5-21. Workload Activity Range Summary by Performance Group

```
          OS/VS2                      SYSTEM ID 6668           DATE  2/23/77          INTERVAL 05.27.335
          RELEASE 03.70               RPT VERSION  03          TIME 14.01.47          IPS = IEAIPS02

          SYSTEM TUNING PARAMETERS                    SUMMARY BY PERFORMANCE      SERVICE DEFINITION COEFFICIENTS
          IOC = 0.1  CPU = 0.1  ERV = 000001             OBJECTIVE                IOC =  5.0  CPU = 10.0  MSO =  3.0
```

**** PERFORMANCE **** GROUP NUMBER	GROUP PERIOD	OBJ NUMBER	DOMAIN NUMBER	INTERVAL SERVICE (TOTAL, BY TYPE AND PER SECOND)		AVERAGE ABSORPTION RATE	AVERAGE TRANS SERV RATE	WORKLOAD LEVEL	NUMBER OF SWAPS	AVERAGE TRANS- ACTIONS	ENDED TRANS- ACTIONS	AVE TIME OF ENDED TRANS HHH.MM.SS.TTT
ALL	ALL	01-10	ALL	ZEROS								
ALL	ALL	11	ALL	IOC=	6,225	37	36	32.20	22	1.92	4	000.01.55.726
				CPU=	12,755							
				MSO=	3,913							
				TOT=	22,893							
				PER SEC=	69							
ALL	ALL	12	ALL	IOC=	24,456	92	84	1.00	27	3.32	3	000.04.44.146
				CPU=	52,292							
				MSO=	15,531							
				TOT=	92,279							
				PER SEC=	281							
ALL	ALL	13-21	ALL	ZEROS								
ALL	ALL	22	ALL	IOC=	6,580	45	38	55.11	439	4.27	374	000.00.02.781
				CPU=	40,487							
				MSO=	6,468							
				TOT=	53,535							
				PER SEC=	163							
ALL	ALL	23	ALL	IOC=	795	89	80	44.00	40	.52	20	000.00.38.187
				CPU=	10,596							
				MSO=	2,420							
				TOT=	13,811							
				PER SEC=	42							
ALL	ALL	24	ALL	IOC=	530	39	37	25.57	21	.86	8	000.00.55.672
				CPU=	7,784							
				MSO=	2,279							
				TOT=	10,593							
				PER SEC=	32							
ALL	ALL	25	ALL	IOC=	18,896	93	91	1.00	27	2.79	4	000.01.38.525
				CPU=	39,419							
				MSO=	25,145							
				TOT=	83,460							
				PER SEC=	254							
ALL	ALL	26-49	ALL	ZEROS								
ALL	ALL	50	ALL	IOC=	0	103	103	1.00	0	1.00	0	000.00.00.000
				CPU=	15,969							
				MSO=	17,762							
				TOT=	33,731							
				PER SEC=	103							

Figure 5-22. Workload Activity Summary by Performance Objective

```
                                      W O R K L O A D     A C T I V I T Y
                                                                                                                  PAGE    14
              OS/VS2                              SYSTEM ID 6668              DATE   2/23/77              INTERVAL 05.27.335
              RELEASE 03.70                       RPT VERSION  03             TIME  14.01.47             IPS = IEAIPS02

          SYSTEM TUNING PARAMETERS                        SUMMARY BY DOMAIN          SERVICE DEFINITION COEFFICIENTS
          IOC = 0.1  CPU = 0.1  ERV = 000001                                        IOC =   5.0  CPU = 10.0  MSO =   3.0

**** PERFORMANCE ****   DOMAIN   INTERVAL SERVICE   AVERAGE     AVERAGE                 NUMBER  AVERAGE   ENDED      AVE TIME OF
GROUP    GROUP  OBJ     NUMBER   (TOTAL, BY TYPE    ABSORPTION  TRANS      WORKLOAD     OF      TRANS-    TRANS-     ENDED TRANS
NUMBER   PERIOD NUMBER           AND PER SECOND)    RATE        SERV RATE  LEVEL        SWAPS   ACTIONS   ACTIONS    HHH.MM.SS.TTT
```

GROUP NUMBER	GROUP PERIOD	OBJ NUMBER	DOMAIN NUMBER	INTERVAL SERVICE (TOTAL, BY TYPE AND PER SECOND)		AVERAGE ABSORPTION RATE	AVERAGE TRANS SERV RATE	WORKLOAD LEVEL	NUMBER OF SWAPS	AVERAGE TRANS-ACTIONS	ENDED TRANS-ACTIONS	AVE TIME OF ENDED TRANS HHH.MM.SS.TTT
ALL	ALL	ALL	001-010	ZEROS								
ALL	ALL	ALL	011	IOC= CPU= MSO= TOT= PER SEC=	6,225 12,755 3,913 22,893 69	37	36	32.20	22	1.92	4	000.01.55.726
ALL	ALL	ALL	012	IOC= CPU= MSO= TOT= PER SEC=	24,456 52,292 15,531 92,279 281	92	84	1.00	27	3.32	3	000.04.44.146
ALL	ALL	ALL	013-019	ZEROS								
ALL	ALL	ALL	020	IOC= CPU= MSO= TOT= PER SEC=	2,865 17,960 2,404 23,229 70	32	24	57.60	303	2.92	300	000.00.01.017
ALL	ALL	ALL	021	ZEROS								
ALL	ALL	ALL	022	IOC= CPU= MSO= TOT= PER SEC=	3,715 22,527 4,064 30,306 92	66	68	53.20	136	1.35	74	000.00.09.931
ALL	ALL	ALL	023	IOC= CPU= MSO= TOT= PER SEC=	795 10,596 2,420 13,811 42	89	80	44.00	40	.52	20	000.00.38.187
ALL	ALL	ALL	024	IOC= CPU= MSO= TOT= PER SEC=	530 7,784 2,279 10,593 32	39	37	25.57	21	.86	8	000.00.55.672
ALL	ALL	ALL	025	IOC= CPU= MSO= TOT= PER SEC=	18,896 39,419 25,145 83,460 254	93	91	1.00	27	2.79	4	000.01.38.525

Figure 5-23. Workload Activity Summary by Domain

```
                              W O R K L O A D    A C T I V I T Y
                                                                                                  PAGE    16
         OS/VS2                      SYSTEM ID 6668              DATE  2/23/77           INTERVAL 05.27.335
         RELEASE 03.70               RPT VERSION  03             TIME 14.01.47           IPS = IEAIPS02

       SYSTEM TUNING PARAMETERS                       SYSTEM SUMMARY        SERVICE DEFINITION COEFFICIENTS
       IOC = 0.1  CPU = 0.1  ERV = 000001                                   IOC =  5.0  CPU = 10.0  MSO =  3.0

**** PERFORMANCE ****   DOMAIN  INTERVAL SERVICE  AVERAGE      AVERAGE                 NUMBER  AVERAGE   ENDED    AVE TIME OF
GROUP   GROUP  OBJ      NUMBER  (TOTAL, BY TYPE   ABSORPTION   TRANS        WORKLOAD    OF     TRANS-    TRANS-   ENDED TRANS
NUMBER  PERIOD NUMBER           AND PER SECOND)   RATE         SERV RATE    LEVEL      SWAPS   ACTIONS   ACTIONS  HHH.MM.SS.TTT


ALL    ALL    ALL      ALL      IOC=    57,952        68           61       13.78       595   18.10      413    000.00.09.585
                                CPU=   221,694
                                MSO=    85,783
                                TOT=   365,429
                                PER SEC=  1,116
```

Figure 5-24. Workload Activity System Summary

Monitor II Session Reports

A Monitor II session report can be displayed during a Monitor II local 3270 display session or a Monitor II TSO display session. Monitor II session reports in printed form can be obtained during a background session, and all reports or individual reports obtained during a display session can also be printed.

Each report consists of two lines of heading information, identifying the data fields included in the report. The data lines consist of a fixed number of columns, each of which corresponds to a heading field. A report can be either a row report (such as the paging report), which consists of one data line, or a table report (such as the report on address space state data), which consists of a variable number of data lines.

This section describes each Monitor II session report RMF provides. The sample reports show the display screen contents for each report. When the reports are printed, the contents are identical to the report contents shown on the screen. However, there are differences in the format of the printed output.

For a **Monitor II background session**, RMF creates a single output data set for each report requested. All interval reports for that measurement activity are written to a single output data set. Thus, if you request three measurements for a session with five reporting intervals, RMF will create three data sets and write five reports to each data set.

The printed output generated for each table report requested is preceded by a line of plus signs (+). Fields within the line of plus signs indicate the option and any operands specified for the report and whether the session is in delta mode or total mode. Each iteration of the report is separated by a line of plus signs. A field within the line of plus signs indicates the time of the report. The column headings are repeated for each iteration of the report.

The printed output generated for each row report is preceded by a single line of plus signs (+). Fields within the line of plus signs indicate the option and any operands specified for the report and whether the session is in delta or total mode. Headings appear only once. There is no delimiter between successive iterations of a row report, and a field within the report line indicates the time of the report.

Figure 5-25 shows an example of printed report output generated during a Monitor II background session.

```
                                    RMF MONITOR II HARDCOPY LOG


                                        SESSION NAME BS


         OS/VS2                    SYSTEM ID 6668            DATE 02/23/77
         RELEASE 03.7              RPT VERSION 3             TIME 13:48:17


++++++++++                              ++++++++++ TOTAL MODE +++++++++++++++++++++++++++ ARD      ++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++ 13.48.17 ++++++++++++++++++++
13:48:17  TX    TRAN    PR AVG  SRM    TCB    EXCP  PAGE NV  VIO
JOBNAME   CT    TIME    FX RS  ABSORB TIME    RATE  SUM  S C  S C
*MASTER*   1 19:18:46    6  37   0.00 874.63 ----- -----    74     0
JES2       1 19:16:43   11  85   0.00 746.51 ----- -----   103     0
SWGCIOC1   1 02:06:55    9  81   0.00 594.31 ----- -----   127     0
TS077046   1 19:13:11   63  74   0.00 3620.1 ----- -----    33     0
M015      24 00:10:28    8  59   0.00  93.30 ----- -----    69     0
M032      45 00:00:37    7  46  99.75  46.59 ----- -----    44     0
S017M      1 00:00:13    8 136 191.27   0.76 ----- -----    16     0
COOK       1 00:01:08    9  61 181.49   3.41 ----- -----    20    94
BKUPJOB    1 00:11:45   19   3  55.49   1.63 ----- -----    48     0
IMSMSG2    1 02:54:37   11  31   0.00  20.90 ----- -----    39     0
W005F20    1 00:01:40   11  36   1.15   0.05 ----- -----    37     0
M022INV    1 00:00:54   11  11 181.30   4.31 ----- -----    27     0
IMS        1 02:56:59  142 184   0.00 361.93 ----- -----    95     0
IMSMSG1  --- 02:54:43    0  26 ------  24.07 ----- -----    38     0
RMF2       1 00:01:53    6  54 121.89   2.34 ----- -----    70     0
M027     138 00:00:17   16  64   0.00  43.08 ----- -----    29     0
W005MISP   1 00:22:48    6  61   0.00  30.31 ----- -----    69     1
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++ 13.48.51 ++++++++++++++++++++
13:48:51  TX    TRAN    PR AVG  SRM    TCB    EXCP  PAGE NV  VIO
JOBNAME   CT    TIME    FX RS  ABSORB TIME    RATE  SUM  S C  S C
*MASTER*   1 19:19:19    6  37   0.00 874.95  0.0  3218   74     0
JES2       1 19:17:16   11  85   0.00 747.17  0.0  3179  102     0
SWGCIOC1   1 02:07:29    9  81   0.00 594.31  0.0   160  127     0
TS077046   1 19:13:45   63  74   0.00 3622.2  0.9   322   33     0
M015      24 00:11:01    8  59   0.00  93.30  0.0   779   69     0
M032      45 00:01:10    7  46 105.05  49.19  0.9    16   44     0
S017M      1 00:00:47   10 155 270.52   3.72  7.5     2   16     0
BKUPJOB    1 00:12:18   11   2  60.67   2.60 21.6    50   48     0
W005F20    1 00:02:13   12  12  89.68   1.40 63.0    49   36     0
M022INV    1 00:01:28   11   6 198.13   7.95 10.2     4   27     0
IMS        1 02:57:33  142 184   0.00 363.03  0.0  3349   95     0
RMF2       1 00:02:26    6  61 167.68   2.68  0.0     7  139     0
M027     141 00:00:00   17  65   0.00  45.02  2.9     0  121     0
W005MISP   1 00:23:21    6  61   0.00  30.31  0.0    58   69     1
```

Figure 5-25. Format of Printed Reports from a Monitor II Background Session

For a **Monitor II display session**, RMF creates a single output data set for each session. All printed output resulting from either hardcopy mode or the print command is sent to the same output data set. Each report printed when the session is in hardcopy mode is delimited by a line of plus signs. Each report printed as a result of the print display command is delimited by a line of asterisks (*). Fields within the line of delimiters indicate the operands specified on the report request, whether the session is in delta or total mode, and the name of the report.

When there are repetitive requests for the same row report, headings appear for the first request; data lines appear for each subsequent request. A field within the line indicates the time of the report.

Figure 5-26 shows an example of printed output from a display session. The first report was printed as a result of the print display command; note that it is a screen image of a report where repetitive requests had caused the display to wrap around. The second report was printed as a result of the user's entering the H ON or H command, putting the session in hardcopy mode and causing all reports to be printed as well as displayed.

```
                                         RMF MONITOR II HARDCOPY LOG


                                            SESSION NAME TSO


        OS/VS2                      SYSTEM ID C168                 DATE 03/03/77
        RELEASE 03.7               RPT VERSION 3                   TIME 10:57:13


**********D16BCL1                       ********** TOTAL MODE ************************* ASDJ
*********CPU= 85 UIC= 93 AFC= 202 ASMQ= 9 ********************************************* 11.02.10
D16BCL1       P P   TRAN    C  R  DP DP  RS  WS  TX WRK  CPU  I/O   SRM      CPU
   TIME   DMN  G P  TIME    L  LS PR PO  F   IN  SC RV   RV   RV    SRVC     TIME
11:04:34   2  41 1 00:00:06 WT TI 7E      0  15   0 100  +0   +0      0     36.37
11:04:50   2  41 1 00:00:00 IN    7E   8 26  25   0 100  +0   +0      0     36.91
11:05:02   3  41 2 00:00:13 IN    7D   8 55  25   0 100  +0   +0   1143     37.37
11:05:11   3  41 2 00:00:21 IN    7D  11 56  25   0 100  +0   +0   1555     37.57
11:05:18   4  41 3 00:00:28 IN    74  15 66  25   0 100  +0   +0   2078     37.78
11:05:26   4  41 3 00:00:36 IN    74  14 66  25   0 100  +0   +0   2083     37.80
11:05:35   4  41 3 00:00:44 IN    71  15 62  25   0 100  +0   +0   2582     38.02
11:03:00   4  41 1 00:01:13 WT TI 7E      0  21   0 100  +0   +0      0     34.16
11:03:07   2  41 1 00:00:05 WT TI 7E      0  15   0 100  +0   +0      0     34.17
11:03:13   2  41 1 00:00:00 IN    7E   8 45  15   0 100  +0   +0      0     34.27
11:03:19   3  41 1 00:00:07 WT TI 7E      0  35   0 100  +0   +0      0     34.70
11:03:28   2  41 1 00:00:06 WT TI 7E      0  25   0 100  +0   +0      0     34.72
11:03:34   2  41 1 00:00:12 WT TI 7E      0  25   0 100  +0   +0      0     34.72
11:03:41   3  41 2 00:00:05 IN    7D  14 51  25   0 100  +0   +0    547     34.97
11:03:48   3  41 2 00:00:12 IN    7D  10 55  25   0 100  +0   +0   1035     35.17
11:03:54   3  41 2 00:00:18 IN    7D   8 55  25   0 100  +0   +0   1452     35.34
11:04:00   4  41 3 00:00:24 IN    74  12 66  25   0 100  +0   +0   2039     35.63
11:04:08   4  41 3 00:00:32 IN    74  11 66  25   0 100  +0   +0   2043     35.65
11:04:14   4  41 3 00:00:38 IN    75  10 38  10   1 100  +0   +0     50     35.73
11:04:21   4  41 3 00:00:44 IN    74   9 42  10   1 100  +0   +0    392     35.91
11:04:28   2  41 1 00:00:00 WT TI 7E      0  15   0 100  +0   +0      0     36.37
*********************************************************************************
+++++++++++T                            ++++++++++ TOTAL MODE +++++++++++++++++++++++++ ASD
+++++++++++CPU=101 UIC= 93 AFC= 202 ASMQ= 18 ++++++++++++++++++++++++++++++++++++++++++ 11.06.23
11:06:23      P P   TRAN    C  R  DP DP  RS  WS  TX WRK  CPU  I/O   SRM      CPU
JOBNAME  DMN  G P  TIME     L  LS PR PO  F   IN  SC RV   RV   RV    SRVC     TIME
D16BAB1    2  41 1 00:00:00 IN    8B   7 31  25   0 100  +0   +0      0      2.56
L81LJO1    4  41 3 00:01:09 IN    70  17 13  13   1  71  +0   +0  15009     19.74
E24JEN1    4  41 3 00:09:07 IN    70  16 34   9   9  83  +0   +0  10200    145.26
L81WFF1    2  41 1 00:00:00 IN    8B   8 20  16   0 100  +0   +0      0     35.26
H45MCE1    3  41 2 00:00:04 IN    7D  14 73  31   0 100  +0   +0    695     10.80
L15CMR1    3  55 2 00:00:09 IN    7D  13 33  14   0 100  +0   +0    874      1.24
E15JBB1    2  41 1 00:00:00 IN    7E  12 13  13   0 100  +0   +0      0      4.29
```

Figure 5-26. Format of Printed Reports for a Monitor II Display Session

Address Space Resource Data Report

The address space resource data report gives information on the system resources — such as processor time, paging, and real storage — used by each address space in the system or each address space that meets the selection criteria that you specify when you request the report.

The number of data lines in the report depends on the number of address space identifiers in the system that meet your selection criteria. The report is very useful in enabling you to determine which jobs are creating performance problems, and, once the problem job is identified, an address space resource data report for that particular job can be requested, thus enabling you to focus your reporting on a known problem area.

Figure 5-27 shows a sample address space resource data report. The field headings, their meanings, and the possible contents are described in Figure 5-28.

```
                                        CPU=100 UIC= 47 AFC= 179 ASMQ=  6  ARD        T
       13:48:51  TX    TRAN     PR AVG  SRM     TCB      EXCP  PAGE NV    VIO
       JCBNAME   CT    TIME     FX RS   ABSORB  TIME     RATE  SUM  S C   S C
       *MASTER*   1 19:19:19   6  37   0.00   874.95    0.0   3218   74     0
       JES2       1 19:17:16  11  85   0.00   747.17    0.0   3179  102     0
       SWGCIOC1   1 02:07:29   9  81   0.00   594.31    0.0    160  127     0
       TSO77046   1 19:13:45  63  74   0.00  3622.2     0.0    322   33     0
       M015      24 00:11:01   8  59   0.00    93.30    0.0    779   69     0
       M032      45 00:01:10   7  46 105.05    49.19    0.9     16   44     0
       SO17M      1 00:00:47  10 155 270.52     3.72    7.5      2   16     0
       EKUPJOB    1 00:12:18  11   2  60.67     2.60   21.6     50   48     0
       WC05F20    1 00:02:13  12  12  89.68     1.40   63.0     49   36     0
       M022INV    1 00:01:28  11   6 198.13     7.95   10.2      4   27     0
       IMS        1 02:57:33 142 184   0.00   363.03    0.0   3349   95     0
       RMF2       1 00:02:26   6  61 167.68     2.68    0.0      7  139     0
       M027     141 00:00:00  17  65   0.00    45.02    2.9      0  121     0
       WC05MISP   1 00:23:21   6  61   0.00    30.31    0.0     58   69     1
```

Figure 5-27. Address Space Resource Data (ARD) Report

Field Heading	Meaning
hh.mm.ss JOBNAME	One to eight character jobname associated with the address space. The JOBNAME heading is preceded by the time the report was requested, in the form hh.mm.ss.
TX CT	One to three digit number indicating the transaction count for the job. This field is reported only for address spaces that are currently in main storage. Dashes are used when no data is reported.
TRAN TIME	Transaction elapsed time; that is, the time that has elapsed since the current transaction began, in the form hh:mm:ss.
PR FX	One to three digit number indicating the number of private (LSQA and non-LSQA) fixed pages for the job.
AVG RS	One to three digit number indicating the average real storage utilization for the job. Depending on your choice, this field can contain either a total value for the RMF session or a changed (delta) value since the last report request.
SRM ABSORB	Number in the form nn.nnn indicating the total SRM service absorption rate for the job. This field is reported only for address spaces that are currently in main storage. Dashes are used when no data is reported. Depending on your choice, this field can contain either a total value for the RMF session or a changed (delta) value since the last report request.
TCB TIME	Number in the form nn.nnn indicating the processor time (TCB) used by the job. Depending on your choice, this field can contain either a total value for the RMF session or a changed (delta) value since the last report request.
EXCP RATE	One to five digit number indicating the EXCP rate for the job. This field always contains a value that reflects the change since the last report request.
PAGE SUM	One to four digit number indicating the common (LPA plus CSA) paging operations for the job.
NV SC	One to four digit number indicating the private non-VIO slot count. This field shows the number of non-VIO auxiliary storage slots committed to this job.
VIO SC	One to four digit number indicating the private VIO slot count. This field shows the number of VIO auxiliary slots committed to this job.

Figure 5-28. Fields in the Address Space Resource Data (ARD) Report

Address Space Resource Data by Jobname Report

The address space resource data by jobname report is the same as the address space resource data report, except that it consists of one line of data that presents address space resource data for the particular jobname that you request. The format and the information for the reports are identical, with one exception: the heading for the first field in the jobname report is

cccccccc

TIME

where cccccccc is the one to eight character name of the job you requested. The data in the first field of the report is the time the report was requested, in the form hh:mm:ss.

You can request the report repetitively to build a table of information about the address space resource data for particular job. Figure 5-29 shows an example of repetitive requests for the report.

					CPU= 81 UIC= 17 AFC= 21 ASMQ= 9 ARDJ T								
JES2	TX	TRAN	PR	AVG	SRM	TCB	EXCP	PAGE	NV	VIO			
TIME	CT	TIME	FX	RS	ABSORB	TIME	RATE	SUM	S C	S C			
10:43:14	1	03:53:00	14	53	0.00	139.71	-----	-----	98	0			
10:43:20	1	03:53:05	14	53	0.00	139.82	0.0	1086	98	0			
10:43:24	1	03:53:09	14	53	0.00	139.87	0.0	1086	98	0			
10:43:28	1	03:53:13	14	53	0.00	139.91	0.0	1086	98	0			
10:43:34	1	03:53:19	14	53	0.00	140.05	1.5	1088	98	0			
10:43:40	1	03:53:25	14	53	0.00	140.23	2.5	1088	98	0			
10:43:45	1	03:53:30	14	53	0.00	140.35	1.6	1088	98	0			
10:43:51	1	03:53:36	14	53	0.00	140.43	0.0	1090	98	0			
10:43:56	1	03:53:41	14	53	0.00	140.45	0.0	1090	98	0			
10:44:02	1	03:53:46	14	53	0.00	140.59	1.3	1090	98	0			
10:44:08	1	03:53:52	26	53	0.00	140.69	0.0	1090	98	0			
10:44:13	1	03:53:57	14	53	0.00	140.99	6.0	1090	98	0			
10:44:18	1	03:54:02	14	53	0.00	141.05	0.0	1090	98	0			

Figure 5-29. Address Space Resource Data by Jobname (ARDJ) Report

Address Space SRM Data Report

The address space SRM services data report gives an overview of the SRM services — such as processor service, MSO service, and I/O service — used by each address space in the system or each address space that meets the selection criteria that you specify when you request the report.

The number of data lines in the report depends on the number of address space identifiers in the system that meet your criteria. The report can help you to determine which jobs are using which services and whether certain jobs are creating performance problems by making excessive use of system services. Running the report in a Monitor II background session with SMF record output can provide a backup record of system use for long-running jobs.

Figure 5-30 shows a sample address space SRM services data report. The field headings, their meanings, and the possible contents are described in Figure 5-31.

```
                                          CPU=100  UIC=  47 AFC=  179 ASMQ=   6   ASRM         T
  13:48:51          P P   TRANS    TRANS    TX    TX    TX      TX      TX   TRANS     SESS
  JOENAME    DMN    G P   ACTIVE   CUR RES  CT    SC    CPU     MSO     IOC  TOTAL     TOTAL
  *MASTER*     0    0 1 19:19:19 19:19:19    1     0 1.351M 307213    2980 1.661M   1.661M
  JES2        90  255 1 19:17:16 19:17:16    1     0 1.151M 593882   60882 1.806M   1.806M
  SWGCIOc1    11    1 2 02:07:29 02:03:38    1    15   7797   5943    3510 1.335M   1.335M
  TSO77046    70  254 1 19:13:45 19:13:45    1     0 5.592M 2.488M     85 8.080M   8.080M
  SO17M       12    1 2 00:00:47 00:00:47    1     0   5649   5358    1875  12882    12882
  BKUPJOB     11    1 2 00:12:18 00:11:27    1     3   4002     53    8810  60666    60666
  WCO5F20     12    1 2 00:02:13 00:02:13    1     0   2137    159   10515  12811    12811
  MO22INV     12    1 2 00:01:28 00:01:22    1     0  12267    467    3475  16511    16511
  IMS         50   27 1 02:57:33 02:57:33    1     0 554915 612059      0 1.167M   1.167M
  RMF2         0    0 1 00:02:26 00:00:33    1     4      0      0       0   5782     5782
  WCO5MISP    11    1 2 00:23:21 00:21:49    1     4   3849   1099    8095 171308   171308
  MO15        20    2 1 00:11:01 00:11:01   24     0      0      0       0      0   294472
  MO32        25    2 5 00:01:10 00:01:10   45     0   7286   1985     190   9461   105045
  MO27        20    2 1 00:00:00 00:00:00  141     0      0      0       0      0   121757
```

Figure 5-30. Address Space SRM Data (ASRM) Report

Field Heading	Meaning
hh.mm.ss JOBNAME	One to eight character jobname associated with the address space. The JOBNAME heading is preceded by the time the report was requested, in the form hh.mm.ss.
DMN	One to three digit number identifying the domain associated with the job.
P G	One to three digit number identifying the performance group associated with the job.
P P	One digit number identifying the performance period associated with the job.
TRANS ACTIVE	Transaction elapsed time; that is, the time that has elapsed since the current transaction began, in the form hh:mm:ss.
TRANS CUR RES	Time, in the form hh.mm.ss, elapsed since the current transaction became resident.
TX CT	One to three digit number indicating the transaction count for the job. This field is reported only for address spaces that are currently in storage. Dashes are used when no data is reported.
TX SC	One digit number indicating the swap count for the current transaction.
TX CPU	One to six digit number indicating the processor service consumed by the current transaction since the last swap-in. The number can be followed by an M; the M indicates millions of units absorbed.
TX MSO	One to six digit number indicating the MSO service consumed by the current transaction since the last swap-in. The number can be followed by an M; the M indicates millions of units absorbed.
TX IOC	One to six digit number indicating the I/O service consumed by the current transaction since the last swap-in. The number can be followed by an M; the M indicates millions of units absorbed.
TRANS TOTAL	One to six digit number indicating the total SRM service consumed by the current transaction. The number can be followed by an M; the M indicates millions of units absorbed.
SESS TOTAL	One to six digit number indicating the total SRM services consumed by the entire job. The number can be followed by an M; the M indicates millions of units absorbed.

Figure 5-31. Fields in the Address Space SRM Data (ASRM) Report

Address Space SRM Data by Jobname Report

The address space SRM data by jobname report is the same as the address space SRM data report, except that it consists of one line of data that presents address space SRM data for the particular jobname that you request. The format and the information for the reports are identical, with one exception: the heading for the first field in the jobname report is

cccccccc

TIME

where cccccccc is the one to eight character name of the job you requested. The data in the first field of the report is the time the report was requested, in the form hh.mm.ss.

You can request the report repetitively to build a table of information about the address space SRM data for a particular job. Figure 5-32 shows an example of repetitive requests for the report.

```
                                      CPU= 89  UIC= 39 AFC= 106 ASMQ=  5  ASRMJ      T
UZ09241              P P  TRANS   TRANS    TX   TX    TX       TX     TX    TRANS  SESS
    TIME     DMN     G P  ACTIVE  CUR RES  CT   SC    CPU      MSO    IOC   TOTAL  TOTAL
 15:11:30     1      6 2 00:12:12 00:05:25  1    2      0        0      0  205416 205416
 15:11:37     1      6 2 00:12:19 00:05:31  1    2    452      204   1495  207567 207567
 15:11:47     1      6 2 00:12:28 00:05:41  1    2   1218      570   4625  211829 211829
 15:11:54     1      6 2 00:12:36 00:05:48  1    2   2008      945   7845  216214 216214
 15:12:12     1      6 2 00:12:53 00:00:00 ---   3   3935     2059  14610       0 ------
 15:12:48     1      6 2 00:13:28 00:06:04  1    3    348       76   2245  228689 228689
 15:12:55     1      6 2 00:13:35 00:06:11  1    3    864      213   4865  231962 231962
 15:13:02     1      6 2 00:13:42 00:06:17  1    3   2412      711  14655  243798 243798
 15:13:11     1      6 2 00:13:51 00:06:25  1    3     16        5      0  251582 251582
 15:13:25     1      6 2 00:14:05 00:06:38  1    3   2248     1376    625  260059 260059
 15:13:32     1      6 2 00:14:12 00:06:42  1    3     36        7      0  256547 256547
 15:13:39     1      6 2 00:14:18 00:06:48  1    3     36        7      0  256547 256547
 15:13:47     1      6 2 00:14:26 00:06:56  1    3     36        7      0  256547 256547
 15:13:55     1      6 2 00:14:34 00:07:04  1    3     36        7      0  256547 256547
```

Figure 5-32. Address Space SRM Data by Jobname (ASRMJ) Report

Address Space State Data Report

The address space state data report gives an overview of the current state of each address space in the system or each address space that meets the selection criteria that you specify when you request the report. Basically, it tells you where each address space is and what it is doing; you can use the report, for example, to determine which jobs are using large amounts of real storage or which jobs are being swapped excessively and why the swapping is occurring. Once a particular job has been spotted as a problem, address space state data reports for that particular job can be requested, thus enabling you to focus your reporting on a known problem area.

The number of rows in the report depends on the number of address space identifiers that meet your selection criteria. Figure 5-33 shows a sample report. The field headings, meanings, and contents are described in Figure 5-34.

15:30:02		P	P	TRAN	C	R	CPU= 47 UIC= 61 AFC= 277 ASMQ= 8 ASD TH							ASD SRM	TH CPU
JOBNAME	DMN	G	P	TIME	L	LS	DP PR	DP PO	RS F	WS IN	TX SC	WRK RV	CPU RV	I/O RV	SRM SRVC	CPU TIME
MASTER	0	0	1	06:05:54	NS		FF	1	15	0	0	0	+0	+0	452430	1021.8
JES2	0	0	1	06:05:38	NS		FF	2	54	10	0	0	+0	+0	1.104M	287.85
WHO	1	39	1	06:05:17	OT	US	76		0	4	1	100	+0	+0	29	0.10
SUPERY12	5	27	2	02:38:17	WM	DW	7F		0	8	83	150	+0	+0	1139	76.38
TCAMNCP	0	0	1	05:56:21	NS		FF	3	73	17	0	0	+0	+0	855953	401.88
RMF	0	0	1	06:05:12	WL	LW	70		0	13	6	192	+0	+0	1297	3.57
D89LGM1D	1	12	1	00:05:21	NS		71	9	13	13	0	100	+0	+0	306	0.16
INIT	0	8	1	00:57:12	WM	DW	CB		0	15	0	100	+0	+0	0	0.15
H82ARC1A	1	7	2	00:00:37	IN		76	8	45	10	0	47	+0	+0	20163	3.28
INIT	0	20	1	00:54:11	WM	DW	CB		0	8	0	150	+0	+0	0	0.31
INIT	0	29	1	00:51:52	WM	DW	CB		0	10	0	150	+0	+0	0	0.13
VTAMIPO	1	39	1	03:57:22	NS		FB	4	6	18	0	0	+0	+0	12253	9.03
D15RAS1B	1	11	2	00:03:33	WM	DW	72		0	16	2	99	+0	+0	240	0.12
D15EFGAA	1	3	2	00:04:39	IN		70	10	56	11	1	56	+0	+0	30855	12.11
SUPERZ15	5	28	1	00:52:30	WM	DW	7F		0	13	8	150	+0	+0	202	1.35
SUPERY10	5	27	2	03:43:42	WM	DW	7F		0	8	121	150	+0	+0	686	95.81
#R490358	5	20	2	00:00:47	>>	DW	FF		44	13	0	150	+0	+0	13642	0.60
E24AJC1	2	41	1	00:03:31	WT	TI	7E		0	23	0	100	+0	+0	0	1.94
D15WLV1	2	41	1	00:00:01	IN		7E	6	38	22	0	100	+0	+0	193	35.80
STARTING	0	0	1	05:05:56	WT	TI	FC		0	9	0	0	+0	+0	0	0.08
D29MAW1	2	41	1	00:00:08	WT	TO	7E		0	15	0	100	+0	+0	0	5.74

Figure 5-33. Address Space State Data (ASD) Report

Field Heading	Meaning
hh.mm.ss JOBNAME	One to eight character jobname associated with the address space. The JOBNAME heading is preceded by the time the report was requested, in the form hh.mm.ss.
DMN	One to three digit number identifying the domain associated with the job.
P G	One to three digit number identifying the performance group associated with the job.
P P	One digit number identifying the performance period associated with the job.
TRAN TIME	Transaction elapsed time; that is, the time that has elapsed since the current transaction began, in the form hh:mm:ss.
C L	Two character field showing the current location of the job. The possible contents and their meanings are: IN — In storage OT — Swapped out and ready NS — Non-swappable WM — Wait queue/MSO WL — Wait queue/long wait WT — Wait queue/terminal wait PR — Privileged >> — In the process of being swapped out of storage << — In the process of being swapped into storage
R LS	Two character field showing the reason for the last swap out associated with the job. This field is blank when the current location of the job is NS, IN, or PR. The possible contents and their meanings are: TI — Terminal input wait TO — Terminal output wait LW — Long wait XS — Auxiliary storage shortage RS — Real storage shortage DW — Detected wait RQ — Requested swap NQ — Enqueue exchange EX — Exchange based on recommendation value US — Unilateral
DP PR	One to two digit number indicating the ASCB dispatch priority for the job.
DP PO	One to two digit number indicating the position of the job on the ASCB dispatch queue.
RS F	One to three digit number indicating the number of real storage frames being used by the job.
WS IN	One to three digit number indicating the size of the working set for the job at the time it was last swapped in.
TX SC	One to three digit number indicating the swap count for the current transaction.
WRK RV	One to three digit number indicating the workload manager recommendation value for the job.
CPU RV	One to three digit number, preceded by a plus (+) or minus (−) sign, indicating the resource manager CPU recommendation value for the job.
I/O RV	One to three digit number preceded by a plus (+) or minus (−) sign, indicating the resource manager I/O recommendation value for the job.
SRM SRVC	One to six digit number indicating the total SRM service for the current transaction since its last swap-in. The number can be followed by an M; the M indicates millions of units absorbed.
CPU TIME	Amount of processor (TCB + SRB) time, in seconds, for the current job step, in the form nnn.dd, where nnn represents the number of seconds and dd hundredths of a second. Depending on your choice, this field can contain either a total value for the current job step or a changed (delta) value since the last report request. When a valid delta value cannot be computed because the job has changed steps between requests for the report, this field contains dashes when delta mode is in effect.

Figure 5-34. Fields in the Address Space State Data (ASD) Report

Address Space State Data by Jobname Report

The address space state data report by jobname is the same as the address space state data report except that it consists of one line of data giving address space state data for the particular jobname that you request. The format and the information for the reports are identical, with one exception; the heading for the first field in the jobname report is:

    cccccccc

    TIME

where cccccccc is the one to eight character name of the job you requested. The data in the first field is the time of the report, in the form of hh:mm:ss.

You can request the report repetitively to build a table of information about the address space state data for a particular job. Figure 5-35 shows an example of repetitive requests for the report.

```
                                        CPU= 85 UIC= 93 AFC= 202 ASMQ=  9  ASDJ    T
D16BCL1          P P   TRAN    C  R   DP DP  RS  WS  TX  WRK  CPU   I/O    SRM    CPU
   TIME    DMN   G P   TIME    L  LS  PR PO  F   IN  SC  RV    RV    RV    SRVC   TIME
10:04:34    2   41 1 00:00:06 WT TI 7E      0  15  0  100   +0    +0      0   36.37
11:04:50    2   41 1 00:00:00 IN     7E  8 26  25  0  100   +0    +0      0   36.91
11:05:02    3   41 2 00:00:13 IN     7D  8 55  25  0  100   +0    +0   1143   37.37
11:05:11    3   41 2 00:00:21 IN     7D 11 56  25  0  100   +0    +0   1555   37.57
11:05:18    4   41 3 00:00:28 IN     74 15 66  25  0  100   +0    +0   2078   37.78
11:05:26    4   41 3 00:00:36 IN     74 14 66  25  0  100   +0    +0   2083   37.80
11:05:35    4   41 3 00:00:44 IN     71 15 62  25  0  100   +0    +0   2582   38.02
11:03:00    4   41 1 00:01:13 WT TI 7E      0  21  0  100   +0    +0      0   34.16
11:03:07    2   41 1 00:00:05 WT TI 7E      0  15  0  100   +0    +0      0   34.17
11:03:13    2   41 1 00:00:00 IN     7E  8 45  15  0  100   +0    +0      0   34.27
11:03:19    3   41 1 00:00:07 WT TI 7E      0  35  0  100   +0    +0      0   34.70
11:03:28    2   41 1 00:00:06 WT TI 7E      0  25  0  100   +0    +0      0   34.72
11:03:34    2   41 1 00:00:12 WT TI 7E      0  25  0  100   +0    +0      0   34.72
11:03:41    3   41 2 00:00:05 IN     7D 14 51  25  0  100   +0    +0    547   34.97
11:03:48    3   41 2 00:00:12 IN     7D 10 55  25  0  100   +0    +0   1035   35.17
11:03:54    3   41 2 00:00:18 IN     7D  8 55  25  0  100   +0    +0   1452   35.34
11:04:00    4   41 3 00:00:24 IN     74 12 66  25  0  100   +0    +0   2039   35.63
11:04:08    4   41 3 00:00:32 IN     74 11 66  25  0  100   +0    +0   2043   35.65
11:04:14    4   41 3 00:00:38 IN     75 10 38  10  1  100   +0    +0     50   35.73
11:04:21    4   41 3 00:00:44 IN     74  9 42  10  1  100   +0    +0    392   35.91
11:04:28    2   41 1 00:00:00 WT TI 7E      0  15  0  100   +0    +0      0   36.37
```

Figure 5-35. Address Space State Data by Jobname (ASDJ) Report

Paging Report

The Monitor II session paging activity report presents overview information on system paging activity. Each report consists of one line of data that gives a "snapshot" view of system paging activity at the time the report was requested. When you invoke the report repetitively, you can build a table showing the differences over a period of time. Figure 5-36 shows how repetitive invocations of the report can build such a table.

All of the fields in the report except the time (TIME), length of the available frame queue (AFC), highest UIC (HI UIC), and the average of the highest UIC (A HI UIC) reflect values that show the change since the last request for the report to enable you to see more clearly the differences with each time interval.

The field headings, their meanings, and the possible contents are described in Figure 5-37.

```
                                   CPU= 75 UIC= 93 AFC= 183 ASMQ=   9  SPAG      T
            COMMON     SWP   PGS-SWPD    PRIVATE      VIO         HI  A HI
   TIME    IN  OUT REC  IN    IN   OUT  IN  OUT REC  I+O    AFC  UIC  UIC
11:00:37 0.5 0.0 0.0  1.8  31.1 34.4  19 4.1 2.2   12     65   93   93
11:00:48 0.1 0.0 0.0  1.7  36.5 35.0  15 3.5 2.7   14     86   93   93
11:00:55 0.1 0.0 0.0  2.1  41.0 38.4 9.0 0.0 2.4  0.9     34   93   93
11:01:03 0.5 0.0 0.0  1.5  34.6 50.6  24 0.0 2.3  4.6    183   93   93
10:57:52 0.3 0.1 0.0  1.9  32.7 23.0  17 1.1 2.6  1.3     25   93   82
10:57:58 0.0 0.0 0.0  1.8  37.2 38.0  13 1.0 2.7  1.3     79   97   82
10:58:04 0.2 1.7 0.0  2.0  45.8 41.0  14 4.7 4.0  0.0     81   93   82
10:58:13 0.7 0.0 0.0  2.3  53.1 54.0  21 2.1 3.1  3.2    100   93   82
10:58:21 0.6 0.0 0.0  2.4  45.3 52.9  27 0.0 2.5  3.0    105   93   90
10:58:33 0.6 0.1 0.0  2.8  46.8 53.9  23 0.7 3.2  0.3    220   93   90
10:58:46 1.0 0.0 0.0  2.6  36.1 44.8  17 3.2 2.2  6.6    209   93   90
10:58:55 0.6 0.0 0.0  2.4  29.4 52.8 9.6 1.3 3.1  1.3    252   93   93
10:59:07 0.8 0.0 0.0  2.1  26.3 40.1 4.1 0.4 1.6  0.4    241   93   93
10:59:18 0.1 1.2 0.0  1.3  21.5 14.5  13 3.4 1.7  0.4     26   25   93
10:59:34 2.2 0.0 0.0  1.6  35.1 52.7  14 1.3 2.2  1.4    181   93   93
10:59:41 0.1 0.0 0.0  1.1  14.4 22.4 9.9 0.9 0.4  1.1    150   93   93
10:59:50 1.4 0.0 0.0  2.1  41.1 55.1  15 2.2 2.0  2.2    236   93   90
11:00:00 0.4 0.0 0.0  1.4  16.0 31.1 7.1 0.9 3.9  0.9    323   93   90
11:00:08 0.6 0.0 0.0  1.3  12.8 24.1 4.4 0.0 0.8  0.0    376   93   90
11:00:18 0.1 0.0 0.0  1.3  22.4 20.4 4.7 0.0 1.1  1.2    314   93   90
11:00:27 0.7 0.0 0.1  1.7  29.2 26.0  24 8.0 1.9   16    121   93   93
```

Figure 5-36. Monitor II Paging (SPAG) Report

Field Heading	Meaning
TIME	Time the report was requested, in the form hh.mm.ss.
COMMON IN	The rate of common (LPA + CSA) pages swapped in; after the initial request, this field represents the change since the previous report.
COMMON OUT	The rate of common (LPA + CSA) pages swapped out; after the initial request, this field represents the change since the previous report.
COMMON REC	The rate of common (LPA + CSA) page reclaims; after the initial request, this field represents the change since the previous report.
SWP IN	The rate of swap-ins; after the initial request, this field represents the change since the previous report.
PGS-SWPD IN	The rate of pages swapped in; after the initial request, this field represents the change since the previous report.
PGS-SWPD OUT	The rate of swap-outs; after the initial request, this field represents the change since the previous report.
PRIVATE IN	The rate of private (VIO + non-VIO) pages swapped in; after the initial request, this field represents the change since the previous report.
PRIVATE OUT	The rate of private (VIO + non-VIO) pages swapped out; after the initial request, this field represents the change since the previous report.
PRIVATE REC	The rate of private (VIO + non-VIO) page reclaims; after the initial request, this field represents the change since the previous report.
VIO I+O	The rate of VIO pages swapped in and swapped out; after the initial request, this field represents the change since the previous report.
AFC	The average length of the available frame queue.
HI UIC	The highest unreferenced interval count (UIC).
A HI UIC	The average of the highest unreferenced interval count (UIC).

Figure 5-37. Fields in the Monitor II Paging (SPAG) Report

Real Storage/Processor/SRM Report

The real storage/processor/SRM report presents a one-line summary of the current utilization of real storage, the processor, and SRM facilities. It is a "snapshot" of system activity at the time that the report is requested. When you invoke the report repetitively, you can build a table showing the differences over a period of time. Figure 5-38 shows how repetitive invocations of the report can build such a table. This report can be extremely helpful in alerting you to any abnormal situations, thus enabling you to obtain detailed reports on a timely basis that can give the additional information you need to fully analyze the problem.

The field headings, their meanings, and the possible contents are described in Figure 5-39.

```
                                   CPU= 61  UIC= 15  AFC= 101 ASMQ=  3   SRCS      TH
                HI SQA   CM   CM  PRV CPU   IN OUT OUT LCH ASM
  TIME    AFC  UIC   F    F   FF   PF UTL    Q  RQ  WQ UTL   Q
10:49:50  180   46 104  670   62  158  56   10   1  59  33  10
10:49:54  243   48 104  670   64  149  85   11   1  58  33  10
10:49:58  267   50 104  675   62  146  51    9   2  59  33  10
10:50:03  204   52 104  675   63  165  57   11   1  59  33  10
10:50:07  227   54 104  704   62  130  81   14   0  57  33  10
10:50:11  229   56 104  704   62  141  66   12   0  59  33  10
10:50:15  189   58 104  705   62  147  60   14   0  57  12   6
10:50:19  286   60 104  705   62  127  41    9   0  62  12   6
10:50:24  257   63 104  705   63  136  56   10   0  61  12   6
10:50:29  213   65 104  710   63  155  71   11   0  60  12   6
10:50:33  237   66 104  728   62  130  49   12   0  60  12   6
10:50:37  147   68 104  728   62  155  38   15   0  58  12   6
10:50:41  212   70 104  728   62  134  37   11   0  62  12   6
10:50:45  267   72 104  730   62  122  82   11   2  61  12   6
10:50:51  218   75 104  730   65  145  84   13   1  60   9   3
10:50:56  148   78 104  730   62  161  72   13   0  61   9   3
10:51:01   87   80 104  730   62  164  75   12   1  61   9   3
10:51:07   84   15 104  570   62  155  80   11   1  62   9   3
10:51:11  101   15 104  571   62  149  61   12   1  61   9   3
```

Figure 5-38. Real Storage/Processor/SRM (SRCS) Report

Field Heading	Meaning
TIME	The time the report was requested, in the form hh.mm.ss.
AFC	The average length of the available frame queue.
HI UIC	The highest unreferenced interval count (UIC).
SQA F	The total number of SQA frames.
CM F	The total number of pageable and fixed common (LPA + CSA) frames.
CM FF	The total number of common (LPA + CSA) fixed frames.
PRV FF	The total number of private (LSQA + non-LSQA) fixed frames.
CPU UTL	A one to three digit number indicating the current processor utilization. The number reported is an average value for all processors currently online.
OUT WQ	The current length of the SRM out wait queue.
IN Q	The current length of the SRM in queue.
OUT RQ	The current length of the SRM out ready queue.
LCH UTL	A one to three digit number indicating the current SRM view of logical channel utilization.
ASM Q	The current SRM view of the length of the ASM queue.

Figure 5-39. Fields in the Real Storage/Processor/SRM (SRCS) Report

Post Processor Reports

RMF provides four types of printed reports: interval reports, duration reports, summary reports, and plot reports. Interval reports can be printed during an RMF session, or the post processor can print them at another time, for example, during off-shift hours. Samples of the interval reports printed either during a session or by the post processor appear earlier in this chapter, under either "Monitor I Session Reports" or 'Monitor II Session reports."

Post processor reports offer a choice of reporting methods that produce overview information about your system's performance. The post processor reports are:

- Duration reports, which summarize a particular system activity over a specified reporting period. See "Duration Reports" later in this chapter.

- Summary reports, which present an overview of system activity over a specified reporting period. See "Summary Reports" later in this chapter.

- Plot reports, which present a graphic summary of a number of key system performance indicators. See "Plot Reports" later in this chapter.

Only the post processor can produce duration reports, summary reports, and plot reports. The post processor generates these reports from SMF records built during a Monitor I session. While the post processor can generate interval reports from data collected during a Monitor II background session and from trace data and enqueue activity data collected during a Monitor I session, this data is not used to generate the duration, summary, or plot reports.

The post processor generates interval reports from SMF records built during a single interval; however, the post processor reports use data in SMF records that were built over a **reporting period**. The reporting period, though it could be equivalent to a single Monitor I session measurement interval, would normally span multiple intervals. The reporting period need not be a single block of continuous time; it could consist of multiple non-continuous time blocks. You could, for example, request a summary report that covers a particular time period -- such as a time of very heavy system use -- over a span of several days. Thus, the reporting period is the time span covered in a post processor report; the ranges of times and days that make up the reporting period are defined on post processor control statements, which are described under "Post Processing" in Chapter 2.

Duration Reports

The post processor can produce duration reports for the following areas of system activity, all of which are measured during a Monitor I session:

- workload activity
- processor (CPU) activity
- page/swap data set activity
- device activity
- paging activity
- channel activity

Duration reports are particularly useful when you are using an RMF Monitor I session as a high-level measurement tool. In this situation, you might run the session over long periods of time and specify SMF record output. You could then use the post processor to generate duration reports. In this way, you can measure your system's performance over long periods of time with a minimal amount of system overhead and a minimal volume of printed output.

A duration report is similar in format and content to the interval report for the same system activity. However, the duration report summarizes that system activity during all of the RMF measurement intervals that fall within the duration interval. The **duration interval** is the period of time covered in the duration report. Factors to consider in selecting the length of the duration interval and its relationship to the length of the post processor reporting period are given under "DINTV Control Statement" in "Chapter 2: Operating Procedures." In any case, the recommended maximum length of a duration interval is 24 hours. The amount of data gathered during a duration interval that exceeds 24 hours could cause some or all of the data fields in the report to overflow. When this condition occurs, the field that overflows contains either a negative number or asterisks, an indication that the length of the duration interval should be reduced.

The data fields in the duration report are identical to those in the corresponding interval report, with the following minor differences:

- In the processor activity report, any processor that had any VARY activity during the duration interval is indicated by an asterisk following the processor identifier.
- In the channel activity report, any channel that had any VARY activity during the duration interval is indicated by an asterisk following the channel identifier.
- In the I/O device activity report, any device that had any VARY activity during the duration interval is indicated by an asterisk following the device address.
- In the workload activity report, a warning message appears in the report whenever the IPS changed during the duration interval; the message indicates that the data might not be consistent.

Each of these differences is noted earlier in this chapter under "Monitor I Session Reports."

The heading fields in the duration report are also similar to those in the corresponding interval report. The heading fields identify the type of operating system, the release number and level of the operating system, the four-character SMF identifier associated with the system at system generation, and the two-digit RMF report level. The START field shows the date, in the form mm/dd/yy, and the time, in the form hh.mm.ss, when the first RMF measurement interval within the duration interval began. The END field shows the date and time when the last interval began. The INTERVAL field shows the total length of the RMF measurement intervals included in the report, in the form of hhh.mm.ss.

The CYCLE heading field indicates the length of the sampling cycle in effect during the reporting period. To set the contents of this field, the post processor uses the cycle length contained in the first SMF record it encounters. If any subsequent SMF records indicate a conflicting cycle length, all such records are ignored, and RMF issues message ERB252I to describe the records that have been omitted from the report.

Figure 5-40 shows a sample duration report for I/O device activity.

DIRECT ACCESS   D E V I C E   A C T I V I T Y

OS/VS2   SYSTEM ID 8B68   START   6/14/77-10.20.04   INTERVAL 008.10.57
RELEASE 03.70   RPT VERSION 03   END   6/14/77-19.34.54   CYCLE 1.000 SECONDS

TOTAL SAMPLES = 28,606

DEV ADR	VOLUME SERIAL	LOG CHN	DEVICE ACTIVITY COUNT	DEVICE ACTIVITY RATE	--% QLNGTH DISTRIBUTION-- 0	1	2	3	4+	AVG Q LNGTH	--%REQ DEFER-- DISTRIBUTION DEV BUSY	PATH BUSY	% DEV BUSY	% CU DELAY	% RESV DELAY	% DEV RESV	AVG DS OPEN	% ALLOC	% MT PEND
660	WB3330	6	28,874	0.980	99.6	0.4	0.0	0.0	0.0	0.00	21.71	78.29	2.16	0.21	0.2	0.4	8.1	91.9	0.0
661	SUPT01	6	51,947	1.763	99.5	0.5	0.0	0.0	0.0	0.00	44.44	55.56	4.67	0.05	0.0	1.0	1.1	72.8	0.0
662	IBTS11	6	17,767	0.603	99.7	0.3	0.0	0.0	0.0	0.00	2.20	97.80	1.50	0.16	0.2	0.5	0.4	90.9	0.0
663	HST113	6	1,144	0.039	100.0	0.0	0.0	0.0	0.0	0.00	0.00	100.00	0.08	0.00	0.0	1.9	0.3	82.7	0.0
664	UTS111	6	27,159	0.922	99.9	0.1	0.0	0.0	0.0	0.00	16.28	83.72	1.98	0.00	0.0	2.1	1.0	72.8	0.0
665	SYSPK3	6	63,097	2.142	98.9	1.0	0.1	0.0	0.0	0.01	65.15	34.85	6.05	0.05	0.0	3.0	11.9	100.0	0.0
668	IMS114	6	5,754	0.195	100.0	0.0	0.0	0.0	0.0	0.00	0.00	100.00	0.51	0.01	0.0	0.0	0.0	9.8	0.0
669	TSIO73	6	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
670	IMS113	6	8,725	0.296	100.0	0.0	0.0	0.0	0.0	0.00	0.00	100.00	0.62	0.00	0.0	0.0	0.1	14.1	0.0
671	IMS111	6	23,062	0.783	99.7	0.3	0.0	0.0	0.0	0.00	26.25	73.75	1.96	0.03	0.0	0.0	4.2	100.0	0.0
672	MISTS1 *	6	0	0.000	37.8	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
673	UTS118	6	11,090	0.376	99.9	0.1	0.0	0.0	0.0	0.00	19.44	80.56	0.94	0.00	0.0	1.4	0.6	92.1	0.0
674	SM0003	6	37,104	1.260	99.6	0.4	0.0	0.0	0.0	0.00	37.10	62.90	3.59	0.01	0.0	0.0	5.3	100.0	0.0
675	APE100	6	2,007	0.068	99.9	0.0	0.0	0.0	0.0	0.00	60.00	40.00	0.26	0.00	0.0	0.1	0.1	15.0	0.0
680	VSPOL2	6	94,203	3.198	97.7	1.9	0.3	0.1	0.0	0.03	83.33	16.67	10.12	0.02	0.0	0.0	2.2	100.0	0.0
681	CCOP21	6	23,909	0.812	99.9	0.1	0.0	0.0	0.0	0.00	0.00	100.00	2.45	0.00	0.0	0.0	0.2	41.8	0.0
682	SCRT01	6	145,168	4.928	96.1	3.2	0.6	0.1	0.0	0.05	87.99	12.01	14.64	0.00	0.0	0.0	4.0	92.4	0.0
683	CCOP27	6	16,935	0.575	99.9	0.1	0.0	0.0	0.0	0.00	2.44	97.56	1.60	0.00	0.0	0.0	0.8	54.4	0.0
685	CCOP28	6	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
731		* 7	OFFLINE																
733	JOHN01	* 7	548	0.019	2.4	3.9	0.0	0.0	0.0	0.04	77.55	22.45	4.65	0.87	0.0	0.0	0.0	3.3	0.0
734		* 7	0	0.000	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
736		* 7	0	0.000	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
810	VSRES1	8	101,154	3.434	97.3	2.1	0.3	0.1	0.2	0.04	45.54	54.46	10.07	0.43	0.0	0.0	30.7	100.0	0.0
811	APLSP1	* 8	2	0.000	62.2	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
812	SCRT02	8	123,752	4.201	96.2	3.0	0.6	0.2	0.1	0.05	79.48	20.52	13.05	0.42	0.0	3.9	3.9	94.6	0.0
813	WBTPDQ	8	74,873	2.542	99.1	0.9	0.0	0.0	0.0	0.01	40.94	59.06	6.93	0.16	0.0	0.8	0.3	92.9	0.0
814	CCOP22	8	13,988	0.475	99.8	0.2	0.0	0.0	0.0	0.00	8.20	91.80	1.51	0.08	0.0	0.0	1.0	40.6	0.0
815	PROD11	8	33,252	1.129	99.6	0.4	0.0	0.0	0.0	0.00	30.48	69.52	3.53	0.13	0.0	0.1	0.9	72.4	0.0
816	SYSB81	8	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0
817	UTS115	8	4,638	0.157	99.5	0.5	0.0	0.0	0.0	0.00	0.00	100.00	0.43	0.02	0.0	0.7	0.0	39.9	0.0
840	CCOP26	8	58,859	1.998	99.8	0.2	0.0	0.0	0.0	0.00	0.00	100.00	4.71	0.01	0.0	0.0	0.3	30.8	0.0
841	TSIO71	8	0	0.000	100.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0

Figure 5-40. Duration Report

Summary Reports

Summary reports provide a high-level view of system activity. A summary report can consist of one line of data that summarizes system activity for each interval within the reporting period, a single line of data giving summary totals for all RMF intervals within the reporting period, or both interval summary data lines and a total summary data line. You specify the type of reporting required on post processor control statements.

The data shown in the report is derived from the SMF records created by any Monitor I sessions that executed during the reporting period. When a particular system activity is not measured during the reporting period, the column or columns derived from measurement of that activity are omitted. For example, if a Monitor I session did not measure channel activity, the columns in the summary report that describe channel activity are omitted.

The heading fields for a summary report identify the type of operating system, the release number and level of the operating system, the four-character SMF identifier associated with the system at system generation, and the two-digit RMF report level. The START field shows the date and time when the first interval in the reporting period began. The END field shows the date and time when the last interval began. The date is in the form mm/dd/yy, and the time is in the form hh.mm.ss. The INTERVAL field shows the average length of the RMF measurement interval during the reporting period, in the form hhh.mm.sss. The CYCLE field shows the length of the sampling cycle during the reporting period. When all SMF records have the same cycle length, that value is reported. When different cycle lengths are encountered, the post processor sets the CYCLE field equal to the average of all cycle lengths encountered.

When a summary report consists of more than one page, the heading fields are repeated for each page. The START, END, CYCLE, and INTERVAL fields reflect the contents of the page on which they appear. When total summary data is requested, a total summary line is generated for the intervals covered on each page, and the last page of the report shows values for START, END, CYCLE, and INTERVAL that reflect the contents of all pages in the report.

Figure 5-41 shows a sample summary report, including both an interval summary line for each RMF measurement interval and a total summary line for all of the intervals. The data fields included in the report are described in the following section.

```
                                      R M F   S U M M A R Y   R E P O R T                                                    PAGE  001
                OS/VS2                      SYSTEM ID 8B68                      START 06/14/77-00.06.09   INTERVAL 00.27.51
                RELEASE 03.70               RPT VERSION 03                      END   06/14/77-20.04.54   CYCLE 1.000 SECONDS


    NUMBER OF INTERVALS 36              TOTAL LENGTH OF INTERVALS 16.42.58


    DATE  TIME      INT    CPUO  SELO BLMXO  DASD JOB JOB TSO TSO STC STC SWAP DEMAND SERVICE  TRANS
    MM/DD HH.MM.SS MM.SS   BUSY  RATE RATE   RATE MAX AVE MAX AVE MAX AVE RATE PAGING  RATE    RATE

    6/14 00.06.09 29.51   99.6  20.6  75.2  95.8  18  17   2   2  15  12 0.21  3.21    1825   0.178
    6/14 00.36.01 29.59   97.8  15.6  82.0  97.6  20  18   2   2  14  12 0.09  1.86    1793   0.067
    6/14 01.06.00 29.59   89.4   8.5  92.4 101.0  20  15   2   2  19  15 0.09  1.02    1495   0.053
    6/14 01.36.00 29.59   91.9   4.8  88.1  92.9  16  15   1   0  17  15 0.01  0.48    1632   0.002

    6/14 02.05.59 30.00   87.3   5.4 100.8 106.2  16  14   1   1  16  15 0.05  0.78    1554   0.027
    6/14 02.36.00 30.00   85.4   3.1  69.9  72.9  14  12   1   1  20  17 0.03  0.75    1260   0.013
    6/14 03.06.00 29.59   82.6   1.7  56.5  58.2  11  10   1   0  21  19 0.03  0.55    1602   0.010
    6/14 04.19.40 30.00   20.9   0.3  12.3  12.6   1   0   1   0  20  18 0.06  0.50     386   0.017

    6/14 04.49.40 30.00   61.8   0.6  49.7  50.4   7   5   1   1  20  17 0.05  0.64    1108   0.034
    6/14 05.19.40 30.00   72.3   1.2  36.4  37.6  10   7   2   2  18  16 0.07  0.89    1243   0.040
    6/14 05.49.40 29.59   75.1   1.6  47.1  48.7  11   9   2   2  16  14 0.05  0.60    1124   0.030
    6/14 06.19.40 41.55   76.3   0.3  29.1  29.4   9   7   3   2  19  16 0.08  0.86    1339   0.060

    6/14 07.01.35 18.05   99.4   1.1  33.5  34.5  10   8   3   3  16  15 0.22  1.71    1843   0.205
    6/14 07.19.41 30.12   99.5   5.1  40.3 131.9  10   7  11   6  20  17 0.38  2.32    1749   0.108
    6/14 07.49.53 29.53   98.5  33.1  62.1  95.4  12   9  29  16  19  14 0.95  5.96    1766   0.893
    6/14 08.19.46 30.32   98.3  29.2  77.4 106.5  13  11  41  34  16  14 1.94 11.35    1570   1.653

    6/14 08.50.19 30.16   98.4  55.8  92.3 148.2  14  12  43  36  15  13 2.04 12.08    1601   1.842
    6/14 09.20.35 29.41   95.7  41.8  80.6 122.4  14  14  42  36  13  11 1.76 11.75    1650   1.448
    6/14 09.50.17 29.47   97.7  34.4  92.2 126.6  14  13  42  39  13  11 2.08 13.69    1717   1.838
    6/14 10.20.04 30.11   98.3  19.2  77.0  96.2  13  12  41  37  14  12 1.26  9.93    1662   1.133

    6/14 10.50.16 29.42   95.6  18.3  91.3 109.6  13  13  41  37  16  12 1.73 11.86    1446   1.522
    6/14 12.02.08 30.01   82.5  17.7 100.9 671.9   9   6  17  13  21  13 0.77  4.42    1388   0.226
    6/14 12.32.10 30.08   99.1  13.1  91.2 104.4  11   9  25  22  16  14 1.16  6.83    1649   1.076
    6/14 13.02.18 30.35   94.9  25.1  90.3 115.4  14  12  30  26  15  12 1.22  9.60    1721   1.081

    6/14 13.32.53 29.42   99.4  21.6 120.1 141.8  14  12  38  34  15  12 1.60 12.80    1392   1.432
    6/14 14.02.35 29.40   98.0  27.1  94.3 121.4  14  12  34  31  13  11 1.82 13.20    1753   1.631
    6/14 14.32.16 29.52   75.3  20.2  80.6 100.7  14  12  40  35  13  12 1.78 13.14    1135   1.054
    6/14 15.02.08 30.05   31.5   4.5  19.0  23.5  12  11  45  42  14  13 0.74  3.99     407   0.381

    6/14 15.32.13 40.57   92.6   9.6  50.1  59.8  14  12  40  37  14  11 1.08  6.33    1073   0.922
    6/14 17.04.54 30.00   65.5   8.1  59.3 676.7  10   5   5   3  21   9 0.27  1.91    1479   0.061
    6/14 17.34.55 29.59   90.4  18.5  93.4 112.1  16  14   7   5  12   9 0.39  3.68    1743   0.317
    6/14 18.04.54 30.08   98.6  20.9 111.1 132.0  17  16   7   5  11   9 0.63  5.56    1671   0.579

    6/14 18.35.03 29.52   99.6  21.4  91.2 112.7  17  16   7   5  12  10 0.39  5.44    1773   0.326
    6/14 19.04.55 29.58   87.6   8.6  78.3 189.2  18  16   4   4  15  12 0.42  5.36    1214   0.175
    6/14 19.34.54 29.59   93.8   6.5  51.4  58.1  15  11   4   3  12   8 0.39  3.57    1660   0.213
    6/14 20.04.54 30.00   87.3  19.2  75.7  94.9  14  11   3   1  18  13 0.20  3.48    1581   0.152


    TOTAL/AVERAGE         86.4  15.1  71.8  94.4  20  11  45  14  21  13 0.72  5.34    1463   0.618
```

Figure 5-41. Summary Report

Data Fields

Two fields precede the data fields. NUMBER OF INTERVALS indicates the number of RMF measurement intervals included in the reporting period. TOTAL LENGTH OF INTERVALS indicates (in the form hh.mm.ss) the total length of the reporting period.

When a summary report consists of more than one page, the NUMBER OF INTERVALS field and the TOTAL LENGTH OF INTERVALS field reflect the contents of the page on which they appear. When total summary data is requested, a total summary line is generated for the intervals covered on each page, and the last page of the report shows values for NUMBER OF INTERVALS and TOTAL LENGTH OF INTERVALS and presents a total summary data line that reflect the contents of all pages in the report.

The meaning of each field in the report is described in the following text. The first three fields, which describe the date, starting time, and length of each RMF measurement interval included in the reporting period, appear only when you request interval summary data. All other fields appear for both interval summary data and total summary data. The single line that reports total summary data begins with the heading TOTAL/AVERAGE.

DATE
MM.DD

The date, in the form mm/dd, when each interval included in the summary report began. This field is reported when you specify interval summary data; it does not appear in the total summary data line.

TIME
HH.MM.SS

The start time for each interval included in the summary report, in the form hh.mm.ss. This field is reported when you specify interval summary data; it does not appear in the total summary line.

INT
MM.SS

The actual length of each interval included in the summary report, in the form mm.ss. This field is reported when you specify interval summary data; it does not appear in the total summary line.

CPU

BUSY

The percentage of time during the reporting period when the processor was busy. The value reported comes from the same source as the WAIT TIME PERCENTAGE field in the processor (CPU) activity interval report.

If your system has a single processor, the summary report includes a single column with a heading of CPUn BUSY, where **n** is either 0 or 1. If your system has two processors, the summary report includes two columns, identified by CPU0 BUSY and CPU1 BUSY. The range of values in the data fields is from 00.0 to 100.0 percent.

In the total summary line, this field indicates the average processor-busy percentage for each processor over all of the measurement intervals included in the reporting period (or page).

This column is omitted when processor (CPU) activity was not measured during the reporting period.

SEL

RATE

The activity per second for all selector channels attached to each processor. The value reported corresponds to the total for the ACTIVITY PER SECOND field for all selector channels in the channel activity interval report.

If your system has a single processor, the summary report includes a single column with a heading of SELn RATE, where **n** is either 0 or 1. If your system has two processors, the summary report includes two columns, identified by SEL0 RATE and SEL1 RATE.

The rate is calculated by dividing the number of successful Start I/O instructions issued to the channels during the interval by the length of the interval. The range of values is from 0.0 to 99.9.

In the total summary line, this field indicates the average activity rate over all of the intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of successful Start I/O instructions issued during all intervals included in the reporting period and divides that total by the length of all the intervals included in the reporting period.

This column is omitted when channel activity was not measured during the reporting period.

BLMX
RATE

The activity per second for all block multiplexor channels attached to each processor. The value reported corresponds to the total for the ACTIVITY PER SECOND field for all BLOCK MPX channels in the channel activity interval report.

If your system has a single processor, the summary report includes a single column with a heading of BLMXn RATE, where n is either 0 or 1. If your system has two processors, the summary report includes two columns, identified by BLMX0 RATE and BLMX1 RATE.

The rate is calculated by dividing the number of successful Start I/O instructions issued to the channels during the interval by the length of the interval. The range of values is from 000.0 to 999.9.

In the total summary line, this field indicates the average activity rate over all of the intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of successful Start I/O instructions issued during all intervals included in the reporting period and divides that total by the length of all the intervals included in the reporting period.

This column is omitted when channel activity was not measured during the reporting period.

DASD
RATE

The activity per second for all direct access storage devices attached to all processors included in the report. The value reported corresponds to an accumulation of each DEVICE ACTIVITY RATE field in the direct access device activity report.

The rate is calculated by dividing the number of successful Start I/O instructions issued to the devices during the interval by the length of the interval. The range is from 00.0 to 99.9.

In the total summary line, this field indicates the average activity rate for all direct access storage devices over all of the measurement intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of successful Start I/O instructions issued during all intervals included in the reporting period and divides that total by the length of all the intervals included in the reporting period.

This column is omitted when I/O device activity for direct access storage devices was not measured during the reporting period.

TAPE
RATE

The activity per second for all magnetic tape devices attached to all processors included in the report. The value reported corresponds to an accumulation of each DEVICE ACTIVITY RATE field in the magnetic tape device activity interval report.

The rate is calculated by dividing the number of successful Start I/O instructions issued to the devices during the interval by the length of the interval. The range is from 00.0 to 99.9.

In the total summary line, this field indicates the average activity rate for all magnetic tape devices over all of the measurement intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of successful Start I/O instructions issued during all intervals included in the reporting period and divides that total by the length of all intervals included in the reporting period.

This column is omitted when I/O device activity for magnetic tape devices was not measured during the reporting period.

JOB
MAX

The maximum number of batch jobs that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the MAX number of BATCH address spaces in the processor (CPU) activity interval report.

In the total summary line, this field indicates the maximum number of batch jobs noted during any of the measurement intervals included in the reporting period (or page).

This column is omitted when processor (CPU) activity was not measured during the reporting period.

JOB
AVE

The average number of batch jobs that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the AVG number of BATCH address spaces in the processor (CPU) activity interval report.

In the total summary line, this field indicates the average number of batch jobs for the reporting period (or page). The value is calculated by dividing the total number of active jobs observed by the total number of samples.

This column is omitted when processor (CPU) activity was not measured during the reporting period.

TSO
MAX

The maximum number of TSO sessions that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the MAX number of TSO address spaces in the processor (CPU) activity report.

In the total summary line, this field indicates the maximum number of TSO sessions noted during any of the measurement intervals included in the reporting period (or page).

This column is omitted when processor (CPU) activity was not measured or TSO was not active during the reporting period.

TSO
AVE

The average number of TSO sessions that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the AVG number of TSO address spaces in the processor (CPU) activity interval report.

In the total summary line, this field indicates the average number of TSO sessions for the reporting period (or page). The value is calculated by dividing the total number of active TSO sessions observed by the total number of samples.

This column is omitted when processor (CPU) activity was not measured or TSO was not active during the reporting period.

STC
MAX

The maximum number of started tasks and mount tasks that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the MAX number of STC address spaces in the processor (CPU) activity interval report.

In the total summary line, this field indicates the maximum number of started tasks and mount tasks noted during any of the measurement intervals included in the reporting period (or page).

This column is omitted when processor (CPU) activity was not measured during the reporting period.

STC
AVE

The average number of started tasks and mount tasks that were active during each measurement interval. The range is from 0 to 999. The value reported corresponds to the AVG number of STC address spaces in the processor (CPU) activity interval report.

In the total summary line, this field indicates the average number of started tasks and mount tasks for the reporting period (or page). The value is calculated by dividing the total number of started tasks and mount tasks observed by the total number of samples.

This column is omitted when processor (CPU) activity was not measured during the reporting period.

SWAP

RATE

The number of swaps per second for each interval. The value reported corresponds to the SWAPS PER SECOND field under SWAP SEQUENCE COUNTS in the Monitor I paging activity interval report.

The rate is calculated by dividing the total number of swaps occurring during the interval by the length of the interval. The range is from 0.00 to 9.99.

In the total summary line, this field indicates the average swap rate over all of the measurement intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of swaps during all intervals included in the reporting period and divides that total by the length of all intervals included in the reporting period.

This column is omitted when paging activity was not measured during the reporting period.

DEMAND

PAGING

The number of demand paging requests per second for each interval. The value reported corresponds to the sum of the PAGE RECLAIMS/NON VIO/RATE and PAGE IN/NON VIO/NON SWAP fields in the Monitor I paging activity interval report.

The rate is calculated by dividing the total number of non-VIO, non-swap page-ins and page reclaims by the length of the interval. The range is from 0.00 to 999.99.

In the total summary line, this field indicates the average demand paging rate over all of the measurement intervals included in the reporting period (or page). To calculate the rate, the post processor computes the total number of non-VIO, non-swap page-ins and page reclaims during all intervals included in the reporting period. That total is then divided by the length of all intervals included in the reporting period.

This column is omitted when paging activity was not measured during the reporting period.

SERVICE

RATE

The number of service units (input/output service, processor service, and main storage service) absorbed during each second of the interval. The value reported corresponds to the INTERVAL SERVICE/PER SEC= field in the system summary workload activity interval report.

The rate is calculated by dividing the total number of service units absorbed by the length of the interval. The range is from 0 to 9,999,999.

In the total summary line, this field contains the number of service units absorbed per second over the total length of the reporting period (or page). To calculate the rate, the post processor computes the total number of service units absorbed during all intervals included in the reporting period and divides that total by the length of all intervals included in the reporting period.

This column is omitted when workload activity was not measured during the reporting period.

TRANS

RATE

The number of transactions that ended during each second of the interval. The value reported comes from the same source as the ENDED TRANSACTIONS field in the workload activity interval report.

The rate is calculated by dividing the total number of ended transactions for the interval by the length of the interval. The range is from 0.000 to 9.999.

In the total summary line, this field contains the average rate of ended transactions over the reporting period (or page). To calculate the rate, the post processor computes the total number of ended transactions during all intervals in the reporting period and divides that total by the length of all intervals included in the reporting period.

This column is omitted when workload activity was not measured during the reporting period.

Plot Reports

Plot reports present a graphic summary of system activity over a specified time range -- the plot reporting period. Plot reports, like the other post processor reports, are generated from data contained in SMF records built during a Monitor I session. The post processor selects the SMF records to be used according to the type of plots that you request and the reporting period that you specify. You describe the type of plot reporting you require on control statements for the post processor. These control statements are:

- PLOTS, which defines the types of plots you require. See "PLOTS Control Statement" in Chapter 2 for details. The description of each different type of plot later in this section includes the option you must specify on the PLOTS statement for each report.

- PINTV, which specifies the length of the plot interval. The **plot interval** is the length of time that is to elapse between plotting each line in the report. For most effective plot reporting, the plot interval should be either equal to the RMF measurement interval or a multiple of the RMF measurement interval. See "PINTV Control Statement" in Chapter 2 for more details.

- PTOD, which specifies the length of time to be included in the plot report for each day in the reporting period. See "PTOD Control Statement" in Chapter 2.

- MAXPLEN, which specifies the maximum number of lines to be included in each plot report. See "MAXPLEN Control Statement" in Chapter 2.

Each page of plot report output consists of headings and space for two plot reports. The heading fields identify the type of operating system, the release number and level of the operating system, the four-chracter SMF identifier associated with the system at system generation, and the two-digit RMF report level. The START field shows the date, in the form mm/dd/yy, and the time, in the form hh.mm.ss, when the first RMF measurement interval in the plot reporting period began. The END field shows the date and time when the last interval began. The INTERVAL field shows the length of the plot interval -- the value specified on the PINTV control statement or, when the PINTV statement was omitted, the default supplied by the post processor. The CYCLE field shows the average length of the cycle at which data was sampled during the plot reporting period.

Each plot report consists of a heading that identifies the plot report, the measurement scale for that report, and a line of plot data for each plot interval within the plot reporting period.

The measurement scale can be either a percentage range or a range of fixed numbers, depending on the type of plot that you request. It is possible that the measurement scale provided for each plot cannot reflect the activity of your particular system accurately; perhaps the range is too small or too large. When the value recorded for a plot line exceeds the upper limit of the measurement scale, RMF prints plus signs (+) across the entire line. A field within the line of plus signs indicates the value recorded. Should your reports indicate that a measurement scale is not adequate for your particular installation, you can modify the measurement scale for any type of plot. The procedure to follow and an example of how to modify the measurement scale for a plot report appear later in this chapter under "Modifying the Measurement Scale."

Figure 5-42 shows a sample of plot report output. As the figure shows, each line in the plot report consists of a line of asterisks that indicate the point on the measurement scale recorded for each plot interval. Each line in the plot is preceded by the time when the RMF measurement interval that collected the plotted data began; the first plot line in each calendar day included in the report is indicated by the number of the day of the month. When more than one RMF interval is used for each plot line, the data from the intervals used is combined. The time shown is the time for the first measurement interval.

Types of Plot Reports

The following areas of system activity can be reported in the form of a plot. Each plot report description includes:

- The name of the plot report.
- The option used to request the plot report.
- The system activity measured in the plot report.
- The heading and measurement scale for the plot report.
- The type of Monitor I session measurement activity that is required to generate the plot report.

The plot reports are described in alphabetical order.

R M F   P L O T   R E P O R T

OS/VS2
RELEASE 03.70

SYSTEM ID 8B68
RPT VERSION 03

START 06/15/77-03.35.04
END   06/15/77-23.32.17

INTERVAL 00.30.00
CYCLE 1.000 SECONDS

CPU BUSY PERCENTAGE - CPU 0

TOTAL PAGING RATE
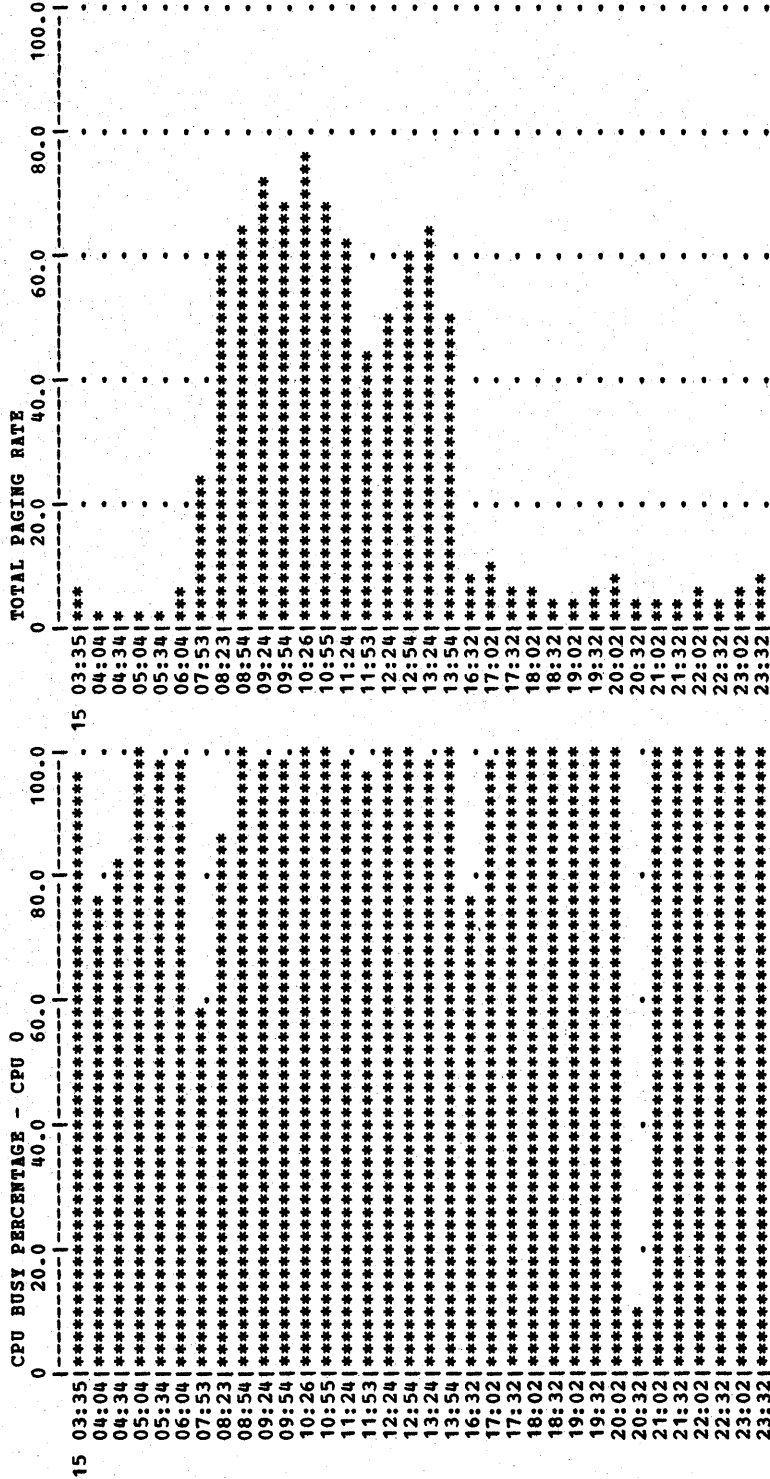
Figure 5-42. Plot Report

Batch Users (BATCH): plots the maximum number of batch users. The value reported corresponds to the MAX number of BATCH address spaces in the processor (CPU) activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 MAXIMUM BATCH UTILIZATION
0           20          40          60          80         100
|---------|---------|---------|---------|---------|
```

The maximum number of batch users can be plotted only when processor (CPU) activity was measured during the reporting period.

Channel Activity Rate (CAC): plots the channel activity rate -- the number of successful Start I/O instructions per second issued to the channel. The rate corresponds to the ACTIVITY PER SECOND field in the channel interval report.

You can obtain a single report for a specific channel or separate reports for all channels attached to a processor; however, the activity rate for a byte multiplexor channel cannot be plotted.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 CPU  n  CHANNEL  mm             ACTIVITY RATE
0        10.0        20.0        30.0        40.0        50.0
|---------|---------|---------|---------|---------|
```

CPU **n** identifies the processor and CHANNEL **mm** identifies the channel.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The channel activity rate can be plotted only when channel activity was measured during the reporting period.

Channel Busy (CH): plots the percentage of time when a channel was busy. The value reported corresponds to the PERCENT CHANNEL BUSY field in the channel activity interval report.

You can obtain a single report for a specific channel or separate reports for all channels attached to a processor.

The measurement scale consists of percentages. The heading and measurement scale for the report are:

```
 CPU  n  CHANNEL  mm             BUSY PERCENTAGE
0        10.0        20.0        30.0        40.0        50.0
|---------|---------|---------|---------|---------|
```

CPU **n** identifies the processor and CHANNEL **mm** identifies the channel.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The channel busy percentage can be plotted only when channel activity was measured during the reporting period.

Channel Service Time (CSV): plots the average time a channel required to process an I/O request. The value reported corresponds to the AVERAGE SERVICE TIME field in the channel activity interval report.

You can obtain a single report for a specific channel or separate reports for all channels attached to a processor.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 CPU n CHANNEL mm     AVERAGE SERVICE TIME
0      0.010     0.020      0.030      0.040      0.050
|---------|---------|---------|---------|---------|
```

CPU **n** identifies the processor and CHANNEL **mm** identifies the channel.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The channel service time can be plotted only when channel activity was measured during the reporting period.

Demand Paging Rate (PAGE): plots the demand paging rate. The rate reported is the number of non-VIO, non-swap page-ins and page reclaims per second. The rate corresponds to the sum of the PAGE RECLAIMS/NON VIO/RATE and PAGE IN/NON VIO/NON SWAP fields in the Monitor I paging activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 DEMAND PAGING RATE
0       10.0      20.0      30.0      40.0      50.0
|---------|---------|---------|---------|---------|
```

The demand paging rate can be plotted only when paging activity was measured during the reporting period.

Device Activity Rate (DAC): plots the device activity rate -- the number of successful Start I/O instructions per second issued to the device -- for a specific device. For a multiple exposure device, the activity rate is the sum of the activity rates for all exposures. The rate corresponds to the DEVICE ACTIVITY RATE field in the I/O device activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 DEVICE cuu               ACTIVITY RATE
0      3.000     6.000     9.000     12.000     15.000
 |---------|---------|---------|---------|---------|
```

DEVICE **cuu** identifies the device included in the report; **cuu** is the device address.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The device activity rate can be plotted only when I/O device activity for the appropriate device class was measured during the reporting period.

Device Busy (DV): plots the percentage of time when a specific device was busy. For a multiple exposure device, the device-busy percentage reflects the time when at least one exposure of the device was busy. The value reported corresponds to the % DEVICE BUSY field in the I/O device activity interval report.

The measurement scale consists of percentages. The heading and measurement scale for the report are:

```
 DEVICE cuu               BUSY PERCENTAGE
0      10.0      20.0      30.0      40.0      50.0
 |---------|---------|---------|---------|---------|
```

DEVICE **cuu** identifies the device included in the report; **cuu** is the device address.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The device-busy percentage can be plotted only when I/O device activity for the appropriate device class was measured during the reporting period.

Device Service Time (DSV): plots the average time a specific device required to process an I/O request. For a multiple exposure device, the average service time includes all I/O requests for any exposure of the device. The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 DEVICE cuu            AVERAGE SERVICE TIME
0       0.050     0.100     0.150       0.200       0.250
|---------|---------|---------|---------|---------|
```

DEVICE cuu identifies the device included in the report; **cuu** is the device address.

An asterisk preceding the time of a plot data line indicates that records were ignored because the sampling cycle changed during the reporting period.

The device service time can be plotted only when I/O device activity for the appropriate device class was measured during the reporting period.

Processor Busy (CPUID): plots the percentage of time when the processor was busy. A report can be obtained for a specific processor or separate reports can be obtained for all processors. The percentage comes from the same source as the WAIT TIME PERCENTAGE field in the processor (CPU) activity interval report.

The value reported is calculated by subtracting the wait time percentage for a processor from 100 percent.

The measurement scale consists of percentages. The heading and measurement scale for the report are:

```
 CPU BUSY PERCENTAGE - CPU n
0       20.0      40.0       60.0        80.0       100.0
|---------|---------|---------|---------|---------|
```

CPU n identifies the processor included in the report, where **n** is either 0 or 1.

The percentage of time a processor was busy can be plotted only when processor (CPU) activity was measured during the reporting period.

Service Rate (SEV): plots the service rate -- the number of service units provided per second. The rate corresponds to the INTERVAL SERVICE/PER SEC= field in the workload activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 SERVICE RATE
0       800       1600      2400        3200       4000
|---------|---------|---------|---------|---------|
```

An asterisk preceding the time of a plot data line indicates that the IPS changed during the reporting period.

The service rate can be plotted only when workload activity was measured during the reporting period.

Started Task and Mount Task Users (STC): plots the maximum number of started task and mount task users. The value reported corresponds to the MAX number of STC address spaces in the processor (CPU) activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 MAXIMUM STC UTILIZATION
0          10          20          30          40          50
|---------|---------|---------|---------|---------|
```

The number of started task and mount task users can be plotted only when processor (CPU) activity was measured during the reporting period.

Swap Rate (SWA): plots the swap sequence rate -- the number of times per second that storage was swapped out and then swapped in. The rate corresponds to the SWAPS PER SECOND field in the Monitor I paging activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 SWAP RATE
0       0.500       1.000       1.500       2.000       2.500
|---------|---------|---------|---------|---------|
```

The swap rate can be plotted only when paging activity was measured during the reporting period.

Total Paging Rate (TPAG): plots the total paging rate. To calculate the rate, the post processor determines the total number of page-ins and page-outs that occurred for any reason during each plot interval; this total is divided by the number of seconds in the plot interval. Page reclaims are not included in the calculation; the rate reported thus represents the I/O activity performed because of paging. The rate corresponds to the sum of the SUM/TOTAL RATE/PAGE IN and SUM/TOTAL RATE/PAGE OUT fields in the Monitor I paging activity report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 TOTAL PAGING RATE
0      20.0        40.0        60.0        80.0        100.0
|---------|---------|---------|---------|---------|
```

The total paging rate can be plotted only when paging activity was measured during the reporting period.

Transaction Rate (TRA): plots the number of ended transactions per second. The rate reported comes from the same source as the ENDED TRANSACTIONS field in the workload activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 TRANSACTION RATE
0       0.500       1.000       1.500       2.000       2.500
|---------|---------|---------|---------|---------|
```

An asterisk preceding the time of a plot data line indicates that the IPS changed during the reporting period.

The transaction rate can be plotted only when workload activity was measured during the reporting period.

TSO Sessions (TSO): plots the maximum number of TSO sessions. The value reported corresponds to the MAX number of TSO address spaces in the processor (CPU) activity interval report.

The measurement scale consists of fixed numbers. The heading and measurement scale for the report are:

```
 MAXIMUM TSO UTILIZATION
0          20          40          60          80          100
|---------|---------|---------|---------|---------|
```

The number of TSO sessions can be plotted only when processor (CPU) activity was measured and TSO was active during the reporting period.

Modifying the Measurement Scale

Measurement scales are provided for each plot report; these scales reflect average system use. However, you might find that some or all of the measurement scales provided are not suitable for reflecting actual system use at your installation. Such a condition is indicated when plot lines consistently overflow the measurement scale or when plot lines consistently cluster on the low end of the measurement scale. When either condition occurs, you can modify the upper limit of the measurement scale for any plot that requires a change. When you modify the upper limit, the major break points within the scale are modified automatically.

The upper limits of each measurement scale appear in the data control section ERBMFPLD within the ERBRMFPP load module. Figure 5-43 shows each plot option, the offset into control section ERBMFPLD required to access the upper limit for each plot, the contents of each entry in ERBMFPLD, and the upper limit of each measurement scale.

Each entry consists of two words. The first word contains the maximum value. The second word contains the scale factor, that is, the power of ten by which the maximum value is multiplied to arrive at the upper limit. For example, the upper limit for the swap rate plot (SWA) is 2.50; this is computed by multiplying the maximum value (2500) by the scale factor (10^{-3} or .001). Note that the scale factor must not be modified; you change the upper limit by modifying the maximum value only.

To change the scale for a particular report, perform the following steps:

1. Determine the upper limit that you require for the scale you are modifying. The values RMF prints when a plot line exceeds the upper limit can help you to determine a new upper limit that is suitable for your installation. The limit you choose must be a multiple of five.

2. Use Figure 5-43 to locate the offset to the maximum value for the scale you are modifying. Determine the maximum value that, multiplied by the scale factor, will yield the upper limit that you want. Convert that number to hexadecimal.

3. Run AMASPZAP to update the maximum value for the entry in ERBMFPLD that describes the plot whose measurement scale you are modifying.

| PLOTS Option | Offset (hex) | ERBMFPLD Entry | | | |
| | | Maximum Value | | Scale Factor | Upper Limit |
		Dec	Hex		
CPUID	0	1000	(3E8)	−1	100
STC	8	50	(32)	0	50
TSO	10	100	(64)	0	100
BATCH	18	100	(64)	0	100
CH	20	500	(1F4)	−1	50
CAC	28	500	(1F4)	−1	50
CSV	30	50	(32)	−3	0.050
DV	38	500	(1F4)	−1	50
DAC	40	15000	(3A98)	−3	15.00
DSV	48	250	(FA)	−3	.250
PAGE	50	500	(1F4)	−1	50
TPAG	58	1000	(3E8)	−1	100
SWA	60	2500	(9C4)	−3	2.50
SEV	68	4000	(FA0)	0	4000
TRA	70	2500	(9C4)	−3	2.50

Figure 5-43. Measurement Scale Entries

Example

The measurement scale for the swap rate plot report runs from 0 to 2.50.
Assume that you want to raise the upper limit to extend the scale from 0 to
4.00. The maximum value for SWA, located at offset X'60' from the
beginning of ERBMFPLD, is 2500 (X'9C4'). To achieve an upper limit of
4.00, the maximum value for SWA must be changed to 4000 (X'FA0').
The superzap job required to change the measurement scale is:

```
//ZAPLIMIT  JOB      accounting information,MSGLEVEL=1
//S1        EXEC       PGM=AMASPZAP
//SYSPRINT  DD       SYSOUT=A
//SYSLIB    DD       DSN=SYS1.LINKLIB,DISP=OLD
//SYSIN DD         *
   NAME     ERBRMFPP     ERBMFPLD
   VER 60        000009C4
   REP 60        00000FA0
/*
```

Chapter 6: SMF Records

Each SMF record contains information similar to the contents of the corresponding formatted report. Some totals, averages, and percentages are not explicitly contained in the SMF records, but are calculated from the SMF data. All SMF records are described below. For elaboration of particular fields in these records, see the descriptions of the corresponding fields in the printed report descriptions in Chapter 5.

Each SMF record produced by RMF is described in this chapter. The record types and the corresponding RMF measurement activities are:

● Record Type 70 – CPU activity
● Record Type 71 – paging activity
● Record Type 72 – workload activity
● Record Type 73 – channel activity
● Record Type 74 – device activity
● Record Type 75 – page/swap data set activity
● Record Type 76 – trace activity
● Record Type 77 – enqueue activity
● Record Type 79 – Monitor II activity

Record type 79 has five sub-types; these sub-types are:

● Sub-type 1 – address space state data
● Sub-type 2 – address space resource data
● Sub-type 3 – paging
● Sub-type 4 – real storage/processor/SRM
● Sub-type 5 – address space SRM data

Each SMF record has an indentical header and common control data section. Note that the header section *includes* the record descriptor word (RDW). The RDW is a 4-byte field that must precede an SMF record when it is written to the SMF data set by the SMFWTM macro instruction. The first two bytes of the RDW contain the length of the logical record (including the four bytes of the RDW). The maximum length of an SMF record is 32,756 bytes.

A field located at offset 40 in the common control data section contains the RMF version number. The contents of this field can be one of the following:

● X'F0F1' for an SMF record produced by MF/1

● X'F0F2' for an SMF record produced by RMF, Version 1, which can be processed only by the Version 1 post processor (or an installation-supplied data reduction program)

● X'F0F3' for an SMF record produced by RMF, Version 2

If your installation has existing data reduction programs that use SMF record input, check the SMF record formats carefully to determine what changes are required. Note that using the SMF record mapping macro instructions supplied by RMF is the most flexible way to access the contents of the SMF records your programs require. When you use the mapping macros, usually only a re-assembly of your program is required to incorporate changes to the record format.

The SMF record mapping macro instruction is ERBSMFR. Its format is:

ERBSMFR (nn,[,nn,...])

where nn identifies the type(s) of the SMF record(s) you want to map. Note that the parentheses are required only when two or more SMF record types are specified.

The mapping macros reside in SYS1.RMFMAC01.

Because RMF can generate spanned SMF records — particularly when I/O device activity is measured — the JCL describing an input SMF record data set should specify RECFM=VBS and a logical record length (LRECL) that is at least equal to the length of the longest record.

Record Type 70 — CPU Activity

Record type 70 is written by ERBMFDCP for each measurement interval and when the session is terminated. It contains data that identifies each CPU, its status, and the amount of wait time that has taken place during an RMF reporting interval, as well as data that describes address space utilization during an interval. Its length is 484 bytes plus 16 bytes for each CPU entry.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF70LEN	2	binary		Record length
2	2	SMF70SEG	2	binary		Segment descriptor
4	4	SMF70FLG	1	binary	SMFWTM service routine	System indicator
						Bit *Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF70RTY	1	binary	internal	Record type: 70 (X'46')
6	6	SMF70TME	4	binary	SMFWTM service routine	Time, in hundredths of a second record was moved to SMF buffer
10	A	SMF70DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer, in the form 00yydddF where F is the sign
14	E	SMF70SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF70SIZ	2	binary	internal	Size of common control data section
20	14	SMF70IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDCP)	Time RMF measurement interval started, in the form 0hhmmssF where F is the sign
24	18	SMF70DAT	4	packed	CVTDATE (Set by ERBMFDCP)	Date RMF measurement interval started, in the form 00yydddF where F is the sign
28	1C	SMF70INT	4	packed	STCK operand of TIME macro (Set by ERBMFDCP)	Duration of RMF measurement interval, in the form mmsstttF where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF70MOD	2	signless packed	CVTMDL	CPU model number
34	22	SMF70SUB	2	binary		Reserved
36	24	SMF70SAM	4	binary	internal (Set by ERBMFECP)	Number of samples
40	28	SMF70MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF70RV1	2	binary		Reserved
44	2C	SMF70RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF70CYC	4	packed	internal	Sampling cycle length in the form 000ttttF, where F is the sign

(continued)

Offsets		Name	Length	Format	Source	Description
CPU Control Section:						
52	34	SMF70SCC	2	binary	internal	Size of CPU control section
54	36	SMF70CPU	2	binary	CVTMAXMP+1	Number of CPU data sections in this record. (Data is not printed for CPUs that were offline at the end of the measurement interval, or had any VARY activity during the interval.)
56	38	SMF70SCD	2	binary	internal	Size of each CPU data section
58	3A	SMF70SAS	2	binary	internal	Length of ASID data section that follows CPU data section
60	3C	SMF70SUS	14	binary	SUBITS	SU bit pattern
74	4A	SMF70RV2	2	binary		Reserved
CPU Data Section:						
+0	+0	SMF70WAT	8	binary	LCCAWTIM (Set by ERBMFDCP)	CPU wait time, where bit 51 = 1 microsecond. That is, the amount of time that the CPU is not executing instructions (PSW wait state bit is on). Note: Data could be invalid if a SET CLOCK occurred during the RMF interval.
+8	+8	SMF70CID	2	binary	internal (CVTMAXMP for maximum)	CPU identification (either 0 or 1)
+10	+A	SMF70RV3	1	binary		Reserved
+11	+B	SMF70CNF	1	binary		Configuration activity indicator
						Bit *Meaning When Set*
						0-5 Reserved
					CSDMF1CP	6 CPU varied online or offline during the measurement interval. Data for this CPU is invalid
					CSDCPUAL	7 CPU currently online
+12	+C	SMF70RV4	1	binary		Reserved
+13	+D	SMF70SER	3	binary	PCCACPID	CPU serial number (6 hexadecimal digits)
ASID Data Area Section:						
0	0	SMF70RMN	2	binary	internal (Set by ERBMFECP)	Ready minimum value over interval
2	2	SMF70RMM	2			Ready maximum value over interval
4	4	SMF70RTT	4			Ready total value over interval
8	8	SMF70R00	4			Count of times ready value was 0
12	C	SMF70R01	4			Count of times ready value was 1
16	10	SMF70R02	4			Count of times ready value was 2
20	14	SMF70R03	4			Count of times ready value was 3
24	18	SMF70R04	4			Count of times ready value was 4
28	1C	SMF70R05	4			Count of times ready value was 5
32	20	SMF70R06	4			Count of times ready value was 6
36	24	SMF70R07	4			Count of times ready value was 7
40	28	SMF70R08	4			Count of times ready value was 8
44	2C	SMF70R09	4			Count of times ready value was 9
48	30	SMF70R10	4			Count of times ready value was 10
52	34	SMF70R11	4			Count of times ready value was 11
56	38	SMF70R12	4			Count of times ready value was 12
60	3C	SMF70R13	4			Count of times ready value was 13
64	40	SMF70R14	4			Count of times ready value was 14
68	44	SMF70R15	4	binary	internal (Set by ERBMFECP)	Count of times ready value was 15 or more

(continued)

Offsets		Name	Length	Format	Source	Description
ASID Data Area Section: (continued)						
72	48	SMF70IMN	2	binary	internal (Set by ERBMFECP)	IN users minimum over interval
74	4A	SMF70IMM	2			IN users maximum over interval
76	4C	SMF70ITT	4			IN users total value over interval
80	50	SMF70I00	4			Count of times IN users was 0
84	54	SMF70I01	4			Count of times IN users was 1 or 2
88	58	SMF70I02	4			Count of times IN users was 3 or 4
92	5C	SMF70I03	4			Count of times IN users was 5 or 6
96	60	SMF70I04	4			Count of times IN users was 7 or 8
100	64	SMF70I05	4			Count of times IN users was 9 or 10
104	68	SMF70I06	4			Count of times IN users was 11 - 15
108	6C	SMF70I07	4			Count of times IN users was 16 - 20
112	70	SMF70I08	4			Count of times IN users was 21 - 25
116	74	SMF70I09	4			Count of times IN users was 26 - 30
120	78	SMF70I10	4			Count of times IN users was 31 - 35
124	7C	SMF70I11	4			Count of times IN users was 36 or more
128	80	SMF70OMN	2			Out users minimum over interval
130	82	SMF70OMM	2			Out users maximum over interval
132	84	SMF70OTT	4			Out users total value over interval
136	88	SMF70O00	4			Count of times out users was 0
140	8C	SMF70O01	4			Count of times out users was 1 or 2
144	90	SMF70O02	4			Count of times out users was 3 or 4
148	94	SMF70O03	4			Count of times out users was 5 or 6
152	98	SMF70O04	4			Count of times out users was 7 or 8
156	9C	SMF70O05	4			Count of times out users was 9 or 10
160	A0	SMF70O06	4			Count of times out users was 11 - 15
164	A4	SMF70O07	4			Count of times out users was 16 - 20
168	A8	SMF70O08	4			Count of times out users was 21 - 25
172	AC	SMF70O09	4			Count of times out users was 26 - 30
176	B0	SMF70O10	4			Count of times out users was 31 - 35
180	B4	SMF70O11	4			Count of times out users was 36 or more
184	B8	SMF70WMN	2			Wait user minimum over interval
186	BA	SMF70WMM	2			Wait users maximum over interval
188	BC	SMF70WTT	4			Wait users total value over interval
192	C0	SMF70W00	4			Count of times wait users was 0
196	C4	SMF70W01	4			Count of times wait users was 1 or 2
200	C8	SMF70W02	4			Count of times wait users was 3 or 4
204	CC	SMF70W03	4			Count of times wait users was 5 or 6
208	D0	SMF70W04	4			Count of times wait users was 7 or 8
212	D4	SMF70W05	4			Count of times wait users was 9 or 10
216	D8	SMF70W06	4	binary	internal (Set by ERBMFECP)	Count of times wait users was 11 - 15

(continued)

Offsets		Name	Length	Format	Source	Description
ASID Data Area Section: (continued)						
220	DC	SMF70W07	4	binary	internal (Set by ERBMFECP)	Count of times wait users was 16 - 20
224	E0	SMF70W08	4			Count of times wait users was 21 - 25
228	E4	SMF70W09	4			Count of times wait users was 26 - 30
232	E8	SMF70W10	4			Count of times wait users was 31 - 35
236	EC	SMF70W11	4			Count of times wait users was 36 or more
240	F0	SMF70BMN	2			Batch users minimum over interval
242	F2	SMF70BMM	2			Batch users maximum over interval
244	F4	SMF70BTT	4			Batch users total value over interval
248	F8	SMF70B00	4			Count of times batch users was 0
252	FC	SMF70B01	4			Count of times batch users was 1 or 2
256	100	SMF70B02	4			Count of times batch users was 3 or 4
260	104	SMF70B03	4			Count of times batch users was 5 or 6
264	108	SMF70B04	4			Count of times batch users was 7 or 8
268	10C	SMF70B05	4			Count of times batch users was 9 or 10
272	110	SMF70B06	4			Count of times batch users was 11 - 15
276	114	SMF70B07	4			Count of times batch users was 16 - 20
280	118	SMF70B08	4			Count of times batch users was 21 - 25
284	11C	SMF70B09	4			Count of times batch users was 26 - 30
288	120	SMF70B10	4			Count of times batch users was 31 - 35
292	124	SMF70B11	4			Count of times batch users was 36 or more
296	128	SMF70SMN	2			Started users minimum over interval
298	12A	SMF70SMM	2			Started users maximum over interval
300	12C	SMF70STT	4			Started users total value over interval
304	130	SMF70S00	4			Count of times started users was 0
308	134	SMF70S01	4			Count of times started users was 1 or 2
312	138	SMF70S02	4			Count of times started users was 3 or 4
316	13C	SMF70S03	4			Count of times started users was 5 or 6
320	140	SMF70S04	4			Count of times started users was 7 or 8
324	144	SMF70S05	4			Count of times started users was 9 or 10
328	148	SMF70S06	4			Count of times started users was 11 - 15
332	14C	SMF70S07	4			Count of times started users was 16 - 20
336	150	SMF70S08	4			Count of times started users was 21 - 25
340	154	SMF70S09	4			Count of times started users was 26 - 30
344	158	SMF70S10	4			Count of times started users was 31 - 35
348	15C	SMF70S11	4			Count of times started users was 36 or more
352	160	SMF70TMN	2			TSO users minimum over interval
354	162	SMF70TMM	2			TSO users maximum over interval
356	164	SMF70TTT	4			TSO users total value over interval
360	168	SMF70T00	4			Count of times TSO users was 0
364	16C	SMF70T01	4			Count of times TSO users was 1 or 2
368	170	SMF70T02	4	binary	internal (Set by ERBMFECP)	Count of times TSO users was 3 or 4

(continued)

Offsets		Name	Length	Format	Source	Description
ASID Data Area Section: (continued)						
372	174	SMF70T03	4	binary	internal (Set by ERBMFECP)	Count of times TSO users was 5 or 6
376	178	SMF70T04	4			Count of times TSO users was 7 or 8
380	17C	SMF70T05	4			Count of times TSO users was 9 or 10
384	180	SMF70T06	4			Count of times TSO users was 11 - 15
388	184	SMF70T07	4			Count of times TSO users was 16 - 20
392	188	SMF70T08	4			Count of times TSO users was 21 - 25
396	18C	SMF70T09	4			Count of times TSO users was 26 - 30
400	190	SMF70T10	4			Count of times TSO users was 31 - 35
404	194	SMF70T11	4	binary	internal (Set by ERBMFECP)	Count of times TSO users was 36 or more

Record Type 71 — Paging Activity

Record type 71 is written by ERBMFDPP for each measurement interval and when the session is terminated. It contains information about the demands made on the system paging facilities and the utilization of real storage and external page storage during the reporting interval. Its length is 344 bytes.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF71LEN	2	binary	internal	Record length
2	2	SMF71SEG	2	binary	internal	Segment descriptor
4	4	SMF71FLG	1	binary	SMFWTM service routine	System indicator *Bit Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF71RTY	1	binary	internal	Record type: 71 (X'47')
6	6	SMF71TME	4	binary	SMFWTM service routine	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF71DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer, in the form 00yydddF, where F is the sign
14	E	SMF71SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF71SIZ	2	binary	internal	Size of common control data section
20	14	SMF71IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDPP)	Time RMF measurement interval started, in the form 0hhmmssF, where F is the sign
24	18	SMF71DAT	4	packed	CVTDATE (Set by ERBMFDPP)	Date RMF measurement interval started, in the form 00yydddF, where F is the sign
28	1C	SMF71INT	4	packed	STCK operand of TIME macro (Set by ERBMFDPP)	Duration of RMF measurement interval, in the form mmsstttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF71RV0	2	binary		Reserved
34	22	SMF71SUB	2	binary		Reserved
36	24	SMF71SAM	4	binary	internal (Set by ERBMFEPG)	Number of samples
40	28	SMF71MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF71RV1	2	binary		Reserved
44	2C	SMF71RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF71CYC	4	packed	internal	Sampling cycle length in the form 000ttttF, where F is the sign (taken from CYCLE option). The range of values is 0.050 to 9.999 seconds
Paging Control Section:						
52	34	SMF71SPC	2	binary	internal	Size of paging control section
54	36	SMF71SPD	2	binary	internal	Size of paging data section

(continued)

Offsets		Name	Length	Format	Source	Description
Paging Data Section:						
56	38	SMF71PIN	4	binary	PVTNPIN[1]	Number of non-VIO, non-swap page-ins. This field includes page-ins required through page faults, specific page requests, and page fixes. It does not include page reclaims, page-ins for VIO data sets, and pages that are swapped in.[1]
60	3C	SMF71POT	4	binary	PVTNPOUT[1]	Number of non-VIO, non-swap page outs. This field includes page-outs required through specific page requests as well as those pages stolen by the paging supervisor as a result of infrequent use. It does not include page-outs for VIO data sets and pages that are swapped out.[1]
64	40	SMF71PRC	4	binary	PVTNPREC[1]	Number of non-VIO page reclaims. This field contains the number of requests for pages as a result of page faults, specific page requests, and page fixes that are satisfied without starting new page-ins. It does not include those pages that are recovered by explicit VIO reclaim.[1]
68	44	SMF71SSQ	4	binary	PVTNSWPS[1]	Number of address space swap sequences. (A swap sequence consists of an address space swap-out and swap-in.)[1]
72	48	SMF71SIN	4	binary	PVTSPIN[1]	Number of pages swapped in. This field includes: LSQA, fixed pages, and those pages that the real storage manager determined to be active when the address space was swapped in. It does not include page reclaims.[1]
76	4C	SMF71SOT	4	binary	PVTSPOUT[1]	Number of pages swapped out. This field includes: LSQA, private area fixed pages, and private area non-fixed changed pages.[1]
80	50	SMF71VIN	4	binary	PVTVAMI[1]	Number of VIO page-ins. This field includes page-ins resulting from page faults or specific page requests on a VIO window. It does not include VIO swap-ins or page-ins for the common area.[1]
84	54	SMF71VOT	4	binary	PVTVAMO[1]	Number of VIO page-outs. This field includes page-outs resulting from specific page requests on a VIO window as well as those pages stolen by the paging supervisor as a result of infrequent use. It does not include VIO swap-outs or page-outs for the common area.[1]
88	58	SMF71VRC	4	binary	PVTVAMR[1]	Number of VIO page reclaims. This field includes page reclaims required through a VIO request that was satisfied without page-in by means of the explicit VIO reclaim interface.[1]
92	5C	SMF71SNI	4	binary	PVTCAIN	Number of non-VIO page-ins performed in common area.
96	60	SMF71SNO	4	binary	PVTCAOUT	Number of non-VIO page-outs performed in common area.
100	64	SMF71SNR	4	binary	PVTCAREC	Number of non-VIO page reclaims performed in common area.
104	68	SMF71RV2	4	binary		Reserved.
108	6C	SMF71RV3	4	binary		Reserved.
112	70	SMF71RV4	4	binary		Reserved.
116	74	SMF71AFC	4	binary	PVTAFC	Number of page frames available in real storage.
120	78	SMF71TFC	4	binary	PVTPOOL	Number of page frames defined in real storage. (This field does not include frames occupied by the nucleus and frames marked as bad or offline.)
124	7C	SMF71TSC	4	binary	ASMSLOTS	Total number of local page data set slots.
128	80	SMF71DSC	4	binary	ASMVSC	Number of local page data set slots allocated to VIO private area pages.
132	84	SMF71VSC	4	binary	ASMNVSC	Number of local page data set slots allocated to non-VIO private area pages.

[1]These fields refer to total system statistics.

(Continued)

Offsets		Name	Length	Format	Source	Description
Paging Data Section: (continued)						
136	88	SMF71NSC	4	binary	ASMSLOTS-(ASMVSC + ASMNVSC + ASMERRS)	Number of local page data set slots that have not been allocated
140	8C	SMF71FIN	4	binary	PVTFPFN	Number of frames in nucleus
144	90	SMF71MNF	4	binary	PVTAFC	Minimum number of unused page frames
148	94	SMF71MXF	4	binary	PVTAFC	Maximum number of unused page frames
152	98	SMF71AVF	4	binary	PVTAFC	Average number of unused page frames
156	9C	SMF71MNP	4	binary	PVTCFMCT-PVTCOMFX	Minimum number of LPA/CSA pageable frames
160	A0	SMF71MXP	4	binary	PVTCFMCT-PVTCOMFX	Maximum number of LPA/CSA pageable frames
164	A4	SMF71AVP	4	binary	PVTCFMCT-PVTCOMFX	Average number of LPA/CSA pageable frames
168	A8	SMF71MNS	4	binary	PVTPOOL-(PVTCNTFX + PVTAFC + (PVTCFMCT-PVTCOMFX))	Minimum number of pageable frames in the private address space
172	AC	SMF71MXS	4	binary	PVTPOOL-(PVTCNTFX + PVTAFC + (PVTCFMCT-PVTCOMFX))	Maximum number of pageable frames in the private address space
176	B0	SMF71AVS	4	binary	PVTPOOL-(PVTCNTFX + PVTAFC + (PVTCFMCT-PVTCOMFX))	Average number of pageable frames in the private address space
180	B4	SMF71MNT	4	binary	PVTPOOL-PVTCNTFX	Minimum total number of pageable frames
184	B8	SMF71MXT	4	binary	PVTPOOL-PVTCNTFX	Maximum total number of pageable frames
188	BC	SMF71AVT	4	binary	PVTPOOL-PVTCNTFX	Average total number of pageable frames
192	C0	SMF71MNQ	4	binary	PVTSQAFX	Minimum number of SQA fixed frames
196	C4	SMF71MXQ	4	binary	PVTSQAFX	Maximum number of SQA fixed frames
200	C8	SMF71AVQ	4	binary	PVTSQAFX	Average number of SQA fixed frames
204	CC	SMF71MNC	4	binary	PVTCOMFX	Minimum number of LPA/CSA fixed frames
208	D0	SMF71MXC	4	binary	PVTCOMFX	Maximum number of LPA/CSA fixed frames
212	D4	SMF71AVC	4	binary	PVTCOMFX	Average number of LPA/CSA fixed frames
216	D8	SMF71MNR	4	binary	PVTCNTFX-(PVTSQAFX + PVTCOMFX)	Minimum number of fixed frames in the private address space
220	DC	SMF71MXR	4	binary	PVTCNTFX-(PVTSQAFX + PVTCOMFX)	Maximum number of fixed frames in the private address space
224	E0	SMF71AVR	4	binary	PVTCNTFX-(PVTSQAFX + PVTCOMFX)	Average number of fixed frames in the private address space
228	E4	SMF71MNX	4	binary	PVTCNTFX	Minimum total number of fixed frames
232	E8	SMF71MXX	4	binary	PVTCNTFX	Maximum total number of fixed frames
236	EC	SMF71AVX	4	binary	PVTCNTFX	Average total number of fixed frames

(Continued)

Offsets		Name	Length	Format	Source	Description
Paging Data Section: (continued)						
240	F0	SMF71MNU	4	binary	ASMSLOTS-(ASMVSC + ASMNVSC + ASMERRS)	Minimum number of local page data set slots that have not been allocated
244	F4	SMF71MXU	4	binary	ASMSLOTS-(ASMVSC + ASMNVSC + ASMERRS)	Maximum number of local page data set slots that have not been allocated
248	F8	SMF71AVU	4	binary	ASMSLOTS-(ASMVSC + ASMNVSC + ASMERRS)	Average number of local page data set slots that have not been allocated
252	FC	SMF71MNV	4	binary	ASMVSC	Minimum number of local page data set slots allocated to VIO private area pages
256	100	SMF71MXV	4	binary	ASMVSC	Maximum number of local page data set slots allocated to VIO private area pages
260	104	SMF71AVV	4	binary	ASMVSC	Average number of local page data set slots allocated to VIO private area pages
264	108	SMF71MNM	4	binary	ASMNVSC	Minimum number of local page data set slots allocated to non-VIO private area pages
268	10C	SMF71MXM	4	binary	ASMNVSC	Maximum number of local page data set page slots allocated to non-VIO private area pages
272	110	SMF71AVM	4	binary	ASMNVSC	Average number of local page data set slots allocated to non-VIO private area pages
276	114	SMF71MNB	4	binary	ASMERRS	Minimum number of unusable local page data set slots
280	118	SMF71MXB	4	binary	ASMERRS	Maximum number of unusable local page data set slots
284	11C	SMF71AVB	4	binary	ASMERRS	Average number of unusable local page data set slots
288	120	SMF71MNA	4	binary	ASMSLOTS	Minimum total number of local page data set slots
292	124	SMF71MXA	4	binary	ASMSLOTS	Maximum total number of local page data set slots
296	128	SMF71AVA	4	binary	ASMSLOTS	Reserved.
300	12C	SMF71TIS	4	binary	RMCATISC	Number of swap-outs due to a terminal waiting for input
304	130	SMF71LWS	4	binary	RMCALWSC	Number of swap-outs caused by user request wait states. Note that an address space could be swapped in, execute, and enter a wait state before SRM receives control. Then RSTORCMP (Sysevent 19) indicates that the address space is in a wait state, and it is swapped out.
308	134	SMF71DWS	4	binary	RMCADWSC	Number of swap-outs of user address spaces that have not issued a WAIT, LONG=YES macro, and have gone without executing for more than 8 seconds.
312	138	SMF71ULS	4	binary	RMCAUSSC	Number of swap-outs that occur because the multi-programming level for a domain became higher than the target multiprogramming level specified for that domain.
316	13C	SMF71NRS	4	binary	RMCARQSC	Number of swap-outs that occur because the program properties table (PPT) indicated that a job or step be non-swappable or V=R was specified on the JOB statement. The address space is swapped out, and its LSQA is swapped into non-reconfigurable storage. This field also includes the number of swap-outs caused by a VARY STOR, OFFLINE command.

(continued)

Offsets		Name	Length	Format	Source	Description
Paging Data Section: (continued)						
320	140	SMF71ASS	4	binary	RMCAXSSC	Number of swap-outs that occur because 70% of all local page slots are allocated. (The swappable batch user address space acquiring auxiliary storage page slots at the greatest rate is swapped out.)
324	144	SMF71RSS	4	binary	RMCARSSC	Number of swap-outs due to a shortage of real pageable frames. (The swappable batch user who acquired the most fixed pages is swapped out.)
328	148	SMF71EXS	4	binary	RMCAEXSC	Number of swap-outs that occur because one user in a domain must be swapped-out to allow another user in the same domain that has a higher workload level to be swapped in.
332	14C	SMF71EES	4	binary	RMCANQSC	Number of swap-outs required to swap-in a user that is enqueued upon a system resource that is required by other users.
336	150	SMF71TOS	4	binary	RMCATOSC	Number of swap-outs due to a terminal waiting for output buffers.
340	154	SMF71RV8	4	binary		Reserved

Record Type 72 — Workload Activity

Record type 72 is written by ERBMFDWP for each performance group (PG) defined in the installation performance specification (IPS). Type 72 records are generated in the order of low to high PG number. Each record contains data on the one-to-eight PG periods for a PG number. Its length is 92 bytes plus 44 bytes for each PG period data section.

This record contains the PG number, number of PG periods, IPS name, number of terminated transactions, elapsed time of terminated transactions, and active time, service and workload level of all transactions. Resource and service information is also provided on IOC, CPU, ERV, and MSO.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF72LEN	2	binary	internal	Record length
2	2	SMF72SEG	2	binary	internal	Segment descriptor
4	4	SMF72FLG	1	binary	SMFWTM service routine	System indicator *Bit Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF72RTY	1	binary	internal	Record type: 72 (X'48')
6	6	SMF72TME	4	binary	SMFWTM service routine	Time, in hundredths of a second record was moved to SMF buffer
10	A	SMF72DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer in the form 00yydddF where F is the sign
14	E	SMF72SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF72SIZ	2	binary	internal	Size of common control data section
20	14	SMF72IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDWP)	Time RMF measurement interval started in the form 0hhmmssF where F is the sign.
24	18	SMF72DAT	4	packed	CVTDATE (Set by ERBMFDWP)	Date RMF measurement interval started, in the form 00yydddF where F is the sign
28	1C	SMF72INT	4	packed	STCK operand of TIME macro (Set by ERBMFDWP) or WAMTTOC and WAMTTMA (Set by IRARMWAR)	Duration of RMF measurement interval, in the form mmsstttF where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF72RVO	2	binary		Reserved
34	22	SMF72SUB	2	binary	internal	Performance group (PG) number. The range of values is 1 to 255.
36	24	SMF72SAM	4	binary		Reserved
40	28	SMF72MFV	2	EBCDIC	STSC MF1V (in STSCT)	RMF version number
42	2A	SMF72RV1	2	binary		Reserved
44	2C	SMF72RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF72CYC	4	packed		Reserved, in the form 0000000F

(Continued)

Offsets		Name	Length	Format	Source	Description
Workload Control Section:						
52	34	SMF72SWC	2	binary	internal	Size of workload control section
54	36	SMF72PGP	2	binary	internal (in WAMT)	Number of PG period data sections in this record
56	38	SMF72SPD	2	binary	internal	Size of each PG period data section
58	3A	SMF72HPG	2	binary	WAMTHPG	Highest PG number defined in installation performance specification (IPS)
60	3C	SMF72IPS	8	EBCDIC	WAMTIPS	Name of IPS
68	44	SMF72IRF	3	EBCDIC	RMPTOPI	IOC resource factor coefficient
71	47	SMF72CRF	3	EBCDIC	RMPTOPC	CPU resource factor coefficient
74	4A	SMF72ERF	6	EBCDIC	RMPTOPE	ERV resource manager coefficient
80	50	SMF72ISD	4	EBCDIC	WAMTIPI	IOC service definition coefficient
84	54	SMF72CSD	4	EBCDIC	WAMTIPC	CPU service definition coefficient
88	58	SMF72MSD	4	EBCDIC	WAMTIPM	Main storage service definition coefficient
Performance Group Period Data Section:						
+0	+0	SMF72TTX	4	binary	WAMPTRN	Number of transactions terminated
+4	+4	SMF72ACT	4	binary	WAMPTAT (Set by IRARMWAR)	Active time of all transactions, in 1024-microsecond units. This field includes the total time that each transaction was in real storage plus any swapped-out time that the transactions were *not* in a long "wait" state. It does not include time between job steps for batch transactions.
+8	+8	SMF72SER	4	binary	WAMPSRV	Service used in all transactions, in service units.
+12	+C	SMF72TTM	4	binary	WAMPTET (Set by IRARMWAR)	Elapsed time accumulated by all transactions that terminated in this PG period, in 1024-microsecond units.
+16	+10	SMF72LEV	4	binary	WAMPNWL	Workload level of all transactions, in units of 1/256 of a level
+20	+14	SMF72MTS	4	binary	WAMPMSO	Main storage total service units
+24	+18	SMF72ITS	4	binary	WAMPIOC	I/O total service units
+28	+1C	SMF72CTS	4	binary	WAMPCPU	CPU total service units
+32	+20	SMF72TAT	4	binary	WAMPTRR	Transaction residency time, in 1024-microsecond units.
+36	+24	SMF72SPP	4	binary	WAMPSWC	Number of swap sequences in period
+40	+28	SMF72CDN	2	binary	WAMPDMN	Domain number
+42	+2A	SMF72PON	1	binary	WAMPOBJN	Performance objective number
+43	+2B	SMF72RV2	1	binary		Reserved

Record Type 73 — Channel Activity

Record type 73 is written by ERBMFDHP when channel activity measurement is requested. Entries are created for all channels in the system that have been online at least once since RMF was started. However, report data is not formatted for channels that were offline at the end of the reporting interval, or for channels that were varied during the interval. Its length is 80 bytes plus 16 bytes for each physical channel data section and 60 bytes for each logical channel data section.

The record contains identification information and data describing the utilization of physical and logical channels.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF73LEN	2	binary	internal	Record length
2	2	SMF73SEG	2	binary	internal	Segment descriptor
4	4	SMF73FLG	1	binary	SMFWTM service routine	System indicator *Bit* *Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF73RTY	1	binary	internal	Record type: 73 (X'49')
6	6	SMF73TME	4	binary	SMFWTM service routine	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF73DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer, in the form 00yydddF, where F is the sign
14	E	SMF73SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF73SIZ	2	binary	internal	Size of common control data section
20	14	SMF73IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDHP)	Time RMF measurement interval started, in the form 0hhmmssF, where F is the sign
24	18	SMF73DAT	4	packed	CVTDATE (Set by ERBMFDHP)	Date RMF measurement interval started, in the form 00yydddF, where F is the sign
28	1C	SMF73INT	4	packed	STCK operand of TIME macro (Set by ERBMFDHP)	Duration of RMF measurement interval, in the form mmsstttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF73RV0	2	binary		Reserved
34	22	SMF73SUB	2	binary		Reserved
36	24	SMF73SAM	4	binary	internal (Set by ERBMFECH)	Number of samples
40	28	SMF73MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF73RV1	2	binary		Reserved
44	2C	SMF73RLS	4	EBCDIC	CVTRELNO	Operating system release number and level, in the form nnll
48	30	SMF73CYC	4	packed	internal	Sampling cycle length in the form 000ttttF, where F is the sign (taken from CYCLE option). The range of values is 0.050 to 9.999 seconds

(continued)

Offsets		Name	Length	Format	Source	Description
Physical and Logical Channel Control Section						
52	34	SMF73SHC	2	binary	internal	Size of physical and logical channel control section
54	36	SMF73CHA	2	binary	internal	Number of physical channel data sections in this record
56	38	SMF73SHD	2	binary	internal	Size of each physical channel data section
58	3A	SMF73LCA	2	binary	internal	Number of logical channel data sections in this record
60	3C	SMF73SLD	2	binary	internal	Size of each logical channel data section
62	3E	SMF73RV2	2	binary		Reserved
64	40	SMF73CB0	4	binary	internal	Frequency counter of any channel busy (for CPU 0)
68	44	SMF73CB1	4	binary	internal	Frequency counter of any channel busy (for CPU 1)
72	48	SMF73WB0	4	binary	internal	Frequency counter of any channel busy while processor (CPU) waits (for CPU 0)
76	4C	SMF73WB1	4	binary	internal	Frequency counter of any channel busy while processor (CPU) waits (for CPU 1)
Physical Channel Data Section:						
+0	+0	SMF73CID	2	binary	internal (CVTMAXMP for maximum)	CPU identification (either 0 or 1)
+2	+2	SMF73HID	1	binary	internal (CSDCHAD for maximum)	Channel identification. The range of values is 0 to 15.
+3	+3	SMF73FG2	1	binary		Channel indicator (if zero, selector channel)
						Bit *Meaning When Set*
						0-1 Reserved
					CATCHID	2 Block multiplexor
					CATCHID	3 Byte multiplexor
						4 Reserved
					CATNID	5 Invalid channel identification (bits 0-4 will be zero)
					CATNOP	6 Data recorded is invalid because channel was varied during interval
					CATNOP	7 Channel is currently online
+4	+4	SMF73CNT	4	binary	CATSIOCT	Number of successful Start I/Os issued to the channel. This field includes redundant successful Start I/O Fast Release instructions (condition code zero). It does not include "sense" Start I/Os.
+8	+8	SMF73BSY	4	binary	TCH instruction (Set by ERBMFTCH or ERBMFECH)	Number of samples in which the channel was in burst mode. (This field is zero for byte multiplexor channels.)
+12	+C	SMF73OLP	4	binary	Set by ERBMFTCH or ERBMFECH when TCH has condition code 2 and PSATOLD= CVTWTCB	Number of samples in which the channel was busy and the CPU was in the wait state. (This field is zero for byte multiplexor channels.)

Offsets		Name	Length	Format	Source	Description
Logical Channel Data Section:						
+0	+0	SMF73LID	2	binary	Index to logical channel table (LCH)	Logical channel path identifier
+2	+2	SMF73RV5	2			Reserved
+4	+4	SMF73PCH	2	binary	Channel available table (CAT)	Bit map of physical channel identifiers for physical channels 0-F
+6	+6	SMF73CPU	2	binary	Common system data area (CSDCPUAL)	Bit map of processor identifiers for processor 0-1
+8	+8	SMF73ABY	4	binary	TCH instruction (set by ERBMFTCH or ERBMFECH)	Total number of physical channel busy samples for the measurement interval
+12	+C	SMF73PBY	4	binary	TCH instruction (set by ERBMFTCH or ERBMFECH)	Total number of physical channel partial busy samples for the measurement interval
+16	+10	SMF73RQS	4	binary	internal	Total number of requests started or queued
+20	+14	SMF73LQ0	4	binary	internal	Counter for queue length of 0
+24	+18	SMF73LQ1	4	binary	internal	Counter for queue length of 1
+28	+1C	SMF73LQ2	4	binary	internal	Counter for queue length of 2
+32	+20	SMF73LQ3	4	binary	internal	Counter for queue length of 3
+36	+24	SMF73LQ4	4	binary	internal	Counter for queue length of 4 or more
+40	+28	SMF73LQT	4	binary	internal	Total number of enqueued requests observed for all samples taken during the measurement interval
+44	+2C	SMF73PBC	4	binary	internal	Counter for I/O requests deferred because of physical busy
+48	+30	SMF73LBC	4	binary	internal	Counter for I/O requests deferred because of logical busy
+52	+34	SMF73PBF	4	binary	internal	Frequency counter for physical busy deferred I/O requests
+56	+38	SMF73LBF	4	binary	internal	Frequency counter for logical busy deferred I/O requests

Record Type 74 – Device Activity

Record type 74 is written by ERBMFDDP for all device classes selected by device class keywords. It contains entries for devices that have been online at least once since RMF was started. The entry for any device that was offline at the end of the reporting interval, or for any device that was varied during the interval, does not contain data. The length of record type 74 is 64 bytes plus 84 bytes for each device data section. Because the maximum length of an SMF record is 32,756 bytes, up to three type 74 records can be written for each device class.

This record contains the sampling cycle length, number of samples, and number of devices. Each device entry contains the volume serial number, number of requests serviced on the device, number of samples in which the device was busy, number of requests enqueued for the device, and device address, class, and type, as well as other data collected about the device.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF74LEN	2	binary	internal	Record length
2	2	SMF74SEG	2	binary	internal	Segment descriptor
4	4	SMF74FLG	1	binary	SMFWTM service routine	System indicator *Bit* *Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF74RTY	1	binary	internal	Record type: 74 (X'4A')
6	6	SMF74TME	4	binary	SMFWTM service routine	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF74DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer, in the form 00yydddF, where F is the sign
14	E	SMF74SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF74SIZ	2	binary	internal	Size of common control data section
20	14	SMF74IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDDP)	Time RMF measurement interval started, in the form 0hhmmssF, where F is the sign
24	18	SMF74DAT	4	packed	CVTDATE (Set by ERBMFDDP)	Date RMF measurement interval started, in the form 00yydddF, where F is the sign
28	1C	SMF74INT	4	packed	STCK operand of TIME macro (Set by ERBMFDDP)	Duration of RMF measurement interval in the form mmsstttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF74RV0	2	binary		Reserved
34	22	SMF74SUB	2	binary	UCBTBYT3	Device Class Code *Bit config.* *Meaning* '0080'X Magnetic tape devices '0040'X Communication equipment '0020'X Direct access devices '0010'X Graphics devices '0008'X Unit record devices '0004'X Character reader devices

(continued)

Offsets		Name	Length	Format	Source	Description
Common Control Data Section: (continued)						
36	24	SMF74SAM	4	binary	internal (Set by ERBMFEDV)	Number of samples
40	28	SMF74MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF74RV1	2	binary		Reserved
44	2C	SMF74RLS	4	EBCDIC	CVTRELNO	Operating system release number and level, in the form nnll
48	30	SMF74CYC	4	packed	internal	Sampling cycle length in the form 000ttttF, where F is the sign (taken from CYCLE option). The range of values is 0.050 to 9.999 seconds
Device Control Data Section:						
52	34	SMF74SDC	2	binary	internal	Size of device control section
54	36	SMF74DEV	2	binary	internal	Number of device data sections in this record
56	38	SMF74SDD	2	binary	internal	Size of each device data section
58	3A	SMF74NXT	2	binary		Number of device data sections in following records for this class
60	3C	SMF74TOT	2	binary		Total number of device data sections in all records for this class
62	3E	SMF74GEN	2	binary		Total number of devices specified for all classes at system generation
Device Data Section:						
+0	+0	SMF74ADD	2	packed	UCBNAME	Device address, in the form hhhF, where F is the sign
+2	+2	SMF74RV3	1	binary		Reserved
+3	+3	SMF74CNF	1	binary		Device indicator
						Bit Meaning When Set
						0-5 Reserved
					UCBMTPXP and UCBBASE	6 Device is multiple exposure device; this is base exposure
					UCBONLI or UCBNAME (Set by ERBMFEDV)	7 Data recorded is invalid because device was varied during interval
					UCBONLI (Set by ERBMFEDV)	8 Device is currently online
+4	+4	SMF74TYP	4	binary	UCBTYP	Unit type
+8	+8	SMF74SER	6	EBCDIC	UCBVOLI	Volume serial number of the volume mounted on this device
+14	+E	SMF74LCH	2	binary		Number of logical channel associated with device
+16	+10	SMF74CNT	4	binary	UCBMFCNT (Set by ERBMFEDV)	Number of requests serviced on this device
+20	+14	SMF74ACT	4	binary	UCBBSY and UCBCUB (Set by ERBMFEDV)	Number of samples in which this device was busy while control unit was not
+24	+18	SMF74QUE	4	binary	UCBCNT (ERBMFEDV)	Number of requests enqueued for this device observed while sampling
+28	+1C	SMF74CON	4	binary	UCBMTPXP, UCBBASE, UCBBSY, and UCBCUB	Number of samples in which a multiple exposure device was busy while control unit was not (reflects base exposure)

(continued)

Offsets		Name	Length	Format	Source	Description
Device Data Section: (continued)						
+32	+20	SMF74NRD	4	binary	UCBNRY	Number of samples taken during the measurement interval that indicated that the device was not ready
+36	+24	SMF74ALC	4	binary	UCBALOC and UCBPRES	Number of samples taken during the measurement interval that indicated that the device was allocated
+40	+28	SMF74CUB	4	binary	UCBCUB	Number of samples taken during the measurement interval that indicated that the control unit was busy
+44	+2C	SMF74BUS	4	binary	UCBCNT, UCBCUB, and UCBBSY	Total requests queued because the device was busy and the control unit was not
+48	+30	SMF74DSO	4	binary	UCBDMC	Total number of data sets open on the device
+52	+34	SMF74AC0	4	binary	UCBCNT	Counter for I/O request queue length of 0
+56	+38	SMF74AC1	4	binary	UCBCNT	Counter for I/O request queue length of 1
+60	+3C	SMF74AC2	4	binary	UCBCNT	Counter for I/O request queue length of 2
+64	+40	SMF74AC3	4	binary	UCBCNT	Counter for I/O request queue length of 3
+68	+44	SMF74AC4	4	binary	UCBCNT	Counter for I/O request queue length of 4 or more
+72	+48	SMF74RSV	4	binary	UCBRESVH	Number of samples taken during the measurement interval that indicated that the device was reserved
+76	+4C	SMF74MTP	4	binary	UCBMOUNT, UCBALOC, and UCBNRY	Number of samples taken during the measurement interval that indicated a mount pending condition
+80	+50	SMF74RDL	4	binary	UCBCUB and UCBBSY	Number of samples taken during the measurement interval indicating a delay caused when a loosely coupled CPU reserved the shared direct access device

Record Type 75 — Page/Swap Data Set Activity

Record type 75 is written by ERBMFDSP at the end of each RMF measurement interval. One record is written for each page data set or swap data set monitored during the interval. It provides information on the use of auxiliary storage page slots, and the use of the page/swap data set by ASM. Its length is 160 bytes.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF75LEN	2	binary	internal	Record length
2	2	SMF75SEG	2	binary	internal	Segment descriptor
4	4	SMF75FLG	1	binary	SMFWTM service routine	System indicator *Bit* *Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF75RTY	1	binary	internal	Record type: 75 (X'4B')
6	6	SMF75TME	4	binary	SMFWTM service routine	Time in hundredths of a second, when record was moved to SMF buffer
10	A	SMF75DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer in the form 00yydddF, where F is the sign
14	E	SMF75SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF75SIZ	2	binary	internal	Size of common control data section
20	14	SMF75IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDSP)	Time RMF measurement interval started in the form 0hhmmssF, where F is the sign
24	18	SMF75DAT	4	packed	CVTDATE (Set by ERBMFDSP)	Date RMF measurement interval started in the form 00yydddF, where F is the sign
28	1C	SMF75INT	4	packed	STCK operand of TIME macro (Set by ERBMFDSP)	Duration of RMF measurement interval in the form mmsstttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF75RV0	2	EBCDIC		Reserved
34	22	SMF75SUB	2	EBCDIC		Reserved
36	24	SMF75SAM	4	binary	internal (Set by ERBMFESP)	Number of samples
40	28	SMF75MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF75RV1	2	EBCDIC		Reserved
44	2C	SMF75RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF75CYC	4	packed	interval	Sampling cycle length in the form 000ttttF, where F is the sign (taken from CYCLE option). The range of values is 0.050 to 9.999 seconds.

(continued)

Offsets		Name	Length	Format	Source	Description
Page/Swap Data Set Control Section:						
52	34	SMF75SCA	2	binary	internal	Size of page/swap data set control section
54	36	SMF75SDA	2	binary	internal	Size of page/swap data set data section
Page/Swap Data Set Data Section:						
56	38	SMF75DSN	44	EBCDIC	PARTDSNL or SARDSNL	Page/swap data set name
100	64	SMF75PST	1	binary	PARETYPE	Page space type *Bit Meaning When Set* 0 PLPA 1 COMMON 2 DUPLEX 3 LOCAL 4 SWAP 5 Data set unusable 6 Data set came online during interval 7 Reserved
101	65	SMF75RV4	1	binary		Reserved
102	66	SMF75RV5	1	binary		Reserved
103	67	SMF75TYP	4	EBCDIC	UCBTYP	Unit type
107	6B	SMF75CHA	2	packed	UCBNAME	Device address in the form hhhF, where F is the sign
109	6D	SMF75VOL	6	EBCDIC	UCBVOLI	Volume serial number
115	73	SMF75RV2	5	binary		Reserved
120	78	SMF75SLA	4	binary	PARESZSL or SRETOTSL	Total number of slots or swap sets contained within the page or swap data set
124	7C	SMF75MXU	4	binary	(PARESZSL - PARESLTA) or (SRETOTSL - SREAVLSL)	Maximum number of slots used or maximum number of swap sets used
128	80	SMF75MNU	4	binary	(PARESZSL - PARESLTA) or (SRETOTSL - SREAVLSL)	Minimum number of slots used or minimum number of swap sets used
132	84	SMF75AVU	4	binary	(PARESZSL - PARESLTA) or (SRETOTSL - SREAVLSL)	Average number of slots used or average number of swap sets used
136	88	SMF75BDS	4	binary	PARERRCT or SRERRCT	Number of unusable slots or unusable swap sets
140	8C	SMF75USE	4	binary	IOAFUSE	Number of samples indicating data set was being used by ASM
144	90	SMF75REQ	4	binary	IORFUSE	Number of requests for the data set observed during RMF sampling
148	94	SMF75RV6	4	binary		Reserved
152	98	SMF75RV7	4	binary		Reserved
156	9C	SMF75RV8	4	binary		Reserved

Record Type 76 − Trace Activity

Record type 76 is written by ERBMFDTP at the end of each measurement interval. One record is written for each field name sampled during the interval. Record type 76 contains information on the number of samples, the number of sets (lines of data), the minimum value of the field, the maximum value of the field, the sum of the squared values of the field, and the final value sampled from the field. The trace values collected for each set are grouped at the end of the record. Its length is 108 bytes plus the variable length of the trace values collected for each set.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF76LEN	2	binary	internal	Record length
2	2	SMF76SEG	2	binary	internal	Segment descriptor
4	4	SMF76FLG	1	binary	SMFWTM service routine	System indicator *Bit* *Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF76RTY	1	binary	internal	Record type: 76 (X'4C')
6	6	SMF76TME	4	binary	SVC 83	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF76DTE	4	packed	SVC 83	Date record was moved to SMF buffer in the form 00yydddF, where F is the sign
14	E	SMF76SID	4	EBCDIC	SMCASID	System identification (taken from SID parameter).
Common Control Data Section:						
18	12	SMF76SIZ	2	binary	internal	Size of common control data section.
20	14	SMF76IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDTP)	Time RMF measurement interval started in the form 0hhmmssF, where F is the sign
24	18	SMF76DAT	4	packed	CVTDATE (Set by ERBMFDTP)	Date RMF measurement interval started in the form 00yydddF where F is the sign.
28	1C	SMF76INT	4	packed	STCK operand of TIME macro (Set by ERBMFDTP)	Duration of RMF measurement interval in the form mmssttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF76RV0	4	EBCDIC		Reserved
36	24	SMF76SAM	4	binary	ERBMFETR	Number of samples taken during interval
40	28	SMF76MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF76RV1	2	EBCDIC		Reserved
44	2C	SMF76RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF76CYC	4	packed	internal	Sampling cycle length in the form 000ttttF, where F is the sign and tttt is the cycle value in milliseconds. The range of values is 0.050 to 9.999 seconds
Trace Control Section:						
52	34	SMF76STR	2	binary	internal	Size of control section
54	36	SMF76SDE	2	binary	internal	Size of trace data entry section
56	38	SMF76NUM	2	binary	internal	Number of sample sets (lines of data) in the trace
58	3A	SMF76RV2	2	EBCDIC		Reserved

(continued)

Offsets		Name	Length	Format	Source	Description
Trace Data Entry Section:						
60	3C	SMF76NAM	8	EBCDIC	MFTRTRAC	Field name specified in the trace options to RMF
68	44	SMF76OPT	1	binary	ERBMFETR	Options specified on trace input in RMF PARMLIB member for the field name: *Bit Meaning When Set* 0 Minimum value of the field is contained in the SMF record 1 Maximum value of the field is contained in the SMF record 2 The sum of the values required to calculate the average of the field is contained in the SMF record 3 The sum of the squared values required to calculate the standard deviation of the field is contained in the SMF record 4 End value of the field is contained in the SMF record 5 All options selected 6 Domain tracing terminated 7 This entry is a domain field
69	45	SMF76SLN	1	binary		Length of a set in bytes
70	46	SMF76DLN	1	binary	ERBMFITR	Length of a field sampled
71	47	SMF76RV3	1	binary		Reserved
72	48	SMF76SSS	2	binary	ERBMFITR	Number of samples in each completed set (or default specified)
74	4A	SMF76SSL	2	binary	ERBMFETR	Number of samples in set being built when interval expires
76	4C	SMF76MIN	4	binary	ERBMFETR	Minimum value found in the field during the interval
80	50	SMF76MAX	4	binary	ERBMFETR	Maximum value found in the field during the interval
84	54	SMF76AVG	8	EBCDIC	ERBMFETR	Sum of the values found in the field during the interval
92	5C	SMF76STD	12	EBCDIC	ERBMFETR	Sum of the squared values found in the field during the interval
104	68	SMF76ENV	4	binary	ERBMFETR	End value in the field taken on the last sample before the RMF interval ends
108	6C	SMF76D or SMF76C	variable variable	binary binary	ERBMFETR ERBMFETR	Trace values collected for each set, stored in an array of either fullwords or halfwords, depending on the length of the field being sampled. There will be one group of values for each sample set (line of data) in the trace

Field Size	Size of Array Element in Bytes	Length of data in bytes and relative position in array				
		Min. Value	Sum of Values	Max. Value	Sum of Sq. Vals	End Value
halfword	2	2	6	2	8	2
fullword	4	4	8	4	12	4

Record Type 77 — Enqueue Activity

Record type 77 is written by ERBMFDEQ at each measurement interval and when the session is terminated. It contains data that identifies the resources for which ENQ/DEQ contention occurred during the measurement interval and data that describes any contention that occurred. Its length is 60 bytes, plus 124 bytes for each resource for which data was gathered.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF77LEN	2	binary	internal	Record length
2	2	SMF77SEG	2	binary	internal	Segment descriptor
4	4	SMF77FLG	1	binary	SMFWTM service routine	System indicator *Bit Meaning When Set* 0-5 Reserved 6 VS2 7 Reserved
5	5	SMF77RTY	1	binary	internal	Record type: 77 (X'4D')
6	6	SMF77TME	4	binary	SMFWTM service routine	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF77DTE	4	packed	SMFWTM service routine	Date on which report interval ended, in the form 00yydddF, where F is the sign
14	E	SMF77SID	4	EBCDIC		System identification (taken from SID parameter)
Common Control Data Section:						
18	12	SMF77SIZ	2	binary	internal	Size of common control data section
20	14	SMF77IST	4	packed	CVTTZ and STCK operand of TIME macro (Set by ERBMFDCP)	Time RMF measurement interval started, in the form 0hhmmssF, where F is the sign
24	18	SMF77DAT	4	packed	CVTDATE (Set by ERBMFDCP)	Date RMF measurement interval started, in the form 00yydddF, where F is the sign
28	1C	SMF77INT	4	packed	STCK operand of TIME macro (Set by ERBMFDCP)	Duration of RMF measurement interval, in the form mmsstttF, where F is the sign. (The end of the measurement interval is the sum of the recorded start time and this field.)
32	20	SMF77RV0	4			Reserved
36	24	SMF77SAM	4			Reserved
40	28	SMF77MFV	2	EBCDIC	STSCMF1V (in STSCT)	RMF version number
42	2A	SMF77RV1	2			Reserved
44	2C	SMF77RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF77CYC	4			Reserved
Enqueue Control Section:						
52	34	SMF77CSZ	2	binary	internal	Size of enqueue control section
54	36	SMF77RNO	2	binary	internal	Number of enqueue data sections in this record
56	38	SMF77RSZ	2	binary	internal	Size of each enqueue data section

(continued)

Offsets		Name	Length	Format	Source	Description
Enqueue Control Section: (continued)						
58	3A	SMF77FG1	1	binary	internal	Enqueue status indicator
						Bit *Meaning When Set*
						0 On — enqueue summary table full
						1 On — specified resource had no contention
						2 On — enqueue had bad CPU clock
						3 On — enqueue event processing abend
						4 On — detail data requested
						Off — summary data requested
						5-7 Reserved
59	3B	SMF77RV2	1			Reserved
Enqueue Data Section:						
+0	+0	SMF77QNM	8	EBCDIC	FROM major QCB	Major name of resource
+8	+8	SMF77RNM	44	EBCDIC	FROM major QCB	Minor name of resource
+52	+34	SMF77WTM	4	binary	internal	Minimum resource contention time, in 1024-microsecond units
+56	+38	SMF77WTX	4	binary	internal	Maximum resource contention time, in 1024-microsecond units
+60	+3C	SMF77WTT	4	binary	internal	Total resource contention time, in 1024-microsecond units
+64	+40	SMF77RV3	2	binary	internal	Reserved
+66	+42	SMF77QL1	2	binary	internal	Counter for queue length of 1
+68	+44	SMF77QL2	2	binary	internal	Counter for queue length of 2
+70	+46	SMF77QL3	2	binary	internal	Counter for queue length of 3
+72	+48	SMF77QL4	2	binary	internal	Counter for queue length of 4 or more
+74	+4A	SMF77QLT	2	binary	internal	Total number of waiting requests during the measurement interval
+76	+4C	SMF77EXM	2	binary	internal	Minimum number of exclusive requests
+78	+4E	SMF77EXX	2	binary	internal	Maximum number of exclusive requests
+80	+50	SMF77SHM	2	binary	internal	Minimum number of share requests
+82	+52	SMF77SHX	2	binary	internal	Maximum number of share requests
+84	+54	SMF77EVT	2	binary	internal	Total number of contention events that occurred during the measurement interval
+86	+56	SMF77RLN	1	binary	minor QCB	Minor name length status
+87	+57	SMF77DFG	1	binary	internal	Current resource detail indicator
						Bit *Meaning When Set*
						0 On — resource still in contention
						1 On — scope of systems
						Off — scope of system
						2 On — owner has exclusive control of the resource
						Off — owner shares the resource
						3 On — first job is waiting for exclusive use
						Off — first job is waiting for shared use
						4 On — second job is waiting for exclusive use
						Off — second job is waiting for shared use
+88	+58	SMF77DOW	2	binary	internal	Number of current owners using the resource
+90	+5A	SMF77DWR	2	binary	internal	Number of current jobs waiting for the resource
+92	+5C	SMF77DO1	8	EBCDIC	ASCB	Job name 1 of current resource owner
+100	+64	SMF77DO2	8	EBCDIC	ASCB	Job name 2 of current resource owner
+108	+6C	SMF77DW1	8	EBCDIC	ASCB	Job name 1 waiting for the resource
+116	+74	SMF77DW2	8	EBCDIC	ASCB	Job name 2 waiting for the resource

Record Type 79 — Monitor II Activity

Record type 79 is written during a Monitor II background session when address space, paging, or real storage/processor/SRM activity is measured and feedback is requested in the form of SMF records. It is written by ERBMFBPC at each measurement interval and when the session is terminated. It contains a section that is identical for all Monitor II reports and a sub-type section that is unique for each report. The length of the record is 160 bytes plus the length of the sub-type section. The sub-types are:

- sub-type 1 — contains information that describes address space state data and address space state data by jobname; the length is 50 bytes for each address space identifier included

- sub-type 2 — contains information that describes address space resource data and address space resource data by jobname; the length is 100 bytes for each address space identifier included

- sub-type 3 — contains information that describes real storage/processor/SRM activity; the length is 36 bytes

- sub-type 4 — contains information that describes paging activity; the length is 62 bytes

- sub-type 5 — contains information that describes address space SRM data and address space SRM data by jobname; the length is 60 bytes for each address space identifier included.

The format is:

Offsets		Name	Length	Format	Source	Description
0	0	SMF79LEN	2	binary	internal	Record length
2	2	SMF79SEG	2	binary		Segment descriptor
4	4	SMF79FLG	1	binary	SMFWTM service routine	System Indicator *Bit*　*Meaning When Set* 0-5　Reserved 6　VS2 7　Reserved
5	5	SMF79RTY	1	binary	internal	Record type: 79 (X'4F')
6	6	SMF79TME	4	binary	SMFWTM service routine	Time, in hundredths of a second, when record was moved to SMF buffer
10	A	SMF79DTE	4	packed	SMFWTM service routine	Date record was moved to SMF buffer, in the form 00yydddF, where F is the sign
14	E	SMF79SID	4	EBCDIC	SMCASID	System identification

(continued)

Offsets		Name	Length	Format	Source	Description
Common Control Header Section:						
18	12	SMF79SIZ	2	binary	internal	Size of common control data section
20	14	SMF79IST	4	packed	MFSBITOD (TIME macro issued by ERBMFBPC)	Time RMF measurement interval started, in the form 0hhmmssF, where F is the sign
24	18	SMF79DAT	4	packed	MFSBIDAT (TIME macro issued by ERBMFBPC)	Date RMF measurement interval started, in the form 00yydddF, where F is the sign
28	1A	SMF79INT	4			Unused
32	20	SMF79RV0	2			Reserved
34	22	SMF79RV2	2			Reserved
36	24	SMF79RV3	4			Reserved
40	28	SMF79MFV	2	EBCDIC	internal	RMF version number
42	2A	SMF79SES	2	EBCDIC	MFSBNAME	RMF session identifier
44	2C	SMF79RLS	4	EBCDIC	CVTRELNO	Operating system release number and level in the form nnll
48	30	SMF79CYC	4			Reserved
52	34	SMF79NRS	2	binary	internal	Number of relocate sections
54	36	SMF79OS1	4			Reserved offset pointer
58	3A	SMF79OS2	4			Reserved offset pointer
62	3E	SMF79OS3	4	binary	internal	Offset pointer to common control data section
66	42	SMF79OS4	4	binary	internal	Offset pointer to sub-type data section
Common Control Data Section:						
70	46	R79GTOD	4	packed	internal	Time when call to data gatherer was issued, in the form hhmmsstF, where F is the sign
74	4A	R79RECST	2	binary	internal	Record sub-type
76	4C	R79RECVN	2	binary	internal	Record version number
78	4E	R79USER	2			Reserved user field
80	50	R79RID	8	EBCDIC	PCTRID	Measurement name
88	58	R79CTXTL	2	binary	PCTOPRD	Length of command text
90	5A	R79CTEXT	32	EBCDIC	PCTOTEXT	Text of command
122	7A	R79DTXTL	2	binary	PCTDRDOL	Length of data reporter default text
124	7C	R79DTEXT	32	EBCDIC	PCTDRO	Default data gatherer text
156	9C	R79NELM	2	binary	internal	Number of subtype data sections (relocate blocks)
158	9E	R79SELM	2	binary	internal	Size of sub-type data section (relocate block)
Sub-type 1 (ASD and ASDJ) Data Section:						
+0	+0	R791ASID	2	binary	ASCBASID	Address space identifier
+2	+2	R791JBN	8	EBCDIC	ASCBJBNI pointer or ASCBJBNS pointer	Name of job
+10	+A	R791DMN	2	binary	OUCBDMN	Domain number
+12	+C	R791NPG	2	binary	OUCBNPG	Performance group
+14	+E	R791PGP	2	binary	((OUCBPGP (LENGTH (WPGD) LENGTH (WPGR))) /LENGTH(WPGP))+1	Performance group period
+16	+10	R791TTOD	4	binary	RMCTTOD OUCBTMO	Real time into transaction (milliseconds)

(continued)

Offsets		Name	Length	Format	Source	Description

Sub-type 1 (ASD and ASDJ) Data Section: (continued)

Offsets		Name	Length	Format	Source	Description
+20	+14	R791CL	2	EBCDIC	Set to IN when all other indicators are off	Current location

Current location:

Contents	Meaning
IN	In storage
PR	Privileged
NS	Non-swappable
WM	Wait queue/MSO
WT	Wait queue/terminal wait
WL	Wait queue/long wait
OT	Swapped out and ready
> >	Transitioning out
< <	Transitioning in

Source detail for R791CL:
- OUCBPVL → PR
- OUCBNSW → NS
- OUCBOFF, OUCBMWT → WM
- OUCBOFF, OUCBTRM → WT
- OUCBOFF, OUCBOUT → WL
- OUCBOUT → OT
- OUCBGOO → > >
- OUCBGOI → < <

| +22 | +16 | R791TAS | 2 | binary | | Type of user |

Contents	Meaning
0	Batch
1	Started task
2	Mount task
3	TSO

Source detail for R791TAS:
- ASCBJBNI → 0
- OUCBSTT → 1
- OUCBMNT → 2
- OUCBLOG → 3

| +24 | +18 | R791SRC | 2 | EBCDIC | OUCBSEC = 1 through 10 | Reason for last swap-out |

Contents	Meaning
TI	Terminal input
TO	Terminal output
LW	Long wait
XS	Auxiliary storage shortage
RS	Real storage shortage
DW	Detected wait
RQ	Request swap
NQ	CAP enqueue
EX	CAP exchange
US	CAP uni-swap
00	Unknown

Offsets		Name	Length	Format	Source	Description
+26	+1A	R791DP	2	binary	ASCBDP	Dispatch priority
+28	+1C	R791SEQN	2	binary	ASCBSEQN	Dispatch position
+30	+1E	R791FMCT	2	binary	ASCBFMCT	Number of real storage frames
+32	+20	R791WSS	2	binary	OUCBWSS	Working set at last swap-in
+34	+22	R791SWC	2	binary	OUCBSWC	Transaction swap count
+36	+24	R791SWMR	2	binary	OUCBWMR/256	SRM workload recommendation value
+38	+26	R791SCRV	2	binary	OUCBCRV* RMPTCPU/256	SRM processor recommendation value
+40	+28	R791SIOC	2	binary	OUCBIRV* RMPTIOC/256	SRM I/O recommendation value
+42	+2A	R791WMS	4	binary	OUCBWMS	SRM service for the current transaction since the last swap-in
+46	+2E	R791TCPU	4	binary	ASCBEJST + ASCBSRBT	CPU time (TCB + SRB) for current job step, in milliseconds

(continued)

Offsets		Name	Length	Format	Source	Description
Sub-type 2 (ARD and ARDJ) Data Section:						
+0	+0	R792ASID	2	binary	ASCBASID	Address space identifier
+2	+2	R792JBN	8	EBCDIC	internal	Name of job
+10	+A	R792DMN	2	binary	OUCBDMN	Domain number
+12	+C	R792NPG	2	binary	OUCBNPG	Performance group
+14	+E	R792CL	2	EBCDIC	OUCBQFL	Current location

Contents	Meaning
IN	Swapped in
OT	Swapped out and ready
NS	Non-swappable
WM	Wait queue/MSO
WL	Wait queue/long wait
WT	Wait queue/term wait
PR	Privileged
> >	Transitioning out
< <	Transitioning in

Offsets		Name	Length	Format	Source	Description
+16	+10	R792TAS	2	binary	OUCB4FL	Type of user

Contents	Meaning
0	Batch
1	Started task
2	Mount task
3	TSO

Offsets		Name	Length	Format	Source	Description
+18	+12	R792TRC	2	binary	OUXBTRC	Transaction count
+20	+14	R792TTOD	4	binary	RMCTTOD, OUCBTMO	Transaction elapsed time, in milliseconds
+24	+18	R792PRFX	4	binary	RSMCNTFX	Number of private fixed frames
+28	+1C	R792ARS	2	binary	OUCBPSE, R792EJST	Average number of real frames for step
+30	+1E	R792SVAR	4	binary	R792TSAM, R792RTM	SRM service absorption rate for step
+34	+22	R792TCPU	4	binary	ASCBEJST + ASCBSRBT	Total processor time (TCB + SRB) for step, in milliseconds
+38	+26	R792PSS	8	EBCDIC	OUCBPSS	Step product of frame, in milliseconds
+46	+2E	R792PSS1	4	binary	OUCBPSS1	High order word
+50	+32	R792PSS2	4	binary	OUCBPSS2	Low order word
+54	+36	R792EJST	4	binary	ASCBEJST	Processor (TCB) time, in milliseconds
+58	+3A	R792TSRM	4	binary	OUXBJBS + OUXBTAS + OUCBUMS	Total SRM service for step
+62	+3E	R792RTM	4	binary	OUXBJBR + OUXBTRR + RMCTTOD - OUCBTMS	Resident time for step, in seconds
+66	+42	R792EXCP	2	binary	ASCBIOSM + OUCBIOSM	EXCP count for step
+68	+44	R792VSC	4	binary	ASCBVSC	VIO slot count for step
+72	+48	R792NVSC	4	binary	ASCBNVSC	Non-VIO slot count for step
+76	+4C	R792PGCT	4	binary	OUXBPIO + OUXBPOUT + OUXBVAM + OUXBVAM0	Total number of paging operations for this interval

(continued)

Offsets		Name	Length	Format	Source	Description
Sub-type 2 (ARD and ARDJ) Data Section: (continued)						
+80	+50	R792V01	4			Reserved
+84	+54	R792V02	4			Reserved
+88	+58	R792V03	4			Reserved
+92	+5C	R792V04	4			Reserved
+96	+60	R792V05	2			Reserved
+98	+62	R792V06	2			Reserved
Sub-type 3 (SRCS) Data Section:						
0	0	R793AFC	2	binary	PVTAFC	Number of available frames
2	2	R793CRI	2	binary	MCVSTCAI	Highest UIC count
4	4	R793SQA	2	binary	PVTSQAFX	Number of SQA frames
6	6	R793CMNF	2	binary	PVTCFMCT	Number of common (LPA + CSA) pageable and fixed frames
8	8	R793CMFF	2	binary	PVTCOMFX	Number of common (LPA + CSA) fixed frames
10	A	R793PRFX	2	binary	PVTCNTFX - PVTSQAFX - PVTCOMFX	Number of private fixed frames (LSQA + non-LSQA)
12	C	R793CPUU	2	binary	CCVUTICP	Processor utilization (0 - 101)
14	E	R793DQ	2	binary	ASCB dispatching queue pointed to by CVTASCBH	Length of ASCB ready queue
16	10	R793INC	2	binary	OUCB queue pointed to by RMCTIQE	Number of address spaces in storage (SRM in queue)
18	12	R793OUTU	2	binary	OUCB queue pointed to by RMCTOTQE	Number of address spaces out of storage (SRM out queue)
20	14	R793LCU	2	binary	RCVTOTDF	SRM measure of logical channel utilization (0 - 100)
22	16	R793ASMQ	2	binary	RCVASMQA	SRM measure of ASM queue length
24	18	R793RV01	2			Reserved
26	1A	R793RV02	2			Reserved
28	1C	R793RV03	2			Reserved
30	1E	R793RV04	2			Reserved
32	20	R793RV05	2			Reserved
34	22	R793RV06	2			Reserved
Sub-type 4 (SPAG) Data Section:						
0	0	R794CMNI	4	binary	PVTCAIN	System common (LPA + CSA) pages in
4	4	R794CMNO	4	binary	PVTCAOUT	System common (CSA) pages out
8	8	R794CMNR	4	binary	PVTCAREL	System common (LPA + CSA) pages reclaimed
12	C	R794SWPI	4	binary	PVTNSWPS	Number of swap-ins
16	10	R794PSPI	4	binary	PVTNSPIN	Number of pages swapped in
20	14	R794PSPO	4	binary	PVTNSPOUT	Number of pages swapped out
24	18	R794PRVI	4	binary	PVTNPIN + PVTVAMI - PVTCAIN	Number of private pages (VIO + non-VIO) swapped in
28	1C	R794PRVO	4	binary	PVTNPOUT + PVTVAMO - PVTCAOUT	Number of private pages (VIO + non-VIO) swapped out
32	20	R794PRVR	4	binary	PVTNPREC + PVTFRMR - PVTCAREC	Number of private pages (VIO + non-VIO) reclaimed

(continued)

Offsets		Name	Length	Format	Source	Description
Sub-type 4 (SPAG) Data Section: (continued)						
36	24	R794VIO	4	binary	PVTVAMI + PVTVAMO	Number of VIO pages (in + out)
40	28	R794AFC	2	binary	PVTAFC	Number of available frames
42	2A	R794CRI	2	binary	MCVSTCRI	Highest UIC count
44	2C	R794ACRI	2	binary ·	RCVUICA	Average of highest UIC count
46	2E	R794RV01	4			Reserved
50	32	R794RV02	4			Reserved
54	36	R794RV03	4			Reserved
58	3A	R794RV04	4			Reserved
Sub-type 5 (ASRM and ASRMJ) Data Section:						
+0	+0	R795ASID	2	binary	ASCBASID	Address space identifier
+2	+2	R795JBN	8	EBCDIC	internal	Name of job
+10	+A	R795DMN	2	binary	OUCBDMN	Domain number
+12	+C	R795NPG	2	binary	OUCBNPG	Performance group
+14	+E	R795PGP	2	binary	OUCBPGP	Performance group period
+16	+10	R795TTOD	4	binary	RMCTTOD - OUCBTMO	Real time into transaction
+20	+14	R795CL	2	EBCDIC	Set to IN when all other indicators are off OUCBOUT OUCBNSW OUCBMVT OUCBLWT OUCBTRM OUCBPVL OUCBGOO OUCBGOI	Current location *Contents* *Meaning* IN In storage OT Swapped out and ready NS Non-swappable WM Wait queue/MSO WL Wait queue/long wait WT Wait queue/terminal wait PR Privileged > > Transitioning out < < Transitioning in
+22	+16	R795TAS	2	binary	 ASCBJBNI OUCBSTT OUCBMNT OUCBLOG	Type of user *Contents* *Meaning* 0 Batch 1 Started task 2 Mount task 3 TSO
+24	+18	R795TROD	4	EBCDIC	OUXBTRR + (RMCTTOD - OUCBTMS)	Transaction resident time
+28	+1C	R795TCNT	2	binary	OUXBTRC	Transaction count
+30	+1E	R795SWC	2	binary	OUCBSWC	Transaction swap count
+32	+20	R795CPUS	4	bianry	OUCBCPU	Total processor service for transaction since last swap-in
+36	+24	R795MSOS	4	binary	OUCBMSO	Total MSO service for transaction since last swap-in
+40	+28	R795IOCS	4	binary	OUCBIOC	Total IOC service for transaction since last swap-in
+44	+2C	R795WMS	4	binary	OUXBTRS + OUCBWMS	Total service for transaction (zeros when ASID is out of storage)
+48	+30	R795TOTL	4	binary	OUXBJBS + OUXBTRS + OUCBWMS	Total service for session (zeros when ASID is out of storage)
+52	+34	R795TOT	4	binary	OUCBWMS	Total service for transaction since last swap-in
+56	+38	R795RESV	4			Reserved

Chapter 7: Fixed Storage Requirements

Fixed Storage Estimates (by options)

Variables		Formulas/Estimates		
If channel (CHAN) activity measurement is selected				
A1 — basic SQA requirement	20	*20*	
A2 — number of processors (assume one)	20*A2	*20*	
A3 — maximum number of channels (assume 16)	20*A3	*320*	
A4 — maximum number of logical channels per CPU (assume 16)	72*A4	*1,162*	
A5 — total SQA for CHAN	A5 = total	*1,502*	*1,502*
A6 — PLPA (fixed)	4.1K	*4,181*	*4,181*
A7 — basic requirement	4.5K	*4,538*	
A8 — maximum number of logical channels (16)	16*A8	*256*	
A9 — number of logical channels (assume 16)	60*A9	*960*	
AA — total temporarily fixed address space for CHAN	AA = total	*5,754*	*5,754*
If processor (CPU) activity measurement is selected				
B1 — total SQA requirement		*400*	*400*
B2 — PLPA (fixed)		*1,484*	*1,484*
B3 — basic requirement		*3,388*	
B4 — number of processors (assume 1)	16*B4	*16*	
B5 — total temporarily fixed address space for CPU	B5 = total	*3,404*	*3,404*
If device (DEVICE) activity measurement is selected				
C1 — basic SQA requirement	64	*64*	
C2 — number of devices sysgened in device classes being measured (assume 275)	60*C2	*16,500*	
C3 — total SQA for DEVICE	C3 = total	*16,564*	*16,564*
C4 — PLPA code (fixed)	1.2K	*1,236*	*1,236*
C5 — address space code - basic requirement	5.4K	*5,406*	
C6 — number of device classes being measured (assume 2)	64*C6	*128*	
C7 — number of devices sysgened in device classes being measured (assume 275)	84*C7	*23,100*	
C8 — total temporarily fixed address space code for DEVICE	= total	*28,634*	*28,634*
If paging (PAGING) activity measurement is selected				
D1 — total SQA required	168	*168*	*168*
D2 — PLPA (fixed)	756	*756*	*756*
D3 — total temporarily fixed address space code requirement	2.8K	*2,868*	*2,868*
SUBTOTAL 1				*60,951*

Variables		Formulas/Estimates		
If Page/Swap data set (PAGESP) activity measurement is selected				
E1 — basic SQA requirement	24	*24*		
E2 — maximum number of page data sets which could be varied online for this IPL (up to 64) — assume 5	52*E2	*260*		
E3 — maximum number of swap data sets which could be varied online for this IPL (up to 25) — assume 2	52*E3	*104*		
E4 — total SQA for PAGESP	E4 = total	*388*	*388*	
E5 — PLPA code (fixed)	1K	*946*	*946*	
E6 — address space code basic requirement	3.2K	*3,191*		
E7 — maximum number of page and swap data sets that could be varied online for this IPL (up to 89) — assume 7	164*E7	*1,148*		
E8 — total temporarily fixed address space code requirement	E8 = total	*4,339*	*4,339*	
If ASM/RSM/SRM trace (TRACE) activity measurement is selected				
F1 — basic SQA requirement per name	100	*100*		
F2 — set size per name (depends on options chosen and the name's field size):	2 to 40	*20*		

Option Requested	Length of Sampled Data	
	$\leq$2 bytes	>2 bytes
Minimum	2	4
Maximum	2	4
End	2	4
Average	6	8
Standard Deviation	14	20
All	20	32

Variables		Formulas/Estimates		
F3 — samples per set — default is 60 (can be zapped in ERBMFTTB)	60	*60*		
F4 — number of samples (interval time ÷ cycle time)	6 to 72000	*3,600*		
default interval = 15 minutes } 3600 samples default cycle = 250 milliseconds				
F5 — total SQA for a name $\left(\dfrac{F4}{F3} * F2\right) + F1$ F5 must be calculated for each name.	$\left(\dfrac{F4}{F3} *F2\right) + F1$	*1,300*		
F6 — total SQA for all names traced = summation of space for each name	Σ F5	*6,500*	*6,500*	
F7 — PLPA code (fixed)	1440	*1,440*	*1,440*	
F8 — total temporarily fixed address space for TRACE data	2652 + F6	*9,152*	*9,152*	
SUBTOTAL 2				*22,765*

Notes:

1. Requesting one of the 5 Domain Names will expand the number of names traced.

2. Discretion must be used in selecting the list of names to trace and the options. If the entire set of names and options is requested with the shortest cycle and the longest interval, an excessive amount of storage is required. You should make a rough estimate of your requirements, how much storage you will need, and what effect this will have on the system performance. By not requesting standard deviation, you will reduce storage requirements significantly (See the table with F2.)

Variables		Formulas/Estimates	
If workload (WKLD) activity measurement is selected			
G1 — basic SQA requirement	64	*64*	
G2 — number of performance numbers in Installation Performance Specification (IPS) (maximum = 255)	4*G2	*40*	
G3 — number of performance group periods in IPS (maximum = 2040)	44*G3	*880*	
G4 — total SQA for WKLD	G4 = total	*984*	*984*
G5 — PLPA (fixed)	1.4K	*1,424*	*1,424*
G6 — total temporarily fixed address space requirements	2.9K	*2,908*	
G7 — highest performance group number in IPS (maximum = 255)	4*G7	*24*	
G8 — number of performance group periods in IPS	44*G8	*880*	
G9 — total temporarily fixed address space code for WKLD	G9 = total	*3,812*	*3,812*
If enqueue (ENQ) activity measurement is selected			
H1 — basic SQA requirement for ENQ on a specified major name	.4K	*408*	
H2 — basic SQA requirement for ENQ on a specified major name and minor name	2K	*2,048*	
H3 — basic SQA requirement for ENQ on all serially-reusable resources	4K	*4,096*	
H4 — total SQA requirement (assume H2 value)	H4 = total	*2,048*	*2,048*
H5 — PLPA (fixed)	2.6K	*2,624*	*2,624*
H6 — total temporarily fixed address space for ENQ	5.7K	*5,734*	*5,734*
SUBTOTAL 3			*16,626*
SUBTOTAL 2			*22,765*
SUBTOTAL 1			*60,951*
TOTAL FIXED RMF CODE			*100,342*

Fixed Storage Estimates (by storage area)

Storage Area	Formula	Estimate
SQA for RMF		
Basic requirement	28	28
CPU (if specified)	B2	400
CHAN (if specified)	A5	1,502
DEVICE (if specified)	C3	16,564
PAGING (if specified)	D1	168
WKLD (if specified)	G4	984
PAGESP (if specified)	E4	388
TRACE (if specified)	F6	6,500
ENQ (if specified)	H4	2,048
	total	28,582
Fixed PLPA for RMF		
Basic requirement (not including 1.6K temporarily fixed)		
CPU (if specified)	B2	1,484
CHAN (if specified)	A6	4,181
DEVICE (if specified)	C4	1,236
CHAN/DEVICE (if specified)	.5K	512
PAGING (if specified)	D2	756
WKLD (if specified)	1.4K	1,424
PAGESP (if specified)	E5	946
TRACE (if specified)	F7	1,440
ENQ (if specified)	2.6K	2,624
	total	14,603
Temporarily Fixed Private Area Storage for RMF		
Basic requirement	.7K	718
CPU (if specified)	B5	3,404
CHAN (if specified)	AA	5,754
DEVICE (if specified)	C8	28,634
WKLD (if specified)	G9	3,812
PAGING (if specified)	D3	2,868
PAGESP (if specified)	E8	4,339
TRACE (if specified)	F8	9,152
ENQ (if specified)	5.7K	5,734
	total	64,415

Chapter 8: Resource Measurement Facility User Completion Codes

0301 *Explanation:* A return code other then 0 or 16 was returned by the TPUT SVC.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Reponse: None.

Problem Determination: Items 4, 5b, 16, and 29.

1200 *Explanation:* An unexpected return code was received from the Monior I session initialization SVC because the SVC tried to issue an ENQ macro instruction but the name (SYSZRBMF,ACTIVE) was already in use.

System Action: Monitor I session processing terminates.

Programmer Response: None.

Problem Determination: Items 2, 4, 5a, 16, and 29.

1201 *Explanation:* An unexpected return code was received from the Monitor I session data collection SVC.

System Action: Monitor I session processing terminates.

Programmer Response: None.

Problem Determination: Items 2, 4, 5a, 16, and 29.

1202 *Explanation:* An OPEN error occurred while opening the RMF programmer message data set that was to contain abnormal messages issued as a result of errors detected during RMF processing.

System Action: RMF processing terminates.

Programmer Response: None.

Problem Determination: Items 2, 4, 5b, 16, and 29.

1203 *Explanation:* An error occurred while attempting to dynamically allocate a SYSOUT data set.

System Action: If the error is associated with a report subtask, RMF measurement collection continues.

If the error is associated with the main RMF task, processing terminates.

Problem Determination: Items 4, 5a, 16, and 29.

1300 *Explanation:* An OPEN error was detected while opening a report SYSOUT data set.

System Action: No reports are formatted for this measurement interval. RMF meausurement collection continues.

Programmer Response: None.

Problem Determination: Items 4, 5b, 16, 18, and 29.

1301 *Explanation:* The report subtask experienced an unexpected return code from one of the system services while formatting and printing reports.

System Action: No reports are formatted for this measurement interval. RMF measurement collection continues.

Programmer Response: None.

Problem Determination: Items 4, 5b, 16, 18, and 29.

1310 *Explanation:* An I/O error occurred while writing a report to the report SYSOUT data set.

System Action: The report subtask might be reinstated. If the reinstatement is successful, a complete set of reports is reformatted and printed for this interval. If the reinstatement is unsuccessful, the reports for the RMF interval are not completely formatted and all RMF measurement collection continues.

Programmer Response: None.

Problem Determination: Items 4, 5b, 16, 18, and 29.

1401 *Explanation:* An error code of 4, 16, 20, or more than 20 was returned by the TGET SVC.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Response: None.

Problem Determination: Items 4, 5b, 16, and 29.

1402 Explanation: A return code of 8, indicating an invalid entry code parameter, was returned by a data gatherer or data reporter during a Monitor II session.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Response: None, if the module causing the error is supplied by IBM. If the module causing the error is an installation-supplied routine, locate the source of the error and test the module again.

Problem Determination: Items 4, 5b, 16, and 29.

1403 Explanation: During a Monitor II session, RMF module ERBRMFPL -- the putline routine -- was called with an invalid input parameter. Either the text length was 0 or greater then 79, or the data type contained a value other than HD or DT.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Response: None, if the module causing the error is supplied by IBM. If the module causing the error is an installation-supplied routine, locate the source of the invalid parameter to the putline routine and test the module again.

Problem Determination: Items 4, 5b, 16, and 29.

1404 Explanation: During a display session, RMF module ERBPUTSM was called to add a header or data line to the logical terminal buffer, but the buffer already contained the maximum number of header or data lines.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Response: None, if the module causing the error is supplied by IBM. If the module causing the error is an installation-supplied routine, locate the source of the error and test the module again.

Problem Determination: Items 4, 5b, 16, and 29.

1405 Explanation: During a display session, RMF module ERBPUTSM was called to add a header or data line to the logical terminal buffer, but the length specified for the text was zero.

System Action: RMF either terminates the session or issues message ERB235A to allow the user to decide whether or not to continue the session.

Programmer Response: None, if the module causing the error is supplied by IBM. If the module causing the error is an installation-supplied routine, locate the source of the error and test the module again.

Problem Determination: Items 4, 5b, 16, and 29.

Problem Determination

Problem determination is the activity required to identify a failing hardware unit or program and determine who is responsible for support.

Problem determination is accomplished by using procedures specified by IBM. In some cases, these procedures may be initiated by a message or code which requires operator or programmer response. The response may include the requirement for additional problem-related data to be collected and will attempt, where possible, to indicate "probable" failure responsibility.

Problem determination information is included for applicable messages and codes under the heading "Problem Determination." Standard problem determination actions are identified as items. Unique actions are identified following the list of standards actions to be taken. In any case, it is intended that the specified actions be taken before calling IBM for support.

If the problem recurs, follow the problem determination aids specified by the associated message or code before calling IBM for support:

1. If MSGLEVEL=(1,1) was not specified in the JOB statement, specify it and rerun the job.
2. Save the console sheet from the primary console. In systems with Multiple Console Support (MCS), save a copy of the hard copy log.
3. Save the job stream associated with the job.
4. Save the system output (SYSOUT) associated with the job.
5. Make sure that the failing job step includes a:
   a. SYSABEND DD statement.
   b. SYSUDUMP DD statement.
   c. PL1DUMP DD statement.
6. Make sure that the PARM parameter of the EXEC statement specifies:
   a. MAP   e. CORE, if applicable
   b. LIST   f. XREF
   c. DIAG   g. DUMP
   d. MSG=AP
7. Execute the LISTIDR function of the AMBLIST service aid program to obtain a list of all members with a PTF or local fix, and save the output. Execute the program against the:
   a. SYS1.LINKLIB data set.
   b. SYS1.SVCLIB data set.
   c. library containing the program that issued the message.
   d. SYS1.LPALIB data set.
8. Execute the Access Method Services LISTCAT command to obtain a listing of the VSAM catalog.
9. Execute the AMBLIST service aid program to obtain:
   a. an object module listing, specifying the LISTOBJ function.
   b. a load module map and cross-reference listing, specifying the OUTPUT=BOTH option of the LISTLOAD function.
10. Have a copy of the Message Control Program (MCP) available.
11. Execute the AMDSADMP service aid program to dump the contents of real storage and page data sets on magnetic tape.
    After restarting the system, execute the appropriate function of the AMDPRDMP service aid program to print the required portion of the dump tape produced by AMDSADMP.
    Save both the tape from AMDSADMP (should further information from the tape be required) and the listing from AMDPRDMP.
12. Execute the SEREP program, and save the resulting output.
13. Save all the associated output.
14. In the normal response to this message, the programmer/operator was requested to execute a specific program. Save all output from that program.
15. Save the program listing associated with the job.
16. Save the dump.
17. Have the system generation (SYSGEN) output available from:
    a. Stage I   b. Stage II
18. Execute the IFCEREP0 service aid program, to dump the SYS1.LOGREC data set. Save the resulting output.
19. Save the assembly listing associated with the job.
20. Save the control cards associated with the job.
21. Save the compiler output associated with the job.
22. Save the source input associated with the job.
23. Save the source program listing associated with the job.
24. Run OLTEP diagnostics for the problem device and save the output.
25. Execute the IEHLIST system utility program to obtain a list of the:
    a. volume table of contents of the associated volume, specifying the FORMAT option.
    b. volume table of contents of the associated volume, specifying the DUMP option.
    c. directory of the associated data set.
26. Execute the IEBPTPCH data set utility to:
    a. print the directory of the applicable data set.
    b. print the applicable data set.
    c. print the applicable member.
    d. print the applicable procedure.
27. Have the linkage editor/loader map available.
28. Save the associated volume.
29. Contact IBM for programming support.
30. Contact IBM for hardware support.
31. Save the trace output data set.
32. Print the trace data set with the AMDPRDMP service aid program using the EDIT statement.
33. Print the associated SVC Dump data set, using the AMDPRDMP service aid with the GO statement.
34. Execute the Access Method Services LISTCAT command to:
    a. list the contents of the applicable catalog.
    b. list the catalog entries for the applicable objects and any related objects.
35. Run the following Access Method Services command:
    a. LIST MSF, for mountable and non-mountable volume.
    b. LIST MSF, specifying the CARTRIDGE parameter.
    c. PRINT, to list the Mass Storage Volume Inventory data set.

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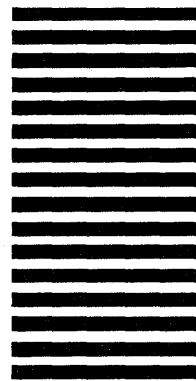Fold and tape   Please Do Not Staple   Fold and tape

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