1 Preface

Brief description of SM2-PA

SM2 Program **A**nalyzer SM2-PA is an analysis routine designed to evaluate user-specific output files created with the aid of the SM2 Software Monitor.

Users can have their tasks monitored by SM2 simply by registering them for SM2 user task measurement. SM2-PA analyzes task-specific characteristics and runtime-related monitored data which has been recorded by SM2 and written to an SM2 output file. The results of analysis provide users with valuable information pertaining to the resources their tasks have tapped and the performance behavior exhibited by application programs. This information serves as the basis for achieving performance improvements.
For details of the SM2 Software Monitor, please refer to the SM2 manual [1].

Target group

This manual is intended for application programmers, system programmers and system administrators.

Summary of contents

The manual comprises six chapters and an appendix with the following contents:

Chapter 1, *Preface*,
contains a brief description of the SM2-PA Program Analyzer, summarizes the changes since the last version and gives hints for using the manual.

Chapter 2, *SM2-PA Program Analyzer*,
describes the SM2-PA scope of functions and prerequisites for use, discusses the files used during analysis and deals with program execution.

Chapter 3, *Operation*,
covers SM2-PA operation in interactive mode (via the mask-driven covers SM2-PA operation in interactive mode (via the mask-driven user interface) and in batch/procedure mode (via the SDF statement interface).

Chapter 4, *List output*,
provides and explains sample list outputs for the various SM2-PA statements/functions.

Chapter 5, *Installation*,
comprises hints for SM2-PA installation.

Chapter 6, *Messages*,
lists the SM2-PA program messages and their meaning.

The *appendix* includes the SDF syntax description, since SM2-PA is operated via the SDF statement interface in batch and procedure mode.

At the back you will find a list of references and an alphabetical index.

Changes since the last version of the manual

This manual (edition November 1993) describes the SM2-PA V2.0 Program Analyzer. The changes listed below refer to the predecessor version V1.0 (edition May 1991).

SM2-PA V2.0 contains adjustments to BS2000 Version 11.0, in particular to SM2 V11.0.

As of V11.0, BS2000 has been renamed "BS2000 / OSD" (Open Systems Direction). The name of the basic configuration has been changed from "BS2000-GA V11.0" to "BS2000 / OSD - BC V1.0". These changes reflect the new orientation of BS2000 as an open server platform.

New functions

- Mask-driven user interface:
  In interactive mode, the SDF statements of SM2-PA have been replaced by a new user interface based on screen masks and menu bars.
  The user simply presses function keys to select menu objects on the screen, request statistics or display analysis results.

  In batch mode, SM2-PA continues to be operated via the SDF statement interface.

  In procedures, a choice between SDF statements and a mask interface is possible. If the BS2000 command /ASSIGN-SYSDTA TO-FILE=*SYSCMD is issued before calling SM2-PA V2.0, SDF statements are expected. If /ASSIGN-SYSDTA TO-FILE=*PRIMARY is given, SM2-PA branches to the mask interface.

- File assignments during program execution:
  The file assignments for the input file, the output file and the optional SVC names file (see below) can be effected during the program run. This permits several input files to be analyzed successively without terminating SM2-PA.
  File assignments are accomplished via the SET-FILES mask or the new SDF statement MODIFY-FILE-ASSIGNMENT.

- SVC names file:
  SM2-PA reads the SVC names from its own table; SVC names and numbers are output. Users also have the possibility to assign their own SVC names file via the link name PASVC.

- Indices for monitored tasks with the same TSN:
  The numerical index serves to distinguish between identical TSNs occurring in different task measurement periods.

– New ADDRESS parameter for PREPARE-PCOUNTER- and PREPARE-SVC-STATISTICS:
  If a program has at least two modules with the same name, the ADDRESS operand can be used to define one of these modules via its start address.

Adjustments to SM2 V11.0

– Extension of the BS2000 command /START-TASK-MEASUREMENT:
  New operand for monitoring foreign tasks: TSN=<alphanum-name 1..4>,
  new parameter for recording the module load information:
  LOAD-INFO=STD/DETAILED.

– Program stop record:
  Number of records that could not be written to the file during the program run (program-specific capturing of missed records).

– Measurement termination ID:
  In the STOP-TASK record a measurement termination ID is supplied which indicates by whom measurement was terminated.

– New value in task statistics:
  ESA PAGES: Maximum allocation of dataspace pages.
  This value is included in the list output for PREPARE-TASK-STATISTICS.

– Overlapping modules:
  Address areas used by multiple modules are exhibited as "OVERLAPPING MODULES".
  If in the SVC-SUMMARY or PCOUNTER-SUMMARY mask the special module "*** OVERLAPPING MODULES" is selected for MODULE evaluation, the mask OVERLAPPED MODULES is output.

Canceled functions

– SM2-PA statement SHOW-EVALUATION-OBJECTS (replaced by function SET-EVAL).

– The following parameters in SM2-PA statements:

  SUPPRESS-ZERO-LINES in PREPARE-PCOUNTER-STATISTICS:
  (No) output of address areas in which no program counter samples were taken.

  OUTPUT in PREPARE-PCOUNTER-STATISTICS, PREPARE-SVC-STATISTICS, PREPARE-TASK-STATISTICS and SHOW-MEASURED-OBJECTS:
  Selection of the output type for analysis results.
  If SM2-PA statements are used, measurement results are no longer output to SYSOUT.

SVC in PREPARE-SVC-STATISTICS:
Selection of SVCs for evaluation of SVC statistics.

FROM, TO for MODULE evaluation in PREPARE-SVC-STATISTICS:
Specification of an address area within a module.

The above parameters and the SHOW-EVALUATION-OBJECTS statement are still accepted but not executed, i.e. no error message is issued.

README file

Any functional changes or current product version updates for this manual can be found in the product-specific README file on your BS2000 computer under the file name `SYSDOC.product.version.READ-ME.E`. The appropriate user ID can be obtained from your system administrator. The README file can be viewed using the `/SHOW-FILE` command or an editor or printed on a standard printer via the following command:

```
/PRINT-FILE FILE-NAME=filename,LAYOUT-CONTROL=PARAMETERS(CONTROL-
CHARACTERS=EBCDIC)
```

2 SM2-PA Program Analyzer

2.1 Scope of functions

SM2 output file as input file

The SM2-PA Program Analyzer evaluates SM2 output files created by one or more user-specific SM2 monitoring operations. SM2-PA reports the results of analysis in the form of statistics. The user can select output in the form of either task statistics, program counter (PC) statistics or SVC statistics.

Task statistics

SM2-PA generates a task statistics report for those tasks which the user has selected for SM2 monitoring by means of the BS2000 command /START-TASK-MEASUREMENT. This report contains task-related data, judging from which the degree of resource utilization can be determined for the particular tasks monitored, for example:

- elapsed CPU time (in seconds), starting at task generation time
- accumulated number of all I/O operations, starting at task generation time
- CPU time (in seconds) during the task monitoring period
- total number of I/O operations during the task monitoring period
- number of SVC calls during the task monitoring period
- number of pages read offline during the task monitoring period
- number of requests issued to the central processor during the task monitoring period
- number of wait states during the task monitoring period
- maximum occupancy of user address space (sum of class 5 and class 6 memory)
- number of service units added during the task monitoring period
- the program with the most CPU time elapsed
- the program with the highest number of I/O operations.

Information output on the individual tasks is further described under "Output of screen and list formats".

Program counter statistics and SVC statistics

In addition to task analysis, SM2-PA generates analysis reports on SM2 program counter statistics and SVC statistics. These program-related statistics represent SM2 extensions relating to user task monitoring. The statistics are used to examine the behavior of application programs more closely; this makes it possible to determine which programs are executed very frequently and therefore are more likely to be necessary targets of performance analysis.

In the case of program counter statistics, the program is interrupted by means of a timer whenever the monitored task has used a certain CPU time interval (BS2000 command /START-TASK-MEASUREMENT PCOUNTER-INTERVAL=<integer 1..10000>). In each case, the address of the instruction to be executed next (contained in the PCounter) is transferred to the task-specific output file by SM2 (recording of program counter samples). The number of samples is thus proportional to the CPU time used.

In the case of SVC statistics, SM2 logs all SVC calls made to the program during the monitoring period and stores the SVC numbers and call addresses in the SM2 output file.

SM2-PA analyzes how recorded program counter samples or SVC calls are distributed to the individual modules and program sections.

Output of analyses

Output of analyses is to screen and/or printer. Representation and the extent of analysis is adapted to the relevant output medium.

In the case of screen output, the relevant results pertaining to a unit of analysis are displayed on the screen as a standard procedure (e.g. the results of task analysis for an individual monitoring cycle, task-related totals for the selected monitoring cycles, etc.).

2.2 Requirements for using SM2-PA

The following diagram shows the interrelationship between SM2 and SM2-PA.

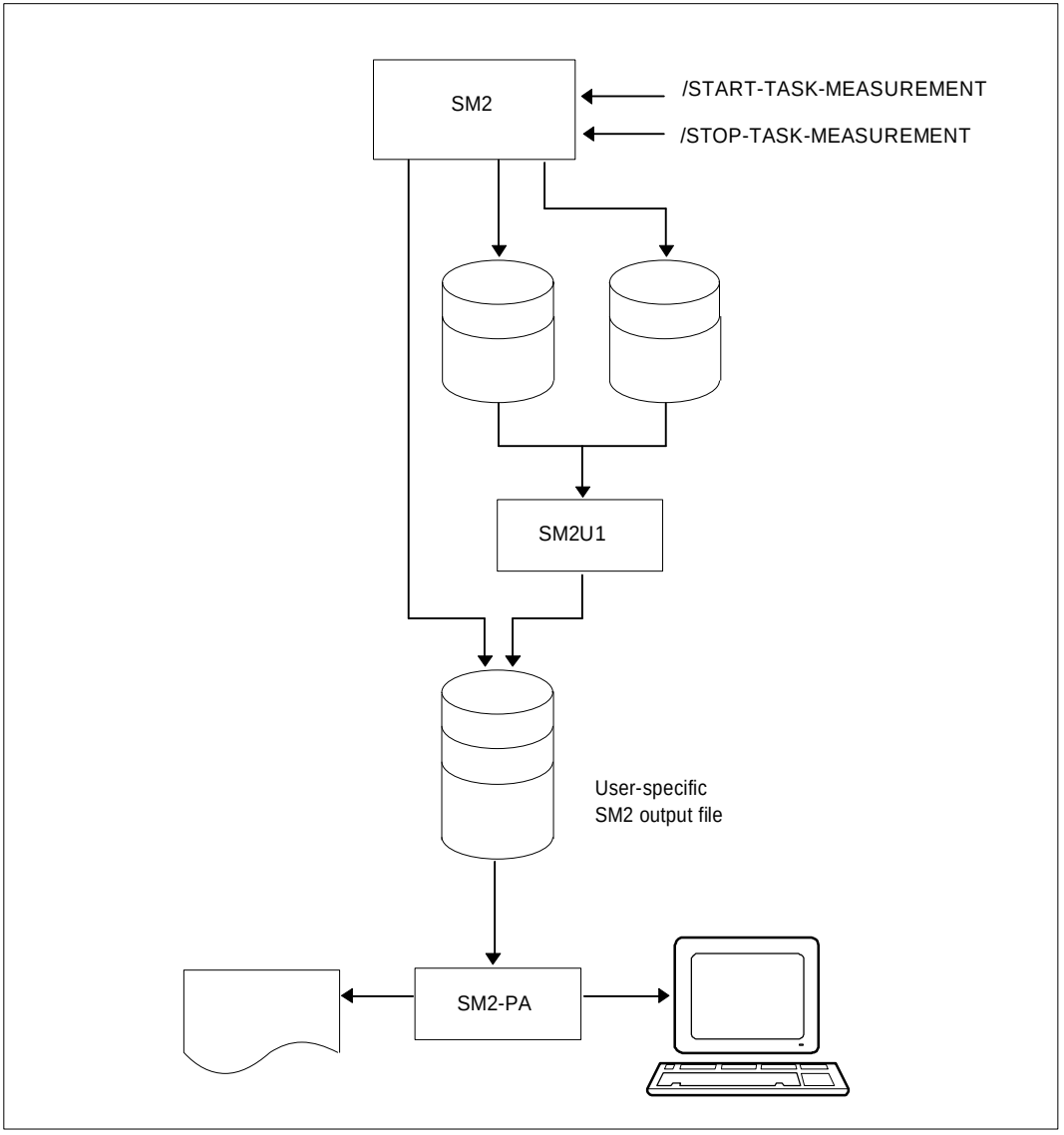


Fig. 1 Interrelationship of SM2 and SM2-PA

Basic execution sequence:

- SM2 records task-specific monitored values and writes them to a user-specific file.
- SM2U1 merges multiple SM2 output files to form one single file.
- SM2-PA analyzes this user-specific SM2 output file and displays the results on the screen and/or outputs them in the form of a report.

Activating user task monitoring

The figure below represents user task monitoring by SM2.

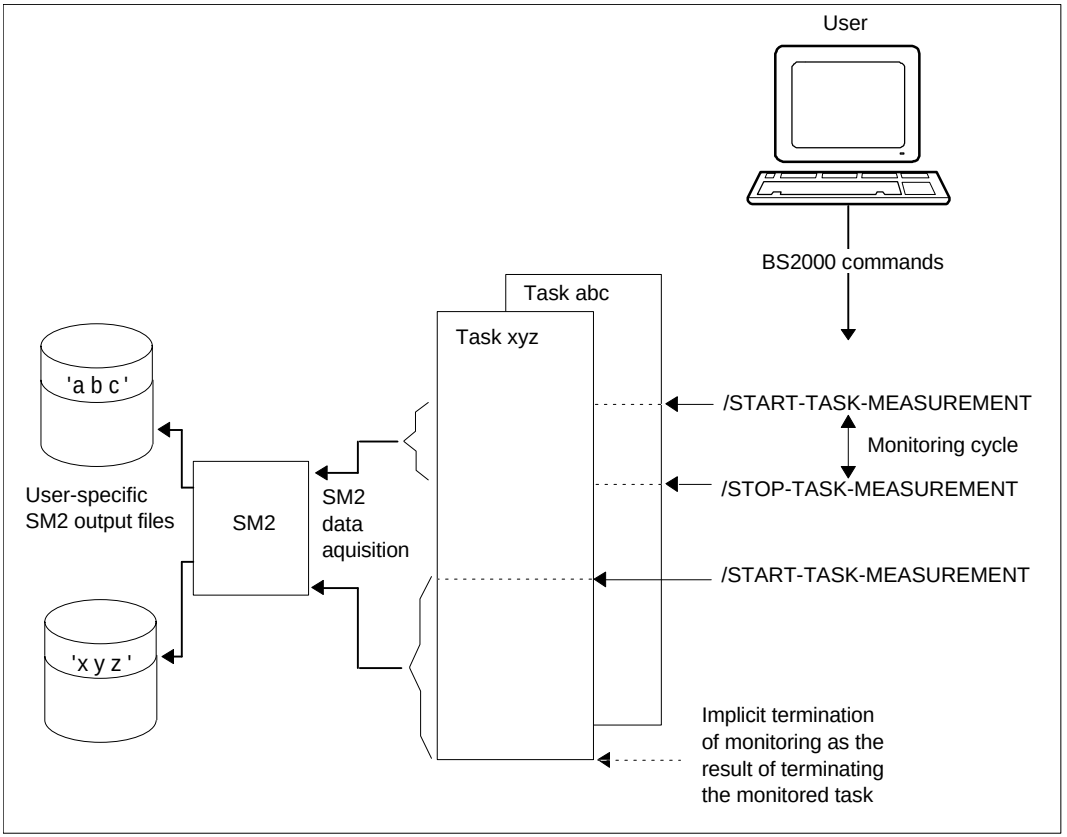


Fig. 2 SM2 user task monitoring

All users can have the tasks of their respective user IDs monitored by SM2, provided that the SM2 primary administrator has allowed for user task monitoring by issuing the SM2 statement MODIFY-USER-ADMISSION TASK=ALLOW (the total number of tasks which can be simultaneously monitored is limited to 16).
Only users having the SWMONADM system privilege may monitor tasks of other user IDs and/or terminate such monitoring.

Command description

With the BS2000 command /START-TASK-MEASUREMENT, the user selects the tasks to be monitored. The SM2 monitoring routine then records task-specific monitored data and enters this information in a user-specific file.

With the BS2000 command /STOP-TASK-MEASUREMENT or at task termination time, user task monitoring is terminated and the user-specific SM2 output file is closed. Ongoing user task monitoring is also terminated if the SM2 primary administrator has withdrawn the permission for user task monitoring (by issuing the SM2 statement MODIFY-USER-ADMISSION TASK=INHIBIT) or if SM2 is unloaded (STOP-SUBSYSTEM SUBSYSTEM-NAME=SM2).

In the following sections, the monitoring cycle between the /START-TASK-MEASUREMENT and /STOP-TASK-MEASUREMENT commands is referred to as the task measurement period.

START-TASK-MEASUREMENT

```
 TSN = *OWN / <alphanum-name 1..4>
,FILE = STD / BY-LINK-NAME
,PCOUNTER-INTERVAL = NONE / <integer 1..10000>
,SVC-STATISTICS = OFF / ON
,LOAD-INFO = STD / DETAILED
```

STOP-TASK-MEASUREMENT

```
 TSN = *OWN / <alphanum-name 1..4>
```

Operand description

TSN =
Specifies the task which is to be monitored or whose monitoring is to be terminated.

TSN = *OWN
The task invoking the command is monitored or its monitoring is terminated.

TSN = <alphanum-name 1..4>
The task with the specified TSN is monitored or its monitoring is terminated. Only users with the SWMONADM system privilege may monitor (or terminate monitoring of) any tasks; all other users are only entitled to do this for tasks of their own user ID.
Restriction: SM2U (the task which processes user-specific SM2 output files) cannot be monitored.

FILE =
Defines the user-specific SM2 output file.

FILE = STD
The user-specific SM2 output file is provided with file attributes (see "File attributes" table below).

FILE = BY-LINK-NAME
The user defines the file name and further file attributes with the aid of corresponding BS2000 commands. File assignment takes place via the link name. The link name for the user-specific SM2 output file is PALINK.

PCOUNTER-INTERVAL =
Defines the sampling cycle (in CPU milliseconds) for the program counter statistics report.

PCOUNTER-INTERVAL = NONE
Program counter statistics not activated.

PCOUNTER-INTERVAL = <integer 1..10000>
Sampling cycle (in CPU milliseconds) relative to the CPU time used by the monitored task.
Only samples taken in status TU (P1) are recorded.

SVC-STATISTICS =
The SVC calls of the task to be monitored are recorded and written to the user-specific SM2 output file.

SVC-STATISTICS = OFF
SVC statistics not activated.

SVC-STATISTICS = ON
SVC statistics activated.
Only SVCs called in status TU (P1) are recorded.

LOAD-INFO =
Defines at which time the module load information is to be recorded.

LOAD-INFO = STD
The module load information is recorded at program/monitoring start and termination only.

LOAD-INFO = DETAILED
The module load information is recorded at program/monitoring start and on any load/unload activity of the task.
This parameter should be specified when using overlay techniques in the monitored program (see page 22).

Command return code

(SC2) SC1	Maincode	Meaning
0	CMD0001	No error
32	NPS0050	System error in SM2 modules. Command rejected
64	NPS0044	No authorization for monitoring the task. Command rejected
64	NPS0045	Task is already being monitored by SM2
64	NPS0046	Task monitoring not initiated via /START-TASK-MEASUREMENT. Command rejected
64	NPS0047	Specified task does not exist
64	NPS0051	Specified task must not be monitored by the user
64	NPS0065	No further tasks can be monitored
64	NPS0066	Invalid file attributes in user-specific SM2 output file
64	NPS0067	DMS code ’(&00)’ on macro call ’(&01)’ for user-specific SM2 output file

Note

A general description of the command return codes can be found in the manual "User Commands (SDF Format)" [5].

File creation operand	FILE = STD	FILE = BY-LINK-NAME
Definition of file attributed	Predefined	Optional
File name	$userid.SM2. TASKSTATISTIK.nnnn	filename
Block length	BUFFER-LENGTH = STD (SIZE=2)	BUFFER-LENGTH = STD (SIZE=number)
Storage space assignment	SPACE = RELATIVE (PRIMARY-ALLOCATION=30, SECONDARY-ALLOCATION=30)	SPACE = RELATIVE (PRIMARY-ALLOCATION=num1, SECONDARY-ALLOCATION=num2)
Access method	SAM	Not optional; mandatory format SAM
Open mode	EXTEND	Not optional; the existing file is extended
Block format	BLOCK-CONTROL-INFO Determined by the relevant CL2 option	BLOCK-CONTROL-INFO = PAMKEY WITHIN-DATA-BLOCK NO

Table 1 File attributes

nnnn = TSN of the task to be monitored.

The BLOCK-CONTROL-INFO=NO operand has the same effect as BLOCK-CONTROL-INFO= WITHIN-DATA-BLOCK, since only the SAM format has been permitted for the file.

Note

If a large amount of data is to be written to the SM2 output file (e.g. a large amount in conjunction with a short PCoutner cycle), the values for BUFFER-LENGTH (and for the primary and secondary allocations) must be increased, otherwise records might be lost in the course of monitoring operations (so-called missed records).

Example

Command sequence for executing user task monitoring:

```
/CREATE-FILE FILE-NAME=USER.TASKSTAT.1,
             SPACE=RELATIVE(PRIMARY-ALLOCATION=300,
                            SECONDARY-ALLOCATION=99)  ————————————————(01)
/SET-FILE-LINK LINK-NAME=PALINK,FILE-NAME=USER.TASKSTAT.1,
             BUFFER-LENGTH=STD(SIZE=16)  ——————————————————————————————(02)
/START-TASK-MEASUREMENT
             FILE=BY-LINK-NAME,PCOUNTER-INTERVAL=1,SVC-STATISTICS=ON  ———(03)
   .
   . any user application commands, e.g.
   .
/START-PROGRAM FROM-FILE=PROGRAM1  ———————————————————————————————————(04)
   .
   .
   .
/STOP-TASK-MEASUREMENT  ——————————————————————————————————————————————(05)
```

(01) Create catalog entry for the user-specific SM2 output file USER.TASKSTAT, to which the task-specific monitored values are to be written.

(02) Assign SM2 output file USER.TASKSTAT.1 via the link name PALINK.

(03) Activate user task monitoring; (allocate the current SM2 output file; define the sampling cycle for program counter statistics, specifying an interval of 1 ms; activate SVC monitoring). The user is informed of the successful start of task monitoring by means of the SM2 message `NPS0048 TASK MONITORING STARTED AT "DATE TIME"`.

(04) Start application program PROGRAM1

(05) Terminate user task monitoring and close the SM2 output file USER.TASKSTAT.1

Merging multiple SM2 output files using SM2U1

The figure below illustrates merging of SM2 output files using SM2U1.

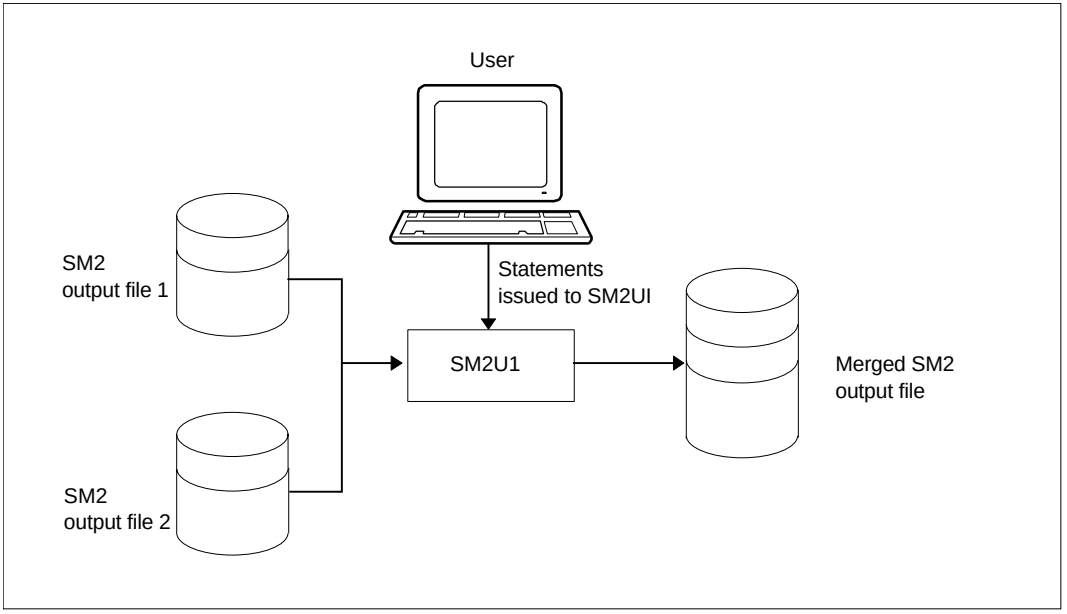


Fig. 3 User-activated merging of SM2 output files

As many as 99 SM2 output files generated during the various task monitoring cycles can be merged using the SM2U1 statement MERGE-FILES, prior to their analysis.

Each input file must be assigned a link name SM2UI1 to SM2UI99, and the output file must be assigned link name SM2U0.
The block lengths of the input files may vary. Files are opened in INPUT mode. The program run is terminated once DMS error messages are issued for any file.
As far as the output file is concerned, the user can control the block length, memory allocation and OPEN mode (OUTPUT or EXTEND operand). By default, an SM2U1 output file is opened with OPEN-MODE=EXTEND.

A newly created output file is assigned the values

```
BUFFER-LENGTH = STD(SIZE=16)
SPACE         = RELATIVE(PRIMARY-ALLOCATION=32,SECONDARY-ALLOCATION=96)
```

by default. Both assignments go into effect only if the user has defined his own values beforehand.
Any BUFFER-LENGTH specifications in the SET-FILE-LINK command are ignored if the files are output files whose values do not correspond to the cataloged value.

MERGE-FILES
TYPE = PA-FILE

Operand description

TYPE =
Selects the type of SM2 output file.

TYPE = PA-FILE
Merges user-specific SM2 output files.

Command sequence for merging SM2 output files:

```
/SET-FILE-LINK LINK-NAME = SM2UI1, FILE-NAME = SM2 output file 1  ————————(01)
/SET-FILE-LINK LINK-NAME = SM2UI2, FILE-NAME = SM2 output file 2  ————————(02)
/CREATE-FILE FILE-NAME = complete SM2 output file ———————————————————————(03)
/SET-FILE-LINK LINK-NAME = SM2UO, FILE-NAME = entire SM2 output file ————(04)
/START-PROGRAM FROM-FILE = $SM2U1  ———————————————————————————————————(05)
//MERGE-FILES TYPE = PA-FILE  ————————————————————————————————————————(06)
//END  ——————————————————————————————————————————————————————————————(07)
```

(01) Assign "SM2 output file 1" as the input file using link name SM2UI1
(02) Assign "SM2 output file 2" as the input file using link name SM2UI2
(03) Create catalog entry for the output file "complete SM2 output file"
(04) Assign output file "entire SM2 output file" using link name SM2UO
(05) Start the SM2U1 routine
(06) SM2U1 statement for merging user-specific SM2 output files (SM2 output file 1 and SM2 output file 2)
(07) Start SM2U1 processing followed by termination of the program.

Note

Merging of files is of advantage if identical program runs are to be grouped among different tasks, in which case the load formats of these programs should also be identical.

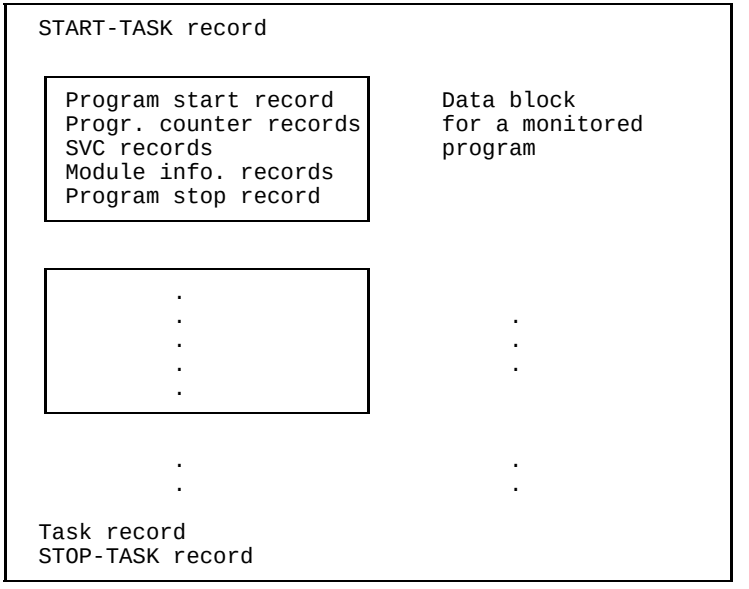
SM2 output file format

User-specific SM2 output files contain information on one or more task monitoring periods for one or more tasks.

All information relating to a task monitoring cycle is combined in a so-called task block. A task block consists of a START-TASK record, one or more program blocks (or none at all), as well as a task record and a STOP-TASK record.

A data block for a monitored program consists of a program start record and, depending on the monitoring operations requested, program counter and/or SVC records, module information records and a program stop record. Multiple program counter and SVC records may occur in a mixed sequence.

Task block



Contents of the individual records

START-TASK record:
Record type, sampling period, TSN of the monitored task, SVC statistics indicator (ON or OFF for user task monitoring). The sampling period is specified in the /START-TASK-MEASUREMENT command; if program counter statistics for task monitoring has not been activated, the value for the sampling period is 0.

Program start record:
Record type, name of the program monitored.

Program counter record:
Record type, contents of program counter.

SVC record:
Record type, SVC numbers called, program counter contents.

Module information record:
Record type, module information (begin addresses, lengths, names of the modules); see section "Link and load information".

Program stop record:
Record type, number of records that could not be written to the file during the program run, name of the monitored program.

Task record:
Record type, information on task monitoring; see task statistics analyses in chapter 4, page 97 ff.

STOP-TASK record:
Record type, number of records that could not be written to the file during monitoring, TSN of the monitored task, measurement termination ID (indicates who terminated monitoring).

Link and load information

Load information (the load address and length) of each CSECT that is linked to the monitored program or that is to be loaded by the monitored program is required to generate program counter and SVC statistics. In the task monitoring period, SM2 transfers this module information at program termination time or fetches the information when monitoring is terminated by means of a /STOP-TASK-MEASUREMENT statement, transferring it to the SM2 output file.

In the following parts of this manual, the term *module* is generally used instead of the Assembler-oriented concept of CSECT, as the concept "module" is also common to higher-level programming languages. The CSECT name generated by the compilers is generally identical to the name of the unit compiled (= module).

Missing or incomplete module information

In certain circumstances, the SM2 module information can only be supplied in part or not at all:

- If the program to be monitored works with overlay techniques, the module load information should be recorded with LOAD-INFO=DETAILED (/START-TASK-MEASUREMENT). Otherwise the samples and SVCs for overlay modules will be assigned to the module loaded at monitoring termination.
- No information is provided for modules/subsystems loaded in shared mode.
- No information is provided for programs linked with SYMTEST=NO.
- No information is provided for code sections which have not been generated via load procedures (e.g. code transferred to dynamically requested memory by means of MOVE instructions).

Checking of module information by SM2-PA

SM2-PA checks the load information of all modules for validity, i.e. the load addresses of the individual modules must not overlap and multiple load information for a module must match. Inconsistency may be the result if several program runs are combined to generate program counter or SVC statistics or if different modules with the same name are linked in a program.

Restrictions pertaining to the analysis of missing, incomplete or inconsistent module information

- There are no restrictions on generating program counter or SVC statistics for the program address area (PROGRAM analysis).
- Generation of program counter or SVC statistics for the address area of individual modules (MODULE analysis) is possible if valid load information is provided for the selected module. The load information for a module is not valid if
  - the address area of the module overlaps with another module
  - the address areas of the module have different lengths (when several program runs are combined).
- The following restrictions apply when generating program counter or SVC statistics for all monitored modules (SUMMARY analysis):
  - Address areas used by multiple modules are identified as OVERLAPPING MODULES (different modules are indicated in the various program runs combined during monitored object selection).
    If in the SVC-SUMMARY or PCOUNTER-SUMMARY mask the special module "*** OVERLAPPING MODULES" is selected for MODULE analysis, the OVERLAPPED MODULES mask is output (see Example 1).
  - The contents of program counters or SVCs whose addresses cannot be assigned to a module are summarized and listed at the end of the report (*** OUT OF MODULES instead of the module name; see Example 2).
  - A module loaded to different address areas by several load operations is listed more than once.
  - Read/write SVCs cannot always be assigned to a particular module, since the code may have been in class 4 memory and moved to class 5 memory (on OPEN) via MOVE. The same applies for program counter samples in this area.

Example 1:

The following mask is output if the special module "*** OVERLAPPING MODULES" has been selected in the SVC-SUMMARY or PCOUNTER-SUMMARY mask:

```
                              OVERLAPPED MODULES

MODULE NAME                                  FROM          TO
-------------------------------------------------------------------------------
*** OVERLAPPING MODULES                      00002000      00003FFF
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB             00002000      00002FFF
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD             00002800      000037FF
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC             00003000      00003FFF
```

Output area:

MODULE NAME	Name of module
FROM	Start address of module
TO	End address of module

All overlapping modules are listed in the address area of "OVERLAPPING MODULES". If one screen cannot accommodate the output volume, scrolling is possible.
If the user confirms the output by pressing [DÜ], the MODULE analysis for special module "*** OVERLAPPING MODULES" is displayed.

Example 2:

The following mask shows a SUMMARY analysis of the program counter statistics. If program counter samples outside the known modules were found, they are listed at the end of the output under "*** OUT OF MODULES ***" instead of the module name.

```
                             PCOUNT-SUMMARY
PRG=:2:$RZV110.ASSXT                                          SAMPLES:       15519

MODULE NAME                          FROM         TO         ABSOLUT       REL(%)
----------------------------------------------------------------------------------
PM2GETA@                             01016858     01016C27         69        0.44
ILAMPK                               0100D000     0100D34F         65        0.42
PMYP1PMS                             0100FDA0     01010787         50        0.32
PM2OPEN@                             010148A8     01015A1F          6        0.04
PM1PLAM                              0100E1B8     0100E2A7          5        0.03
PMY108                               01010788     01010997          3        0.02
PM2PUTA@                             01016180     0101667F          2        0.01
PM2OPEN                              01013B08     01013BC7          1        0.01
PM2GETA                              01013870     010138BF          1        0.01
*** OUT OF MODULES ***                                          15317       98.70





SUM                  PRG                    MODULE
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

2.3 Files used

Input file

SM2-PA analyzes the monitored values which have been written to the corresponding SM2 output file as part of user task monitoring. The input file is in SAM format. For an analysis run, it is assigned using the /SET-FILE-LINK command. PADTA is defined as the link name.
Assignment of a new input file during the program run is possible either via the SET-FILES mask (interactive mode) or via the SM2-PA statement MODIFY-FILE-ASSIGNMENT (batch mode).

PLI1 text file

SM2-PA requires a PLI1 file which contains messages pertaining to execution operations within the programs. This file is likewise assigned using the SET-FILE-LINK command. The link name is TEXTLINK. This file is supplied with SM2-PA.

Output file

The results of analysis can be output to the screen and/or a file edited for printing (file in SAM format). A corresponding output file is assigned by the user via the SET-FILE-LINK command. PALST is defined as the link name for the output file.
Assignment of a new output file during the program run is possible either via the SET-FILES mask (interactive mode) or via the SM2-PA statement MODIFY-FILE-ASSIGNMENT (batch/procedure mode).
If file assignment is omitted and statistics output to a file is requested, this will be rejected.

SVC names file

SM2-PA reads the SVC names from its own table.
Users also have the possibility of assigning their own SVC names file via the link name PASVC; this file (if it has the correct format, see below) is then used as the valid names table. Otherwise the SVC default names will be inserted.
Assignment of an SVC names file during the program run is possible either via the SET-FILES mask (interactive mode) or via the SM2-PA statement MODIFY-FILE-ASSIGNMENT (batch/procedure mode).

Format of the SVC names file

The file must have SAM format; it may be created using an editor.
For each SVC whose name is to be altered or newly entered, a separate line must be written.
Line format:

- SVC number (3 digits)
- one blank
- SVC name (8 characters, e.g. 009 TERM)

If the SVC name is shorter than 8 characters, it must be padded with blanks. For unnamed SVCs 8 blanks must be entered.

File	Link name	Definition
Input file	PADTA	SM2 output file to be analyzed
PLI1 text file	TEXTLINK	File with help texts (on program-internal operations)
Output file	PALST	File with analysis results
SVC names file	PASVC	User-specific SVC names table

2.4 Program execution

SM2-PA analyzes the monitored data written to the user-specific SM2 output file as part of its user task monitoring operations and outputs the requested statistics to the screen and/or lists them in a report.
The user controls analysis by either selecting a function in the user interface (interactive mode) or entering a sequence of statements (batch and procedure modes).

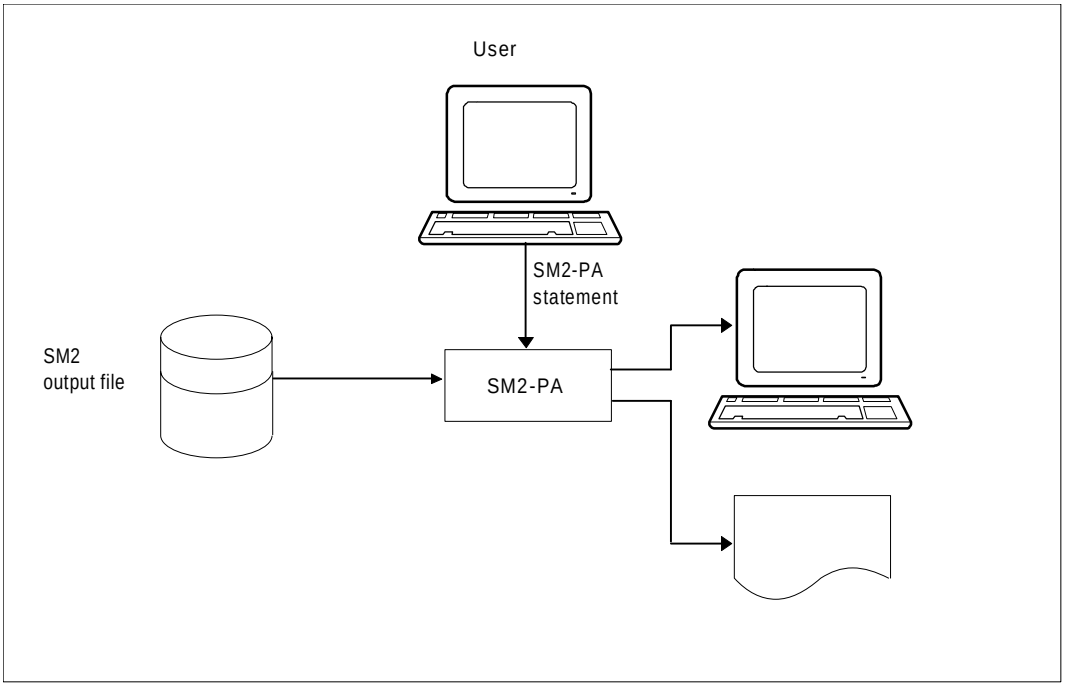


Fig. 4 Analysis of monitoring results by the user

Method of analysis:

1. Select monitored objects
2. Request statistics

After starting the program, the user must first select monitored objects (program run, tasks) for which he wants to request output of statistics. (SM2-PA rejects any requests for detailed statistics not previously selected for object monitoring).

Afterwards the user can define the statistics to be output. All statistics requested are based on monitored object selections made beforehand.

Command sequence / control of analysis:

```
/SET-FILE-LINK LINK-NAME=TEXTLINK, FILE-NAME=PLI1-textfile  ————————————(01)
/START-PROGRAM FROM-FILE=$SM2-PA  ——————————————————————————————————————(02)

Interactive mode     | Batch and procedure modes
---------------------|-------------------------
SET-FILES            | //MODIFY-FILE-ASSIGNMENT ————————————————————————(03)
.                    | .
.  Functions         | .  Statements ———————————————————————————————————(04)
.                    | .
END                  | //END ———————————————————————————————————————————(05)
```

(01) Assign input file "PLI1-textfile" via link name TEXTLINK
(02) Start SM2-PA program
(03) Assign input file (SM2 output file) via link name PADTA,
assign output file via link name PALST
(04) Select SM2-PA functions or enter SM2-PA statements
(05) Terminate SM2-PA program

Operation of SM2-PA is interactive:
The functions selected or the statements entered are executed immediately; when processing is completed, SM2-PA expects the next request.

The user terminates analysis with END if no further statistics output is desired.
The analyzed monitoring results are displayed on the screen and/or written to an output file in edited form.
This SM2-PA output file has a table of contents showing to which monitored object selection the subsequent analyses belong.

Note:

By setting user switch 1 (/MODIFY-USER-SWITCHES ON=1) before starting SM2-PA, PLI1 control statements are first requested with the message *RUNOPT OR *END EXPECTED. Following entry of the control statements (*RUNOPT) and (*END) (see the "PLI1" User Guide [2]), input can be continued using SM2-PA statements.

3 Operation

This chapter describes SM2-PA program operation in interactive mode and in batch/procedure mode.

The SM2-PA Program Analyzer is started via

/START-PROGRAM FROM-FILE=$SM2-PA

3.1 Interactive mode

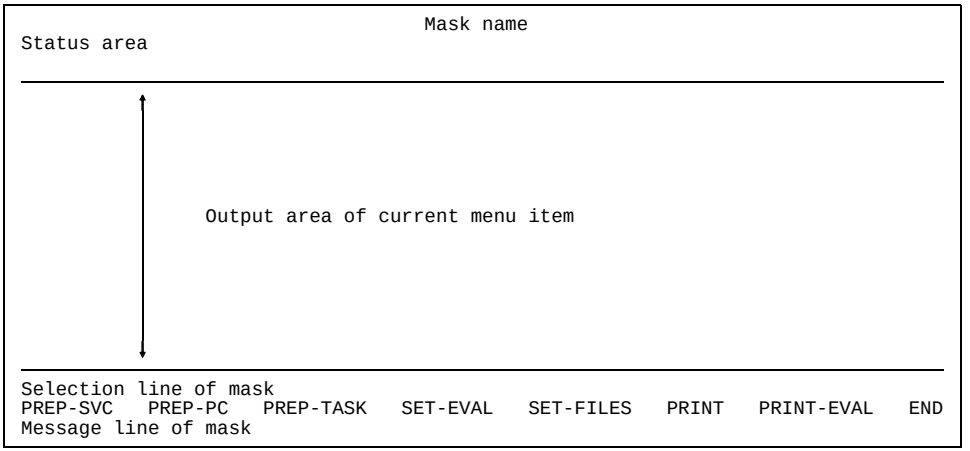
In interactive mode the functions are selected via a mask-driven user interface.

Overview of the functions of the mask-driven user interface

Function	Meaning
END	Terminate SM2-PA
PREP-PC	Request program counter statistics
PREP-SVC	Request SVC statistics
PREP-TASK	Request task statistics
PRINT	Write output area to assigned output file
PRINT-EVAL	Request serial evaluation of entire SM2 output file
SET-EVAL	Select monitored objects
SET-FILES	Assign files during program run

General mask structure of the SM2-PA user interface

Mask format:



Mask name:	Full-length name of function (e.g. SET-EVALUATION-OBJECTS) or designation of subfunction (e.g. SVC-SUMMARY).
Status area:	– Status information on the invoked function – Object(s) selected: Display of the selected program, e.g. PRG= ASSEMB(0BEH(1,2,3,4),0AXL(2,3)), or the selected task, e.g. TASKS=(0LLE(1,2),1ABC(1)). If the total output overflows the designated field, the screen segment can be moved using the keys F19 and F20.
Output area of current menu item:	This area displays the data of the invoked function.
Selection line of mask:	This displays the current options relative to the function selected; e.g. the options SUM, PRG, MODULE appear for the SVC-SUMMARY mask. If there are no options to be selected, this line is part of the output area of the current menu item.

Main menu: This lists all possible functions.
Functions not applicable at a given point are locked, i.e. they cannot be selected.

Function	Corresponding SDF statement in batch mode
PREP-SVC	PREPARE-SVC-STATISTICS
PREP-PC	PREPARE-PCOUNTER-STATISTICS
PREP-TASK	PREPARE-TASK-STATISTICS
SET-EVAL	(SHOW-EVALUATION-OBJECTS and) SET-EVALUATION-OBJECTS
SET-FILES	MODIFY-FILE-ASSIGNMENT
PRINT	Output of the displayed statistics in the form of a listing
PRINT-EVAL	PRINT-EVALUATION-SERIES
END	END

Message line: This displays messages if errors occurred during program execution.
This line can be deleted using key F2. If the message overflows the line length, two dots are added at the end. The user can then view the complete message via the BS2000 command /HELP <messagenumber>.

Key assignment

The table below shows the program-specific function key assignment of SM2-PA.

Key	Function
K2	Switch to system mode
	(use /RESUME-PROGRAM to continue the program run; press DÜ to restore the screen if necessary)
F2	Delete a message from the screen
F7	Call preceding mask page
F8	Call next mask page
F19	Shift screen segment to the left
F20	Shift screen segment to the right

Note:

If a keyboard has less than 20 function keys, the P keys P7, P8, P19, P20 are loaded with the function code of the appropriate F keys when the program is started: e.g. F8 → P8: P8 can now be used to page forwards. The user's P key assignment is lost in this process.

Moving the screen segment (scrolling)

If the contents of an output field cannot be fully displayed on one screen, the symbol ">" is appended to indicate that the output is incomplete. The user can shift the screen segment to view the remaining part of the output (scrolling). Keys F19 and F20 are used for this purpose. If the first scrolling operation still does not display the entire contents, the symbols "<" and ">" are displayed at the beginning and end of the output field respectively. In this case, scrolling is possible both to the left (backwards) and to the right (forwards). As soon as the complete contents have been displayed, only the symbol "<" appears at the beginning of the output field, i.e. scrolling is now only possible to the left.

Calling a new mask page (paging)

If one screen cannot accommodate the desired statistics output, one of the following prompts will appear in the bottom right corner of the screen:

Prompt	Meaning
MORE: +	Further output masks will follow; F8 can be used to page forwards
MORE: -+	There is at least one more subsequent mask and one preceding output mask; F8 and F7 can be used to page forwards and backwards respectively
MORE: -	The final output mask has been reached; F7 can be used to page backwards

Note:

When task statistics are output, "PAGE" appears instead of "MORE".

Selecting functions and objects

The user can select functions, subfunctions and objects. The following keys are used for selecting functions and objects:

MAR or mark marks functions and objects (the cursor must be at the correct location), DÜ confirms the selection.

Selections always refer to an object and/or a function. For example, a user might select a program name in the SET-EVAL mask via MAR or mark, then choose the PREP-SVC function in the same way, and finally confirm the selections via DÜ. SM2-PA then generates SVC statistics for the selected program.
There are also functions which do not accept object selections, e.g. the PRINT-EVALUATION-SERIES function where the program itself selects the appropriate objects.

The exact selection options for each mask are contained in the individual function descriptions.

Internal error handling

Any error that occurs will trigger an appropriate error message.
Selection errors are pointed out in the message line. Such errors reset the program to the status before input. The message line is automatically deleted upon the next correct input.
Error message output is based on message texts read from the message file.

Mask format and description of the individual functions

The following describes the various function masks in accordance with a typical evaluation sequence.

SET-EVAL
Select monitored objects

This function provides the user with all the important data of the SM2 output file to be analyzed. On the basis of this information, the user can select monitored programs and/or tasks for statistics output.

Mask format:

```
                              SET-EVALUATION-OBJECTS
PRG=*NONE;TASKS=*NONE

0MXL(  1):                                          PC-STATISTICS   SVC-STATISTICS
 UNLOAD                            (  1)                0 SAMPLES         2 EVENTS
 :W:$OBN.C.SRCID                   (  1)                2 SAMPLES        95 EVENTS
NO MODULE INFORMATION FOR THIS PROGRAM
 :2:$RZV110.ASSXT                  (  1)            15519 SAMPLES     16583 EVENTS
MEASUREMENT FROM 1990-12-12  14:46:38   TO   1990-12-12  14:48:46
-------------------------------------------------------------------------------
0731(  1):
MEASUREMENT FROM 1990-10-15  14:40:58   TO   1990-10-15  14:41:55
-------------------------------------------------------------------------------
0731(  2):                                          PC-STATISTICS   SVC-STATISTICS
 :W:$OBN.SM2-PA                    (  1)              544 SAMPLES       302 EVENTS
MEASUREMENT FROM 1990-10-15  14:42:20   TO   1990-10-15  14:45:20
MISSED RECORDS FOR THIS TASK:           1
-------------------------------------------------------------------------------
4KZS(  1):
MEASUREMENT FROM 1991-04-18  11:18:53   TO   1991-04-18  11:18:59


PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
                                                                      MORE:  +
```

Mask description:

Mask header:

PRG	Selected program or *NONE
TASKS	Selected task(s) or *NONE

Output area:

For each monitoring period in the SM2 output file, an information block with the following contents is output:

- TSN of the monitored task with index
  (the index serves to distinguish identical TSNs occurring in several task measurement periods).
- List of programs monitored in the relevant monitoring period. The task-specific index is added to the program name. The number of measured program counter samples and SVCs is indicated for each program name. If the program counter or SVC statistics were deactivated, OFF appears under the appropriate designation.
- Beginning and end of the monitoring period.

The following cases are indicated in addition:

- module information for a program is missing
  (`NO MODULE INFORMATION FOR THIS PROGRAM`)
- task information for a task measurement period is missing
  (`NO TASK INFORMATION FOR THIS TASK`)
- a STOP-TASK record of a task measurement period is missing, i.e. no precise information could be conveyed on any data records that could not be written to the file during monitoring (missed records)
  (`INFORMATION FOR THIS TASK MAY BE INCOMPLETE`)
- monitoring was terminated by the SM2 administrator
  (`MEASUREMENT STOPPED BY SM2-ADMINISTRATOR`)
- program-specific missed records occurred
  (`MISSED RECORDS FOR THIS PROGRAM`)
- task-specific missed records occurred
  (`MISSED RECORDS FOR THIS TASK`).

The SET-EVALUATION-OBJECTS function is called automatically if an SM2 output file is assigned prior to the program start or if the PRINT-EVALUATION-SERIES function is performed during the program run (this function causes all program and task selections to be canceled).

The selection fields include the program names, the TSNs of the various measurements, and the listed functions.
MAR or mark can be used to mark identical program names and identical or differing tasks.
If the user calls the SET-EVALUATION-OBJECTS function in this mask again, a reset will occur which deletes the entire monitored object selection and automatically displays the first mask page.
Programs and tasks are selected additively.
If a program measurement with another program name is selected, an error message appears and the entire program selection is deleted.
If the same program or task measurement is selected repeatedly, the selection is canceled.

Possible errors:

- The same program is selected more than 32 times within the same task
- The same program is selected more than 32 times in different tasks
- More than 16 task measurement periods are selected within the same task
- More than 16 task measurement periods are selected in different tasks
- Differing programs are selected
- PR-SVC is called but no program was selected or the SVC statistics were off during program monitoring
- PR-PC is called but no program was selected or the program counter statistics were off during program monitoring
- PR-TASK is called but no task was selected

SET-FILES
Assign files during program run

This function enables the user to assign input, output and SVC names files during the program run. These files may alternatively be assigned prior to the program start via /SET-FILE-LINK using the link names PADTA (input file), PALST (output file) and PASVC (SVC names file). The file names are then output in the mask.

Mask format:

```
                                  SET-FILES

EVAL-FILE(LINK=PADTA): :2OS6:$OBN.PA.TUTTI

LIST-FILE(LINK=PALST): *NONE

SVC-FILE(LINK=PASVC) : *NONE









PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

Mask description:

Output area:

EVAL-FILE	Name of input file
LIST-FILE	Name of output file
SVC-FILE	Name of SVC names file

For LIST- and SVC-FILE the entry *NONE is possible, in which case the corresponding link names are released.
Any existing file assignments can be overwritten.

The SET-FILES function is called automatically if no (or an errored) input file was assigned prior to the program start.

If invalid file assignments are made in the mask, the statement is underlined and an error message output.
As long as no valid input file has been assigned, the user cannot assign an output or SVC names file or call any function except END.
However, it is possible to assign all three files at the same time and then use MAR or mark and DÜ to additionally select a function which is not locked.
If the input of valid file names is confirmed with DÜ and no other function is selected, the SET-EVALUATION-OBJECTS mask is called automatically.

Possible errors:

- The PR-SVC or PR-PC function is called but no program was selected
- The PR-TASK function is called but no task was selected
- An SVC names and/or output file is assigned but no valid input file was assigned

Notes:

The output files are not extended but overwritten on every new opening.

If *NONE is entered for SVC-FILE, the SVC names retain their pre-assignment status; only the link name (PASVC) is released.

PREP-SVC
Request SVC statistics evaluation

The PREP-SVC function provides the user with SVC statistics analyses. SM2-PA supplies information on the distribution of the various SVC calls

- over all modules of the program (SUMMARY analysis) or
- within specified address areas (PROGRAM analysis) or
- within the various program modules (MODULE analysis)

(see function description for PREPARE-SVC-STATISTICS statement, page 72).

When PREP-SVC is called, the SUMMARY analysis is displayed first.
Exception: If no module load information exists for the selected program, the PROGRAM analysis is called automatically; the SUMMARY and MODULE analyses are not offered in this case.

Mask format of the SUMMARY analysis:

```
                                SVC-SUMMARY
PRG=:W:$OBN.SM2-PA                                        SVC-CALLS:        302

──────────── MODULE ──────────── ──── SVC ──── SUM IN  ── REL TO SVCS IN % ──
NAME                 ADDRESS    DEC HEX NAME     MODULE  MODULE  PROGRAM  ALL
──────────────────────────────────────────────────────────────────────────────
ITPOPCX#             000466A0 186  BA DMSMGM31      15   55.56   88.24   4.97
                              144  90 DMSSRV31      10   37.04   76.92   3.31
                              159  9F FILE           1    3.70  100.00   0.33
                              135  87 SYSINFO        1    3.70  100.00   0.33
──────────────────────────────────────────────────────────────────────────────
ITPIOSY#             00041BD0  39  27 SYSFI         24  100.00   96.00   7.95
──────────────────────────────────────────────────────────────────────────────
ITPRAHM#             00059AC0 128  80 STXIT          8   61.54  100.00   2.65
                              191  BF JOB-MGMT      2   15.38  100.00   0.66
                               39  27 SYSFI         1    7.69    4.00   0.33
                               28  1C QUIETDEV      1    7.69  100.00   0.33
                                9  09 TERM          1    7.69  100.00   0.33
──────────────────────────────────────────────────────────────────────────────
ITPSTVW#             00053FC0   1  01 MMGMT         9  100.00   60.00   2.98

SUM                  PRG                    MODUL
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
                                                                   MORE:  +
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SVC-CALLS	Total number of SVC calls registered in the selected program

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

MODULE NAME	Name of the module (within the selected program) that was analyzed
MODULE ADDRESS	Start address of the module
SVC DEC	SVC number for which calls were registered in the relevant module, in decimal form
SVC HEX	SVC number for which calls were registered in the relevant module, in hexadecimal form
SVC NAME	Name of analyzed SVC
SUM IN MODULE	Number of recorded calls of each listed SVC in the relevant module
REL TO SVCS IN %	
MODULE	Percentage share of the relevant SVC in the total number of SVC calls recorded in the relevant module
PROGRAM	Percentage share of the relevant SVC (in the relevant module) in the total number of SVC calls recorded for this SVC number
ALL	Percentage share of the relevant SVC (in the relevant module) in the total number of SVC calls recorded in the selected program

Selection line:

SUM	Output the first page of the SVC-SUMMARY analysis
PRG	Call the SVC-PROGRAM analysis
MODULE	Call the SVC-MODULE analysis for the selected module

The modules are output sorted by the number of SVCs.
If SVCs outside of the known modules are found, they are listed at the end of the output under the designation "*** OUT OF MODULES ***" instead of the module name.

The user can now select a module or the PROGRAM analysis.
A module is selected by means of MAR or mark and DÜ (or MAR or mark and DÜ in connection with MODULE).
The PROGRAM analysis is called by selecting PRG via MAR or mark and DÜ.

If the user selects PREP-SVC once more, the first page of the SUMMARY analysis is displayed again.

Mask format of the PROGRAM analysis:

```
                                SVC-PROGRAM
PRG=:W:$OBN.SM2-PA                                           SVC-CALLS:        302

───── SVC ────── ──────────── MODULE ──────────────  ─── CALLS ────  ── SUM SVC ──
DEC HEX NAME      NAME                     OFFSET     ABS    REL(%)  ABS    REl(%)
────────────────────────────────────────────────────────────────────────────────
188  BC SAM       *** OUT OF MODULES ***    00DFDE42    196  95.15
                                            00DFD616     10   4.85    206  68.21
────────────────────────────────────────────────────────────────────────────────
 39  27 SYSFI     ITPIOSY#                  0000016A     13  52.00
                                            00000194     11  44.00
                  ITPRAHM#                  00000298      1   4.00     25   8.28
────────────────────────────────────────────────────────────────────────────────
186  BA DMSMGM31 ITPOPCX#                   0000103A      5  29.41
                                            00001048      5  29.41
                                            00001BB2      5  29.41
                  ITPTXST#                  000001A2      1   5.88
                                            000001E8      1   5.88     17   5.63
────────────────────────────────────────────────────────────────────────────────
  1  01 MMGMT     ITPSTVW#                  00000E2C      8  53.33

PRG                 FROM:00000000  TO:7FFFFFFF
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
                                                                     MORE:  +
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SVC-CALLS	Number of SVC calls registered in the selected program

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

SVC DEC	SVC number in decimal form
SVC HEX	SVC number in hexadecimal form
SVC NAME	Name of analyzed SVC

MODULE	
NAME	Name of the module in which the SVC call was recorded
OFFSET	Call address of the SVC in the module
CALLS	
ABS	(Absolute) number of the recorded calls of the relevant SVC at the relevant address
REL(%)	Percentage share of the calls at this address in the number of calls of the relevant SVC in the program
SUM SVC	
ABS	Number of calls of the relevant SVC in the selected program
REL(%)	Percentage share of the relevant SVC in the total number of all SVC calls in the selected program

Selection line:

PRG	Output the first page of the SVC-PROGRAM analysis
FROM	Start address of analysis
TO	End address of analysis

The SVCs are output sorted by the frequency of their occurrence. Within the various SVC analysis areas, the related modules are sorted by their number of SVC calls.

For the special modules "*** OVERLAPPING MODULES" and" "*** OUT OF MODULES ***" absolute addresses are output instead of module-specific addresses. If no module load information exists for the program, "*ABS+" is output instead of the module name. In this case the address under OFFSET is an absolute address.
For module names exceeding 25 characters the complete name can be made visible by shifting the screen segment (scrolling).

The user can restrict the address area shown in the mask by explicitly entering the desired start or end address, i.e. overwriting the old with the new value and confirming input with DÜ. If the new address area specification is invalid, an error message is output and the values for FROM and TO are reset to the previous state.

If the user picks PRG in the selection line, the initial values are inserted again and statistics output occurs from the beginning.
If PREP-SVC is selected, the first page of the SUMMARY analysis is displayed again.

Possible error:

The address specified for FROM is greater than that specified for TO.

Mask format of the MODULE analysis:

```
                  SVC-MODULE: ITPOPCX#
PRG=:W:$OBN.SM2-PA                                                  SVC-CALLS:        27

────── SVC ────────            OFFSET      ────── CALLS ─────── ───── SUM SVC ──────
DEC  HEX   NAME                HEX         ABSOLUT        REL(%) ABSOLUT         REL(%)
────────────────────────────────────────────────────────────────────────────────────────
186   BA   DMSMGM31            0000103A              5     33.33
                               00001048              5     33.33
                               00001BB2              5     33.33             15    55.56
────────────────────────────────────────────────────────────────────────────────────────
144   90   DMSSRV31            0000008E              5     50.00
                               000000C2              5     50.00             10    37.04
────────────────────────────────────────────────────────────────────────────────────────
159   9F   FILE                0000159A              1    100.00              1     3.70
────────────────────────────────────────────────────────────────────────────────────────
135   87   SYSINFO             00001552              1    100.00              1     3.70




PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SVC-CALLS	Number of SVC calls registered in the selected module

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

SVC DEC	SVC number in decimal form
SVC HEX	SVC number in hexadecimal form
SVC NAME	Name of analyzed SVC
OFFSET HEX	Call address of SVC relative to the start address of the module
CALLS	
ABSOLUT	Number of recorded calls of the relevant SVC at the relevant address
REL(%)	Percentage share of the calls at this address in the total number of calls of the relevant SVC in the module

SUM SVC

ABSOLUT	Total number of calls of the relevant SVC in the specified address area
REL(%)	Percentage share of the relevant SVC in the total number of SVC calls in this module

The SVCs are output sorted by the frequency of their occurrence.
All functions can be selected via (MAR) or (mark) and (DÜ).
If PREP-SVC is selected, the first page of the SUMMARY analysis is displayed again.

PREP-PC
Request program counter statistics evaluation

The PREP-PC function provides the user with program counter statistics analyses. SM2-PA supplies information on the distribution of program counter samples

- over all modules of the program (SUMMARY analysis) or
- within specified address areas (PROGRAM analysis) or
- within the various program modules (MODULE analysis)

(see function description for PREPARE-PCOUNTER-STATISTICS statement, page 67).

For the program counter statistics, the program is interrupted by means of a timer at certain intervals (relative to the CPU time used) and the address of the next executable instruction (contained in the program counter) is transferred to the task-specific SM2 output file (recording of program counter samples).
An increased frequency of samples in a control section or module indicates that the CPU time consumption in these address areas is well above average.

When PREP-PC is called, the SUMMARY analysis is displayed first.
Exception: If no module load information exists for the selected program, the PROGRAM analysis is called automatically; the SUMMARY and MODULE analyses are not offered in this case.

Mask format of the SUMMARY analysis:

```
                                PCOUNT-SUMMARY
PRG=:W:$OBN.SM2-PA                                          SAMPLES:         544

MODULE NAME                                  FROM         TO         ABSOLUT        REL(%)
-------------------------------------------------------------------------------------------
NPASVC                                       0001E000     00026B8B       340     62.50
NPADIA                                       00005000     000068F3        42      7.72
ITPPUT##                                     0003BF70     0003CEB5        35      6.43
ITPFL###                                     0004B1C0     0004BABB        31      5.70
NPAOBJ                                       0000D000     00011EE3        28      5.15
ITPPVE##                                     0003B4B0     0003BF6B        18      3.31
ITPKONV#                                     00033000     00039E55        12      2.21
ITPSTVW#                                     00053FC0     00055381        12      2.21
NPAPCO                                       00012000     00019323         6      1.10
NPATSKO                                      0002B000     00030763         3      0.55
NPASHE                                       0001A000     0001B203         2      0.37
ITPOPCX#                                     000466A0     00048D27         2      0.37
NPADIA                                       00008000     000095C3         1      0.18
ITPSSVC#                                     0003B358     0003B4A9         1      0.18
ITPIOSY#                                     00041BD0     0004274F         1      0.18

SUM                  PRG                     MODUL
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL    SET-FILES   PRINT   PRINT-EVAL   END
                                                                        MORE:  +
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SAMPLES	Total number of program counter samples recorded for the selected program

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

MODULE NAME	Name of the modules within the selected program
FROM	Start address of the relevant module
TO	End address of the relevant module
ABSOLUT	Number of samples in the relevant module
REL(%)	Percentage share of the samples (in the relevant module) in the total number of samples

Selection line:

SUM	Output first page of PCOUNTER-SUMMARY analysis
PRG	Call PCOUNTER-PROGRAM analysis
MODULE	Call PCOUNTER-MODULE analysis

The modules are output sorted by the number of program counter samples. Modules for which no samples were taken are not shown. If samples are found outside of the known modules, they are listed at the end of the output under the designation "*** OUT OF MODULES ***" instead of the module name.

The user can now select a module or the PROGRAM analysis. A module is selected by means of MAR or mark and DÜ (or MAR or mark and DÜ in connection with MODULE).
The PROGRAM analysis is called by selecting PRG via MAR or mark and DÜ.
If the user selects PREP-PC once more, the first page of the SUMMARY analysis is displayed again.
If the special module "*** OUT OF MODULES ***" is selected, an error message will appear.

Mask format of the PROGRAM analysis:

```
                                PCOUNT-PROGRAM
PRG=:W:$OBN.SM2-PA                                          SAMPLES:         544

FROM      TO         ABSOLUT     REL(%)
-------------------------------------------------------------------------------
00005000  000F3758         535   98.35  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
000F3759  001E1EB1           0    0.00
001E1EB2  002D060A           0    0.00
002D060B  003BED63           0    0.00
003BED64  004AD4BC           0    0.00
004AD4BD  0059BC15           0    0.00
0059BC16  0068A36E           0    0.00
0068A36F  00778AC7           0    0.00
00778AC8  00867220           0    0.00
00867221  00955979           0    0.00
0095597A  00A440D2           0    0.00
00A440D3  00B3282B           0    0.00
00B3282C  00C20F84           0    0.00
00C20F85  00D0F6DD           0    0.00
00D0F6DE  00DFDE44           9    1.65

PRG                 FROM:00005000  TO:00DFDE44   BYTES:   976729   LINES:    15
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SAMPLES	Total number of program counter samples recorded for the selected program

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

FROM	Start address of address area
TO	End address of address area
ABSOLUT	Absolute number of samples assigned to the individual address areas
REL(%)	Percentage share of the samples in the relevant address area relative to the total number of samples in the selected program

Apart from the text display, the computed hit rates are also shown as a bar chart (histogram).

Selection line:

FROM	Start address of the selected evaluation area
TO	End address of the selected evaluation area
BYTES	Increment (in bytes) with which the selected area is divided into subareas
LINES	Output length in lines (indirect specification of the increment for the various subareas)

The user can restrict the evaluation area in the mask by marking the FROM and TO values in the output area and overwriting them in the menu line. Moreover, the user can specify the number of lines the output is to comprise (default: 15 lines) or the size (in bytes) of the address area to be represented in one line. To change a value, it must be overwritten and the input confirmed with DÜ. The change can refer either to the BYTES value (between 2 and 2147483647 (X'7FFFFFFE')) or to the LINES value (between 1 and 32760).
If only the FROM address is marked/overwritten, the TO address is assumed to be the address in the selection line, and vice versa. If none of the two values is marked or newly entered, the values in the selection line apply for any BYTES or LINES changes. Invalid entries for the evaluation area result in the display of an error message and in a reset of the selection line values to the previous state.

If no hit can be assigned to an address area, the corresponding line is output nonetheless.

Possible errors:

- The BYTES and LINES values were changed concurrently
- BYTES value < 2 or > 2147483647 (X'7FFFFFFE')
- LINES value <1 or > 32760
- Address area or BYTES/LINES values were specified and selected together with PRG
- FROM address > TO address
- No HEX address was specified (invalid syntax)
- Specified address > module end address

If the user selects PREP-PC once more, the first page of the SUMMARY analysis is displayed again.

Mask format of the MODULE analysis:

```
                PCOUNT-MODULE: NPASVC
PRG=:W:$OBN.SM2-PA                                          SAMPLES:         340

FROM      TO         ABSOLUT     REL(%)
-------------------------------------------------------------------------------
00000000  0000094C           0    0.00
0000094D  00001299           7    2.06  X
0000129A  00001BE6           4    1.18
00001BE7  00002533           1    0.29
00002534  00002E80           1    0.29
00002E81  000037CD          39   11.47  XXXXXXXX
000037CE  0000411A         193   56.76  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
0000411B  00004A67          93   27.35  XXXXXXXXXXXXXXXXXX
00004A68  000053B4           2    0.59
000053B5  00005D01           0    0.00
00005D02  0000664E           0    0.00
0000664F  00006F9B           0    0.00
00006F9C  000078E8           0    0.00
000078E9  00008235           0    0.00
00008236  00008B8B           0    0.00

                    FROM:00000000  TO:00008B8B   BYTES:     2381   LINES:    15
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

Mask description:

Status line:

PRG	Name of the program selected for analysis
SAMPLES	Number of program counter samples recorded for the selected module

Output area:

The statistics values are represented in tabular form. The fields of the individual columns have the following contents:

FROM	Start address of address area
TO	End address of address area
ABSOLUT	Absolute number of samples assigned to the various address areas
REL(%)	Percentage share of the samples in the relevant address area relative to the total number of samples in the selected module

Apart from the text display, the computed hit rates are also shown as a bar chart (histogram).

Selection line:

FROM	Start address of the selected evaluation area
TO	End address of the selected evaluation area
BYTES	Increment (in bytes) with which the selected area is divided into subareas
LINES	Output length in lines (indirect specification of the increment for the various subareas)

The user can restrict the evaluation area in the mask by marking the FROM and TO values in the output area and overwriting them in the menu line. Moreover, the user can specify the number of lines the output is to comprise (default: 15 lines) or the size (in bytes) of the address area to be represented in one line. To change a value, it must be overwritten and the input confirmed with DÜ. The change can refer either to the BYTES value (between 2 and 2147483647 (X'7FFFFFFE')) or to the LINES value (between 1 and 32760).
If only the FROM address is marked/overwritten, the TO address is assumed to be the address in the selection line, and vice versa. If none of the two values is marked or newly entered, the program-updated values in the selection line apply for any BYTES or LINES changes.
Invalid entries for the evaluation area result in the display of an error message and in a reset of the selection line values to the previous state.

If no hit can be assigned to an address area, the corresponding line is output nonetheless.

Possible errors:

- The BYTES and LINES values were changed concurrently
- BYTES value < 2 or > 2147483647 (X'7FFFFFFE')
- LINES value <1 or > 32760
- Address area or BYTES/LINES values were specified and selected together with PRG
- FROM address > TO address
- No HEX address was specified (invalid syntax)
- Specified address > module end address

If the user selects PREP-PC once more, the first page of the SUMMARY analysis is displayed again.

PREP-TASK
Request task evaluation

The PREP-TASK function provides the user with a list of task-related data supplying information on the resource consumption of the various tasks (see page 101 for an explanation of the monitored values).

Within the framework of task evaluation, the various task-specific possibilities of monitored object selection are assigned the following types of output:

– If only one task measurement period is selected (via the SET-EVALUATION-OBJECTS function), detailed output is created automatically and no other type of evaluation is offered.

– If only task measurement periods with the same TSN are selected, the output of task-related sum values (TASK-SUMMARY FOR TSN) is called; detailed output is offered in addition.

– If only task measurement periods with different TSNs are selected, the output of global sum values (TASK-SUMMARY FOR ALL TASKS) is called; detailed output is offered in addition.

– Otherwise the output of global sum values is called automatically; detailed output and the output of task-related sum values are offered in addition.

Mask format for the output of global sum values:

```
                          TASK-SUMMARY FOR ALL TASKS
TASKS=(0MXL(1),0731(1,2))
NUMBER TASK MEASUREMENTS:          3

ELAPSED TIME (S)                366.8139    ACTIVE WAITS                268
CPU-TIME (S)                     20.1560     DURATION (S)                 1.9325
IO                             2280          INACTIVE WAITS               1
PAM-PG PER DISK IO                4.5663     DURATION (S)                 1.0488
SVC / TU STATE                16982          DISK IO WAITS             1969
PAGE FAULTS                    3565           DURATION (S)              281.6627
PAGE READS                      176          BOURSE LONG WAITS           30
PAGE RECLAIMS                     9           DURATION (S)               41.9385
WSET (PPC) IN PAGES             313          INPUT  MSG (1/S)           467.4378
SERVICE UNITS                590503          OUTPUT MSG (1/S)          2804.6273
CPU SERVICE UNITS            337490
IO  SERVICE UNITS             21258
MEM SERVICE UNITS            231755




SUM-ALL    SUM-TASK  DETAIL
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
```

Mask description:

Status lines:

TASKS	Display of all task measurement periods selected
NUMBER TASK MEASUREMENTS	Indicates the number of task measurement periods over which the monitored values have been collated

Output area:

This is a collation of task-related values from all measurements selected. For the meanings of the various monitored values see page 101.

Selection line:

SUM-ALL	Call the output of global sum values
SUM-TASK	Call the output of task-related sum values
DETAIL	Call detailed output

If PREP-TASK is selected once more, the first page of the global summary is displayed again.

Mask format for the output of task-related sum values:

```
                          TASK-SUMMARY FOR TSN: 0MXL
NUMBER TASK MEASUREMENTS:          1


ELAPSED TIME (S)                128.3593    ACTIVE WAITS                197
CPU-TIME (S)                     18.9750     DURATION (S)                 1.5337
IO                             1733          INACTIVE WAITS               1
PAM-PG PER DISK IO               1.5516      DURATION (S)                 1.0488
SVC / TU STATE                 16680         DISK IO WAITS             1456
PAGE FAULTS                     2745          DURATION (S)               63.2476
PAGE READS                        65         BOURSE LONG WAITS            6
PAGE RECLAIMS                      0          DURATION (S)               27.4401
WSET (PPC) IN PAGES              176         INPUT  MSG (1/S)           467.4378
SERVICE UNITS                  557875         OUTPUT MSG (1/S)          2804.6273
CPU SERVICE UNITS              317227
IO  SERVICE UNITS               15776
MEM SERVICE UNITS              224872




SUM-ALL    SUM-TASK  DETAIL
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
                                                                    PAGE:  +
```

Mask description:

Mask title:

TASK-SUMMARY FOR TSN
: TSN of the task being evaluated

Status line:

NUMBER TASK MEASUREMENTS
: Indicates the number of task measurement periods over which the monitored values have been collated

Output area:

This is a collation of task-related values, for the task with the specified TSN, from the task measurement periods selected.
For the meanings of the various monitored values see page 101.

Selection line:

SUM-ALL	Call the output of global sum values
SUM-TASK	Output first page of task-related summary
DETAIL	Call detailed output

If PREP-TASK is selected once more, the first page of the task-related summary is displayed again.

Mask format for detailed output:

```
                        TASK-DETAIL FOR TSN: 0MXL(  1)
USERID: OBN      CATEGORY: DIALOG1      JOBNAME: OBNSAST   JOBCLASS: JCDSTD
START: 90-12-12  14:46:38               STOP: 90-12-12  14:48:46

ELAPSED TIME (S)                128.3593    ACTIVE WAITS                197
CPU-TIME (S)                     18.9750     DURATION (S)                1.5337
IO                             1733          INACTIVE WAITS              1
PAM-PG PER DISK IO                1.5516     DURATION (S)                1.0488
SVC / TU STATE                 16680         DISK IO WAITS            1456
PAGE FAULTS                     2745          DURATION (S)              63.2476
PAGE READS                        65         BOURSE LONG WAITS           6
PAGE RECLAIMS                      0          DURATION (S)              27.4401
WSET (PPC) IN PAGES              176         INPUT  MSG (1/S)          467.4378
SERVICE UNITS                 557875         OUTPUT MSG (1/S)         2804.6273
CPU SERVICE UNITS             317227
IO  SERVICE UNITS              15776
MEM SERVICE UNITS             224872




SUM-ALL    SUM-TASK  DETAIL
PREP-SVC   PREP-PC   PREP-TASK   SET-EVAL   SET-FILES   PRINT   PRINT-EVAL   END
                                                                 PAGE:  +
```

Mask description:

Mask title:

DETAIL FOR TSN	TSN of the task evaluated in the current detailed output

Status lines:

Detailed output displays the following fields identifying the task and indicating the monitoring period:

USERID	User identification
CATEGORY	Category
JOBNAME	Job name
JOBCLASS	Job class
START	Date and time when monitoring started
STOP	Date and time when monitoring ended

Output area:

This displays a detailed evaluation for each task measurement period selected. See page 101 for the meanings of the monitored values.

Selection line:

SUM-ALL	Call the output of global sum values
SUM-TASK	Call task-related summary
DETAIL	Output first page of detailed evaluation

If PREP-TASK is selected once more, the first page of the detailed evaluation is displayed again.

PRINT
Write evaluation results to file

The PRINT function is offered in the menu line of every mask.
When this function is selected in a mask, the entire output area is written to a print-edited output file assigned either before SM2-PA startup via the SET-FILE-LINK command or during the program run via the SET-FILES function.
If the user has not assigned an output file, the PRINT function is locked.

PRINT-EVAL
Request serial evaluation of SM2 output file

The PRINT-EVAL function is offered in the menu line of every mask.
When this function is selected in a mask, the standardized serial evaluation for the entire SM2 output file is written to the SM2-PA output file assigned either before program startup via the SET-FILE-LINK command or during the program run via the SET-FILES function.

With this function, SM2-PA generates statistics of all types (program counter, SVC and task statistics) with predefined evaluation parameters for all the individual program runs and task measurement periods for which monitored values are stored in the file.
Detailed information on this serial evaluation can be found in the description of the PRINT-EVALUATION-SERIES statement on page 77.
If the user has not assigned an output file, the PRINT-EVAL function is locked.
When the function has been completed, the previous monitored object selection is no longer valid and the SET-EVALUATION-OBJECTS mask is displayed again.

END
Terminate SM2-PA

The END function is offered in the menu line of every mask.
When this function is selected, the SM2-PA program is terminated. If a list output occurred during the program run, a table of contents is written to the output file.

3.2 Batch/procedure mode

In batch mode, SM2-PA is operated via the SDF statement interface.
The SDF statement interface is also used if the BS2000 command /ASSIGN-SYSDTA TO-FILE=*SYSCMD is entered in a procedure prior to the SM2-PA call.
All analysis results are written to the output file assigned. If this file assignment is missing at the time of output, an error message is issued and the SM2-PA run terminated.

Overview of the SM2-PA statements

Statement	Meaning
END	Terminate SM2-PA
MODIFY-FILE-ASSIGNMENT	Assign files during the program run
PREPARE-PCOUNTER-STATISTICS	Request program counter statistics
PREPARE-SVC-STATISTICS	Request SVC statistics
PREPARE-TASK-STATISTICS	Request task statistics
PRINT-EVALUATION-SERIES	Request serial evaluation of entire SM2 output file
SET-EVALUATION-OBJECTS	Select monitored objects
SHOW-MEASURED-OBJECTS	Request overview of monitored objects in SM2 output file

The statements relating to statistics output can be divided into three classes:

1. Information
   - The SHOW-MEASURED-OBJECTS statement informs the user of the program runs and tasks monitored in the current SM2 output file. This determines which evaluations are possible.
2. Selection
   - The SET-EVALUATION-OBJECTS statement serves to select the program runs and/or tasks for which statistics output is to be requested.
3. Evaluation
   - The PREPARE-TASK-STATISTICS statement serves to request the analysis of task-specific monitored values (output of task statistics).
   - The PREPARE-PCOUNTER-STATISTICS statement serves to request the output of program counter statistics.
   - The PREPARE-SVC-STATISTICS statement serves to request the output of SVC statistics.
   - The PRINT-EVALUATION-SERIES statement serves to request the standardized evaluation of a complete SM2 output file.

Statements

The following describes the statements to the SM2-PA program in alphabetical order.

END
Terminate SM2-PA

The END statement terminates the SM2-PA Program Analyzer.

END

MODIFY-FILE-ASSIGNMENT
Assign files during the program run

This statement permits the user to assign files during the program run. Multiple files can thus be analyzed in succession without terminating the program.
Since new SVCs are added with every new version, SVC names files can be created for each version. If the user wants to analyze SM2 output files from different BS2000 versions, the MODIFY-FILE-ASSIGNMENT statement can also be used to assign different SVC names files, apart from the input files with the monitored values and the output files with the evaluation results.

```
MODIFY-FILE-ASSIGNMENT

 EVAL-FILE = *UNCHANGED / <full-filename>
,LIST-FILE = *UNCHANGED / <full-filename>
,SVC-FILE = *UNCHANGED / <full-filename>
```

Operand description

EVAL-FILE =
Defines the input file with the monitored values to be analyzed.

EVAL-FILE = *UNCHANGED
The input file assigned for the evaluation run is retained.

EVAL-FILE = <full-filename>
Specifies the name of the input file to be assigned via link name PADTA.

LIST-FILE =
Defines the output file for the evaluation results.

LIST-FILE = *UNCHANGED
The output file assigned for the evaluation run is retained.

LIST-FILE = <full-filename>
Specifies the name of the output file to be assigned via link name PALST.

SVC-FILE =
Defines the valid SVC names file.

SVC-FILE = *UNCHANGED
The assigned SVC names file is retained.

SVC-FILE = <full-filename>
Specifies the name of the SVC names file to be assigned via link name PASVC.

PREPARE-PCOUNTER-STATISTICS
Request program counter statistics evaluation

With this statement the user obtains analyses pertaining to program counter statistics. SM2-PA provides information on the distribution of program counter sampling

- for all program modules (SUMMARY analysis) or
- within defined address areas (PROGRAM analysis) or
- within the individual program modules (MODULE analysis).

A request for program counter statistics requires appropriate monitored object selection in advance, by issuing the SET-EVALUATION-OBJECTS statement. If this statement is omitted, the request for analysis is rejected.

Program counter statistics are represented as text and diagrams:

- The text includes the names of modules or the address areas (depending on which selection parameters were chosen), along with the number of samples, which are specified both as absolute and as relative numbers for the address areas relevant for the current statistics report.
- The pictorial representation (next to the text) shows the frequency of hits (hit rate) in relation to the individual modules or address subareas in the form of bar charts (histograms). Here the scale is selected so as to use the complete screen width or list format.

For the detailed layout of result presentation after issuing the PREPARE-PCOUNTER-STATISTICS statement see chapter 4, "List output", page 84 ff.

PREPARE-PCOUNTER-STATISTICS

```
STATISTICS = SUMMARY / PROGRAM(...) / MODULE(...)

  PROGRAM(...)
     |  FROM = STD / <x-string 1..8>
     | ,TO = STD / <x-string 1..8>
     | ,BY = STD / BYTES(...) / LINES(...)
     |    BYTES(...)
     |      |  STEP = <x-string 1..8>
     |    LINES(...)
     |      |  NUMBER = <integer 1..32760>
  MODULE(...)
     |  NAME = <full-filename 1..32 without-gen-vers>
     | ,ADDRESS = STD / <x-string 1..8>
     | ,FROM = STD / <x-string 1..8>
     | ,TO = STD / <x-string 1..8>
     | ,BY = STD / BYTES(...) / LINES(...)
     |    BYTES(...)
     |      |  STEP = <x-string 1..8>
     |    LINES(...)
     |      |  NUMBER = <integer 1..32760>
```

Operand description

STATISTICS =
Defines the type of analysis to be provided as part of the program counter statistics which have been requested.

STATISTICS = SUMMARY
The program counter samples which have been recorded are assigned to the modules of the program which was selected for analysis. For each module, a list is made of the number of samples assigned to it and the percentage of samples in relation to the total number of samples.

STATISTICS = PROGRAM(...)
An analysis is requested, determining the distribution of program counter samples within a more precisely definable address area of the program which has been selected. For each individual subarea a list is made of the number of samples assigned to this area and the percentage of samples in relation to the total number of samples recorded in the selected address area during the monitoring period.

FROM =
Specifies the start address from which the PROGRAM analysis is to be generated.

FROM = STD
Analysis is to begin with the lowest recorded program counter status of the program which performs the analysis.

FROM = <x-string 1..8>
Specifies an absolute hexadecimal address value at which the requested PROGRAM analysis is to begin. "x-string" must be a value between X’0’ and X’7FFFFFFE’.

TO =
Specifies the end address of the area for which PROGRAM analysis is to be performed.

TO = STD
The analysis is to extend to the maximum program counter status recorded for the program to be analyzed.

TO = <x-string 1..8>
Specifies an absolute hexadecimal address value up to which the requested PROGRAM analysis is to extend. "x-string" must be between X’0’ and X’7FFFFFFE’ and greater than or equal to the value specified for FROM.

BY =
Defines the increment used to subdivide the area to be analyzed into individual subareas for which statistics are to be kept.

BY = STD
SM2-PA defines (depending on the output medium selected) an increment value which makes it possible to display the resulting statistics on one screen or on one print page.

BY = BYTES(...)
Explicit definition of the increment by specifying the subarea size in bytes.

STEP = <x-string 1..8>
Specifies the increment for the subareas; the size of the subarea is given in hexadecimal form in bytes. "x-string" must be a value between X'1' and X'7FFFFFFF'.

BY = LINES(...)
The increment for the subareas is indirectly defined via the specification of the number of desired result lines (= number of subareas).

NUMBER = <integer 1..32760>
Specifies the number of input lines desired.

STATISTICS = MODULE(...)
An analysis is requested, determining the distribution of program counter samples within a module of the selected program. For each individual address area a list is made of the number of samples which have accrued and the percentage of samples this represents; these are the samples which were recorded in the course of monitoring operations for the selected module or module area.

NAME = <full-filename 1..32 without-gen-vers>
Defines the module for which the analysis is to be performed; the name of the module must be specified here.

ADDRESS =
Specifies the start address of the module for which analysis is to be performed. This parameter is only relevant if the program includes at least two modules with the same name.

ADDRESS = STD
Specifies the start address of the module with the most program counter samples.

ADDRESS = <x-string 1..8>
Specifies the start address of the selected module for which analysis is to be performed.

FROM =
Specifies the start address of the area in the selected module for which the MODULE analysis is to be generated.

FROM = STD
Analysis is to commence at the beginning of the selected module.

FROM = <x-string 1..8>
Specifies a hexadecimal address value in the selected module (relative to the beginning), at which the requested MODULE analysis is to commence. "x-string" must be a value between X'0' and X'7FFFFFFE'.

TO =
Specifies the end address in the selected module for which the MODULE analysis is to be generated.

TO = STD
Analysis is to extend to the end of the selected module.

TO = <x-string 1..8>
Specifies a hexadecimal address value in the selected module (relative to the beginning), up to which the requested MODULE analysis is to extend. "X-string" must be between X'0' and X'7FFFFFFE' and greater than or equal to the value specified for FROM.

BY =
Defines the increment used to subdivide the area to be analyzed into individual subareas for which statistics are to be kept.

BY = STD
SM2-PA defines (depending on the output medium selected) an increment value which makes it possible to display the resulting statistics on one screen or on one print page.

BY = BYTES(...)
Explicit definition of the increment by specifying a subarea size in bytes.

STEP = <x-string 1..8>
Specifies the increment for the subareas; the size of the subarea is given in hexadecimal form in bytes. "x-string" must be a value between X'1' and X'7FFFFFFF'.

BY = LINES(...)
The increment for the subareas is indirectly defined via the specification of the number of desired result lines (= number of subareas).

NUMBER = <integer 1..32760>
Specifies the number of result lines desired.

Example of syntax

```
PREPARE-PCOUNTER STATISTICS=PROGRAM(FROM=X'1000',TO=X'2000',BY=LINES
                                                    (NUMBER=55))
PREPARE-PCOUNTER STATISTICS=MODULE(NAME=ABCD)
```

PREPARE-SVC-STATISTICS
Request SVC statistics evaluation

With this statement the user obtains analyses pertaining to SVC statistics. SM2-PA then provides information on the distribution of the individual SVC calls

- for all modules of the program (SUMMARY statement) or
- within specified address areas (PROGRAM analysis) or
- within individual modules of the program (MODULE analysis).

The analysis comprises all SVC calls; restriction to specific SVC numbers is not possible.
An SVC is identified by its decimal SVC number; in addition, the corresponding hexadecimal SVC number and the associated SVC names are included in the statistics output.

A request for SVC statistics requires appropriate monitored object selection in advance, by issuing the SET-EVALUATION-OBJECTS statement. If this statement is omitted, SM2-PA rejects the request for analysis.

SVC statistics are listed in the form of tables.

A list of the SVCs called is generated for each module of the program monitored, as part of the SUMMARY analysis.
For each SVC, the number of times it is called in the module in question is represented as follows:

- as an absolute number
- as a percentage of the total number of SVC calls in the module in question
- as a percentage of the total number of SVC calls which were recorded while monitoring the corresponding monitored object
- as a percentage of all SVC calls recorded.

A list of the respective call addresses within the selected address area is generated as part of the PROGRAM and MODULE analysis for each SVC. For each call address, information is provided on how frequently the corresponding SVC was called at this address. The frequency is expressed as follows:

- as an absolute number
- as a percentage of the total number of SVC calls which were recorded while monitoring the selected monitored object for the address area.

In addition, the total number of calls in the monitored address area is supplied for each SVC included in the analysis. This specification is expressed

– as an absolute number
– as a percentage of the total number of SVC calls recorded for the address area.

Thus the user obtains a list of the SVCs included in the analysis whose call addresses and call frequency are within the address range selected.

For the detailed layout of the results output by the PREPARE-SVC-STATISTICS statement see chapter 4, "List output", page 90 ff.

```
PREPARE-SVC-STATISTICS

STATISTICS = SUMMARY / PROGRAM(...) / MODULE(...)

  PROGRAM(...)
    |  FROM = STD / <x-string 1..8>
    |,TO = STD / <x-string 1..8>

  MODULE(...)
    |  NAME = <full-filename 1..32 without-gen-vers>
    |,ADDRESS = STD / <x-string 1..8>
```

Operand description

STATISTICS =
Selects which type of analysis is to be provided as part of the requested SVC statistics.

STATISTICS = SUMMARY
The SVC calls recorded are assigned to the modules of the selected program. For details of how the SVCs included in the analysis are displayed, see page 72 (SUMMARY analysis).

STATISTICS = PROGRAM(...)
Requests an analysis covering the distribution of the SVC calls recorded within a selected program address area still to be defined more precisely. For details of how the SVCs included in the analysis are displayed, see page 72 (PROGRAM analysis).

FROM =
Specifies the start address of the area for which the PROGRAM analysis is to be generated.

FROM = STD
Analysis is to begin at the lowest program address recorded.

FROM = <x-string 1..8>
Specifies an absolute hexadecimal address value at which the requested PROGRAM analysis is to begin. "x-string" must be a value between X’0’ and X’7FFFFFFE’.

TO =
Specifies the end address of the area for which the PROGRAM analysis is to be generated.

TO = STD
Analysis is to extend to the highest program address recorded.

TO = <x-string 1..8>
Specifies an absolute hexadecimal address value up to which the requested PROGRAM analysis is to extend. "x-string" must be a value between X70’ and X’7FFFFFFE’ and must be greater than or equal to the value specified for FROM.

STATISTICS = MODULE(...)
Requests an analysis which covers the distribution of the SVC calls registered within a selectable module in the selected program. For details of how the SVCs included in the analysis are displayed, see page 72 (MODULE analysis).

NAME = <full-filename 1..32 without-gen-vers>
The module name is used to define the module for which the analysis is to be performed.

ADDRESS =
Specifies the start address of the module for which a MODULE analysis is to be performed.
This parameter is only relevant if the program includes at least two modules with the same name.

ADDRESS = STD
Specifies the start address of the module in which the most SVC calls were recorded.

ADDRESS = <x-string 1..8>
Specifies the start address of the selected module for which a MODULE analysis is to be performed.

Example of syntax

```
PREPARE-SVC STATISTICS=PROGRAM(TO=X’50000’)
PREPARE-SVC STATISTICS=MODULE(EDOR,X’1000’)
```

PREPARE-TASK-STATISTICS
Request task evaluation

With this statement the user obtains a list of task-related data which provides him or her with information on the resources used by the individual tasks (for a further explanation of the monitored data see chapter 4, "List output", page 101 ff).

A request for program counter statistics requires appropriate monitored object selection in advance, by issuing the SET-EVALUATION-OBJECTS statement. If this statement is omitted, SM2-PA rejects the request for an analysis. Analysis always refers to the monitored objects selected by the last valid SET-EVALUATION-OBJECTS statement.

For the detailed layout of the results output by the PREPARE-TASK-STATISTICS statement see chapter 4, "List output", page 97 ff.

```
PREPARE-TASK-STATISTICS

INFORMATION = ALL / DETAIL / GLOBAL
```

Operand description

INFORMATION =
Defines the type of information to be provided as part of the task statistics requested.

INFORMATION = ALL
Requests both analyses in accordance with the DETAIL operand as well as analyses in accordance with the GLOBAL operand.

INFORMATION = DETAIL
Requests an analysis in which an individual task analysis is performed for each monitoring cycle recorded for monitored object selection (each cycle is limited by the /START-TASK-MEASUREMENT and /STOP-TASK-MEASUREMENT statements) and outputs a corresponding statistics report.

INFORMATION = GLOBAL
Requests an analysis in which task analyses common to the selected monitoring cycles are performed, the results of which are provided in the following two forms:
- in the form of task-related total values (the values pertaining to the monitoring cycles for each individual selected task are addedd together) and
- in the form of global total values (the values pertaining to all selected tasks and monitoring cycles are added together).

PRINT-EVALUATION-SERIES
Request serial evaluation

With this statement the user requests standard series analysis for a complete SM2 output file.

SM2-PA then generates statistics of all types (i.e. program counter statistics, SVC statistics, task statistics) using predefined analysis parameters for all the individual program runs and task monitoring periods for which monitoring information is stored in the file. In this case no monitored object selection is required or taken into account, as was the case for the other SM2-PA statements requesting individual statistics. The only output medium permitted here is an SM2-PA output file because of the volume of output resulting from such an analysis of the entire SM2 output file. The SM2-PA output file must have been previously assigned.
A display of the results on the screen is not provided.

During this standard analysis, separate analyses are generated for the program counter and SVC statistics on each segment of program monitoring information stored in the file (no merging of multiple program runs for an analysis unit). Within the framework of task statistics, separate analyses are output for each monitoring cycle (time between /START-TASK-MEASUREMENT and /STOP-TASK-MEASUREMENT).

SM2-PA issues a SUMMARY report for each program run monitored for program counter and SVC statistics. In addition, MODULE analyses with default parameters are initiated for the 10 modules with the most samples. If no module load information exists, a PROGRAM analysis with default parameters is initiated.

Task statistics are generated individually for all monitoring cycles in the file (INFORMATION=DETAIL).

The overall way in which result statistics are represented corresponds to the output formats resulting from individual requests (see the list layouts in chapter 4, "List output", page 83 ff).

PRINT-EVALUATION-SERIES

Note

Any monitored object selection made prior to this statement is no longer valid (*NONE for PROGRAM and TASK).

SET-EVALUATION-OBJECTS
Define monitored objects for subsequent statistics output

With this statement the user can define the monitored objects (tasks and program runs) which are to be included in the subsequent statistic reports. As the result of the selection involved here, specific statistics can be requested.

Monitored object selection for statistics related to the program run:

To obtain analyses for precisely one program run when program counter and/or SVC statistics are requested, the user must select the monitored object in such detail that precisely the required program run is selected.

If, on the other hand, a monitored object is selected for these statistics and the results do not consist of an individually monitored program run (e.g. if all runs of this program under the specified TSN are selected when only one program name and one TSN are specified), SM2-PA generates a shared statistics report (program counter and/or SVC statistics) on all selected program runs. The monitored values from the selected program runs are merged and treated as if they were the monitored values from a single run.

Monitored object selection for task statistics:

In this case all task-specific monitored data for the selected tasks is supplied.

```
SET-EVALUATION-OBJECTS

 PROGRAM = *NONE / <full-filename 1..54 without-gen-vers>(...)

   <full-filename 1..54 without-gen-vers>(...)

     TSN = *ANY / list-poss(32): <alphanum-name 1..4>(...)

       <alphanum-name 1..4>(...)

         INDEX = *ANY / list-poss(32): <integer 1..255>

,TASK = *NONE / *ALL / list-poss(64): <alphanum-name 1..4>(...)

   <alphanum-name 1..4>(...)

     INDEX = *ANY / list-poss(16): <integer 1..255>
```

Operand description

PROGRAM =
Monitored object selection for statistics related to the program run (program counter statistics, SVC statistics).

PROGRAM = *NONE
No monitored values related to the program run are selected; when statistics are requested, no program counter or SVC analyses are possible.

PROGRAM = <full-filename 1..54 without-gen-vers>(...)
By specifying the program name, the program whose monitored values are to be included in the statistics is selected. The file name or the name of the library member under which the program is stored (container name) is used as the program name. A more precise selection can also be made as part of the relevant monitoring operations pertaining to this program.

TSN =
Selects those tasks to be taken into account when monitoring this program.

TSN = *ANY
Monitoring operations on this program are to be performed for all tasks (all tasks contained in the file).

TSN = list-poss(32): <alphanum-name 1..4>(...)
Specifying the relevant TSN or TSNs selects those tasks for which monitoring operations for the specified program are to be performed. For each task, selection can be restricted to specific program runs.

INDEX = Selection of the program runs to be monitored for the specified task.

INDEX = *ANY
All program runs under the task with the specified TSN are to be monitored.

INDEX = list-poss(32): <integer 1..255>
Specifying indices selects the program runs which are to be monitored under the task with the specified TSN. Here the index corresponds to the task-specific enumeration of the various program calls (see also SHOW-MEASURED-OBJECTS statement).

TASK =
Selects the monitored object for output of task statistics, selecting the particular tasks to be monitored.

TASK = *NONE
No task monitoring data is to be selected. Task analyses are not possible in the subsequent requests.

TASK = *ALL
The monitored data on all task measurement periods included in the file is selected.

TASK = list-poss(64): <alphanum-name 1..4>
Selects the tasks whose monitored data (recorded in the file during the various task measurement periods) is to be analyzed. The selection is made by specifying the appropriate TSN(s).

INDEX =
Selects the task measurement periods to be analyzed for the specified task(s).

INDEX = *ANY
All task measurement periods of the task(s) with the specified TSN(s) are evaluated.

INDEX = list-poss(16): <integer 1..255>
Indices are specified to select the task measurement periods to be evaluated under the task(s) with the specified TSN(s).

Example of syntax:

```
SET-EVAL-OBJECTS PROGRAM=ABCDE(TSN=1234(INDEX=(1,3)),TSN=1256)
```

SHOW-MEASURED-OBJECTS
Overview of the monitored objects in the SM2 output file

This statement provides the user with an overview of the tasks and program runs for which monitored values from SM2 user task monitoring operations are present in the current SM2 output file. The user can then determine which analyses are possible for which programs or tasks.

Output pertaining to the user task and program monitoring information given in the SM2 output file is in the form of a list of the consecutive monitoring cycles recorded in the file (i.e. the respective intervals between the /START- and /STOP-TASK-MEASUREMENT statements). In this case the task for which monitoring was activated and the program run monitored are indicated for each monitoring cycle. In addition, for each program run an indication is made as to whether the program counter and/or SVC statistics were activated and how many program counter samples or SVC calls were recorded.

In this list the task is identified with the aid of the relevant TSN and the program with the aid of the relevant program name. The program name consists of the file name or the name of the library member in which the program has been stored (container name).

In order to distinguish between more than one call of the same program, the different program calls (with identical program name) are numbered on a task-specific basis. With the aid of this index, the programs can be addressed unambiguously during ensuing monitored object selections.
A typical output might thus show the following pattern of program monitoring information:

- 1st monitoring operation for program 1 under task A,
- 2nd monitoring operation for program 1 under task A,
- 1st monitoring operation for program 2 under task A,
- 1st monitoring operation for program 1 under task B,
- 1st monitoring operation for program 2 under task B,
- 3rd monitoring operation for program 1 under task A,
- 2nd monitoring operation for program 1 under task B, and so forth.

For details of the report provided by the SHOW-MEASURED-OBJECTS statement refer to chapter 4, "List output", page 104 f.

SHOW-MEASURED-OBJECTS

4 List output

In batch/procedure mode, SM2-PA is operated via the SDF statement interface. All analysis results are written to the output file assigned.
If the user, in interactive mode, selects the PRINT function offered in the menu line of every mask, this likewise causes the entire output area to be written to the assigned file.
This chapter provides sample list outputs for the various SM2-PA statements/functions, arranged in alphabetical order by statement names.

List output generally corresponds to the output on the screen. Discrepancies occur only where the screen or list format has an influence on the layout of the output.

List outputs for the PREPARE-PCOUNTER-STATISTICS statement (PREP-PC function)

Output for the SUMMARY analysis:

```
                SM2-PA PCOUNTER STATISTICS (SUMMARY EVALUATION)

  PROGRAM          : :W:$OBN.SM2-PA
  PCOUNT AREA      : *STD     - *STD                                    NO. MODULES WITHOUT PCOUNTER:  155
  NUMBER OF SAMPLES: 544                                                SAMPLING INTERVAL  (MSEC)   :  1

+------------------------------+----------+----------+--------+-------+-------------------------------------------------------+
I MODULE                       I FROM     I TO       I ABS    I REL(%)I                                                       I
+------------------------------+----------+----------+--------+-------+-------------------------------------------------------+
I NPASVC                       I 0001E000 I 00026B8B I    340 I 62.50 IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX I
I NPADIA                       I 00005000 I 000068F3 I     42 I  7.72 IXXXXXXX                                                I
I ITPPUT##                     I 0003BF70 I 0003CEB5 I     35 I  6.43 IXXXXXX                                                 I
I ITPFL###                     I 0004B1C0 I 0004BABB I     31 I  5.70 IXXXXX                                                  I
I NPAOBJ                       I 0000D000 I 00011EE3 I     28 I  5.15 IXXXXX                                                  I
I ITPPVE##                     I 0003B4B0 I 0003BF6B I     18 I  3.31 IXX                                                     I
I ITPKONV#                     I 00033000 I 00039E55 I     12 I  2.21 IX                                                      I
I ITPSTVW#                     I 00053FC0 I 00055381 I     12 I  2.21 IX                                                      I
I NPAPCO                       I 00012000 I 00019323 I      6 I  1.10 I                                                       I
I NPATSKO                      I 0002B000 I 00030763 I      3 I  0.55 I                                                       I
I NPASHE                       I 0001A000 I 0001B203 I      2 I  0.37 I                                                       I
I ITPOPCX#                     I 000466A0 I 00048D27 I      2 I  0.37 I                                                       I
I NPADIA                       I 00008000 I 000095C3 I      1 I  0.18 I                                                       I
I ITPSSVC#                     I 0003B358 I 0003B4A9 I      1 I  0.18 I                                                       I
I ITPIOSY#                     I 00041BD0 I 0004274F I      1 I  0.18 I                                                       I
I ITPCDHD#                     I 0005B4A8 I 0005C9A7 I      1 I  0.18 I                                                       I
I *** OUT OF MODULES ***       I          I          I      9 I  1.65 IX                                                      I
+------------------------------+----------+----------+--------+-------+-------------------------------------------------------+
```

Explanation of the output:

The following entries may appear in the header lines:

`PROGRAM:`
: Name of the relevant program for analysis.

`PCOUNT AREA:`
: Address area selected for analysis.

`NUMBER OF SAMPLES:`
: Number of program counter samples recorded for this area.

`NO. MODULES WITHOUT PCOUNTER:`
: Number of modules for which no sampling operations were performed.

`SAMPLING INTERVAL (MSEC):`
: Sampling cycle (in milliseconds).

The following analysis information is output in the data area:

under MODULE:	respective modules registered
under FROM:	relevant start addresses
under TO:	relevant end addresses
under ABS:	absolute number of hits assigned to the individual modules
under REL(%):	hit rate (as a percentage), relative to the total number of samples.

The modules are output sorted by the number of samples.
If samples outside the known modules are found, they are listed at the end of output under the designation "*** OUT OF MODULES ***" instead of the module name.

Unlike screen outputs, list outputs of a SUMMARY analysis include the calculated hit rates not only in numerical representation but also as a bar chart (histogram).

Output for PROGRAM analysis:

```
                         SM2-PA PCOUNTER STATISTICS (PROGRAM EVALUATION)


  PROGRAM          : :W:$OBN.SM2-PA
  PCOUNT AREA      : *STD     - *STD
  NUMBER OF SAMPLES: 544                                              SAMPLING INTERVAL  (MSEC):    1

+----------+----------+-----+-------+-------------------------------------------------------------------------------------+
I FROM     I TO       I ABS I REL(%)I                                                                                     I
+----------+----------+-----+-------+-------------------------------------------------------------------------------------+
I 00005000 I 000F3758 I 535 I 98.35 IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
I 000F3759 I 001E1EB1 I   0 I  0.00 I                                                                                     I
I 001E1EB2 I 002D060A I   0 I  0.00 I                                                                                     I
I 002D060B I 003BED63 I   0 I  0.00 I                                                                                     I
I 003BED64 I 004AD4BC I   0 I  0.00 I                                                                                     I
I 004AD4BD I 0059BC15 I   0 I  0.00 I                                                                                     I
I 0059BC16 I 0068A36E I   0 I  0.00 I                                                                                     I
I 0068A36F I 00778AC7 I   0 I  0.00 I                                                                                     I
I 00778AC8 I 00867220 I   0 I  0.00 I                                                                                     I
I 00867221 I 00955979 I   0 I  0.00 I                                                                                     I
I 0095597A I 00A440D2 I   0 I  0.00 I                                                                                     I
I 00A440D3 I 00B3282B I   0 I  0.00 I                                                                                     I
I 00B3282C I 00C20F84 I   0 I  0.00 I                                                                                     I
I 00C20F85 I 00D0F6DD I   0 I  0.00 I                                                                                     I
I 00D0F6DE I 00DFDE44 I   9 I  1.65 IX                                                                                    I
+----------+----------+-----+-------+-------------------------------------------------------------------------------------+
```

Explanation of the output:

The following entries appear in the header lines:

`PROGRAM:`
Name of the relevant program for analysis.

`PCOUNT AREA:`
Program address area selected for analysis.

`NUMBER OF SAMPLES:`
Number of program counter samples recorded for this area.

`SAMPLING INTERVAL (MSEC):`
Sampling cycle (in milliseconds).

The following analysis information is output in the data area:

Under FROM:	respective start addresses of the address subareas
under TO:	respective end addresses of these subareas
under ABS:	absolute number of hits assigned to the individual subareas (if the number of hits is greater than 999999, 999999 will be specified)
under REL(%):	corresponding percentage of hits, relative to the total number of samples.

In addition to text, the display also includes the calculated hit rates in the form of a bar chart (histogram).

Output for MODULE analysis:

```
                          SM2-PA PCOUNTER STATISTICS (MODULE EVALUATION)


  PROGRAM          : :W:$OBN.SM2-PA
  PCOUNT AREA      : *STD     - *STD        OF  NPASVC                            ADDRESS: 0001E000
  NUMBER OF SAMPLES: 340                                                SAMPLING INTERVAL  (MSEC):    1

+----------+----------+-----+-------+-----------------------------------------------------------------------------------------+
I FROM     I TO       I ABS I REL(%)I                                                                                         I
+----------+----------+-----+-------+-----------------------------------------------------------------------------------------+
I 00000000 I 0000094C I   0 I  0.00 I                                                                                         I
I 0000094D I 00001299 I   7 I  2.06 IXXX                                                                                      I
I 0000129A I 00001BE6 I   4 I  1.18 IX                                                                                        I
I 00001BE7 I 00002533 I   1 I  0.29 I                                                                                         I
I 00002534 I 00002E80 I   1 I  0.29 I                                                                                         I
I 00002E81 I 000037CD I  39 I 11.47 IXXXXXXXXXXXXXXXXX                                                                        I
I 000037CE I 0000411A I 193 I 56.76 IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
I 0000411B I 00004A67 I  93 I 27.35 IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                               I
I 00004A68 I 000053B4 I   2 I  0.59 I                                                                                         I
I 000053B5 I 00005D01 I   0 I  0.00 I                                                                                         I
I 00005D02 I 0000664E I   0 I  0.00 I                                                                                         I
I 0000664F I 00006F9B I   0 I  0.00 I                                                                                         I
I 00006F9C I 000078E8 I   0 I  0.00 I                                                                                         I
I 000078E9 I 00008235 I   0 I  0.00 I                                                                                         I
I 00008236 I 00008B8B I   0 I  0.00 I                                                                                         I
+----------+----------+-----+-------+-----------------------------------------------------------------------------------------+
```

Explanation of the output:

The following entries appear in the header lines:

`PROGRAM:`
Name of the relevant program for analysis.

`PCOUNT AREA:`
Address area selected for this analysis, including specification of the name of the module selected (all address entries here are relative to the beginning of the selected module).

`NUMBER OF SAMPLES:`
Number of program counter samples recorded for this area.

`ADDRESS:`
Start adress of analyzed module.

`SAMPLING INTERVAL (MSEC):`
Sampling cycle (in milliseconds).

The following statistics are output in the data area:

under FROM:	respective start addresses of the address subareas
under TO:	relevant end address areas of these subareas (the address subareas refer to the module selected for analysis)
under ABS:	absolute number of hits assigned to the individual subareas
under REL(%):	corresponding percentage of hits, relative to the total number of samples.

In addition to text, the display includes the calculated hit rates in the form of a bar chart (histogram).

List outputs for the PREPARE-SVC-STATISTICS statement (PREP-SVC function)

Output for SUMMARY analysis:

```
                          SM2-PA SVC STATISTICS (SUMMARY EVALUATION)


  PROGRAM      :     :W:$OBN.SM2-PA                                           TOTAL SVC-CALLS:      302
  ADDRESS RANGE:     *STD     - *STD

                         ----------------------------------------------------------------------------
                         I                            I           I  REL (%)  I  REL (%)  I  REL (%)  I
            DESCRIPTION: I  SVC     SVC   SVC         I  SUM SVC  I  TO SVCS  I  TO SVCNO I  TO ALL   I
                         I  DEC     HEX   NAME        I IN MODULE I IN MODULE I  TOTAL    I  SVCS     I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPOPCX#                          ADDRESS: 000466A0
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I  186      74    DMSMGM31   I       15  I   55.56   I   88.24   I    4.97   I
                         I  144      20    DMSSRV31   I       10  I   37.04   I   76.92   I    3.31   I
                         I  159      3E    FILE       I        1  I    3.70   I  100.00   I    0.33   I
                         I  135      0E    SYSINFO    I        1  I    3.70   I  100.00   I    0.33   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPIOSY#                          ADDRESS: 00041BD0
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I   39      4E    SYSFI      I       24  I  100.00   I   96.00   I    7.95   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPRAHM#                          ADDRESS: 00059AC0
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I  128      00    STXIT      I        8  I   61.54   I  100.00   I    2.65   I
                         I  191      7E    JOB-MGMT   I        2  I   15.38   I  100.00   I    0.66   I
                         I   39      4E    SYSFI      I        1  I    7.69   I    4.00   I    0.33   I
                         I   28      38    QUIETDEV   I        1  I    7.69   I  100.00   I    0.33   I
                         I    9      12    TERM       I        1  I    7.69   I  100.00   I    0.33   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPSTVW#                          ADDRESS: 00053FC0
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I    1      02    MMGMT      I        9  I  100.00   I   60.00   I    2.98   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       CMDCSTM                           ADDRESS: 00063000
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I   88      B0    CMD 24     I        8  I  100.00   I  100.00   I    2.65   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPOPRD#                          ADDRESS: 0004FCE8
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I    1      02    MMGMT      I        5  I   71.43   I   33.33   I    1.66   I
                         I  144      20    DMSSRV31   I        2  I   28.57   I   15.38   I    0.66   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPOS#                            ADDRESS: 00039E58
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I  172      58    IOSID      I        1  I   33.33   I  100.00   I    0.33   I
                         I   72      90    GETSW      I        1  I   33.33   I  100.00   I    0.33   I
                         I    1      02    MMGMT      I        1  I   33.33   I    6.67   I    0.33   I
                         I----------------------------I-----------I-----------I-----------I-----------I

            MODULE:       ITPTHAI#                          ADDRESS: 0004BAC0
                         I----------------------------I-----------I-----------I-----------I-----------I
                         I  183      6E    ITABLE     I        1  I   50.00   I  100.00   I    0.33   I
                         I  144      20    DMSSRV31   I        1  I   50.00   I    7.69   I    0.33   I
                         I----------------------------I-----------I-----------I-----------I-----------I
```

```
                I-------------------------I----------I----------I----------I----------I
                I                         I          I  REL (%)  I  REL (%)  I  REL (%)  I
DESCRIPTION:    I  SVC     SVC   SVC      I  SUM SVC  I  TO SVCS  I  TO SVCNO I  TO ALL   I
                I  DEC     HEX   NAME     I IN MODULE I IN MODULE I  TOTAL    I  SVCS     I
                I-------------------------I----------I----------I----------I----------I

MODULE:          ITPTXST#                        ADDRESS: 00057088
                I-------------------------I----------I----------I----------I----------I
                I  186      74    DMSMGM31 I        2  I  100.00   I   11.76   I    0.66   I
                I-------------------------I----------I----------I----------I----------I

MODULE:          NPATCHN                         ADDRESS: 00027000
                I-------------------------I----------I----------I----------I----------I
                I   70      8C    TMODE    I        1  I  100.00   I  100.00   I    0.33   I
                I-------------------------I----------I----------I----------I----------I

MODULE:          *** OUT OF MODULES ***
                I-------------------------I----------I----------I----------I----------I
                I  188      78    SAM      I      206  I  100.00   I  100.00   I   68.21   I
                I-------------------------I----------I----------I----------I----------I
```

Explanation of the output:

The following entries appear in the header lines:

`PROGRAM:`
: Name of the relevant program for analysis.

`ADDRESS RANGE:`
: Address area selected for this analysis.

`TOTAL SVC-CALLS:`
: Number of SVC calls recorded in the specified address area.

The actual statistical values are provided in the subsequent information blocks for the SVC calls in the individual modules of the monitored program, the name (`MODULE:`) and start address (`ADDRESS:`) being indicated for each module.

The `DESCRIPTION` lines specify the types of numbering, the relevant name and the different types of analysis of the SVC calls for the various modules, the specifications being contained in the individual columns of the information blocks:

The `SVC DEC` column lists the SVC numbers for which calls were analyzed; the numbers are given in decimal form.

The `SVC HEX` column lists the SVC numbers for which calls were analyzed; the numbers are given in hexadecimal form.

The `SVC NAME` column lists the names of the analyzed SVCs.

For each SVC number listed, the column `SUM SVC IN MODULE` specifies the absolute number of recorded calls in the relevant module for this SVC.

The column `REL(%) TO SVCS IN MODULE` lists the corresponding SVC percentage relative to the total number of SVC calls monitored for this module.

The column REL(%) TO SVCNO TOTAL lists the corresponding SVC percentage in the relevant module, relative to the total number of SVC calls analyzed for this SVC number.

The column REL(%) TO ALL SVCS lists the corresponding SVC percentage in the relevant module, relative to the total number of SVC calls which were monitored.

The modules are output sorted by the number of SVCs.
If SVCs outside the known modules are found, they are listed at the end of the output under the designation "*** OUT OF MODULES ***" instead of the module name.

Output for PROGRAM analysis:

```
                    SM2-PA SVC STATISTICS (PROGRAM EVALUATION)

  PROGRAM      :     :W:$OBN.SM2-PA                                TOTAL SVC-CALLS:      433
  ADDRESS RANGE:     *STD     - *STD
```

SVC DEC	SVC HEX	SVC NAME	MODUL-NAME	OFFSET	CALLS AT LOCATION	REL (%) TO SVCNO TOTAL	SUM SVCS OF SVCNO	REL (%) TO ALL SVCS IN AREA
188	78	SAM	*** OUT OF MODULES ***	00DFDE42	196	95.15		
				00DFD616	10	4.85	206	47.57
39	4E	SYSFI	ITPIOSY#	0000016A	13	52.00		
				00000194	11	44.00		
				00000298	1	4.00	25	5.77
186	74	DMSMGM31	ITPOPCX#	0000103A	5	29.41		
				00001048	5	29.41		
				00001BB2	5	29.41		
				000001A2	1	5.88		
				000001E8	1	5.88	17	3.93
1	02	MMGMT	ITPSTVW#	00000E2C	8	53.33		
				00000088	1	6.67		
				00000950	1	6.67		
				00000974	1	6.67		
				00000994	1	6.67		
				000009E8	1	6.67		
				00000CBC	1	6.67		
				00000170	1	6.67	15	3.46
144	20	DMSSRV31	ITPOPCX#	0000008E	5	38.46		
				000000C2	5	38.46		
				00000BAA	2	15.38		
				000002B0	1	7.69	13	3.00
128	00	STXIT	ITPRAHM#	00000196	8	100.00	8	1.85
88	B0	CMD 24	CMDCSTM	0000046E	7	87.50		
				00000346	1	12.50	8	1.85
191	7E	JOB-MGMT	ITPRAHM#	000000A6	1	50.00		
				00000688	1	50.00	2	0.46
135	0E	SYSINFO	ITPOPCX#	00001552	1	100.00	1	0.23
70	8C	TMODE	NPATCHN	00000088	1	100.00	1	0.23
159	3E	FILE	ITPOPCX#	0000159A	1	100.00	1	0.23
172	58	IOSID	ITPOS#	0000012E	1	100.00	1	0.23
183	6E	ITABLE	ITPTHAI#	00000324	1	100.00	1	0.23
72	90	GETSW	ITPOS#	000001A6	1	100.00	1	0.23
28	38	QUIETDEV	ITPRAHM#	0000072C	1	100.00	1	0.23
9	12	TERM	ITPRAHM#	00000740	1	100.00	1	0.23

Explanation of the output:

The following entries appear in the header lines:

PROGRAM:
: Name of the relevant program for analysis.

ADDRESS RANGE:
: Address area selected for this analysis.

TOTAL SVC-CALLS:
: Number of SVC calls recorded in the relevant address area.

In the evaluation part, columns SVC DEC and SVC HEX list the SVC number in decimal and hexadecimal form respectively, and column SVC NAME lists the relevant name of the analyzed SVC.

Column MODULNAME lists the names of the modules in which the respective SVC calls were recorded.

Column OFFSET indicates the call addresses within the relevant module for each SVC.

Column CALLS SVCS AT LOCATION provides the number of calls recorded for this SVC at each call address.

Column REL(%) TO SVCNO TOTAL shows, for each call address, the percentage share of calls at this address in relation to the total number of analyzed calls for this SVC.

Column SUM SVCS OF SVCNO shows, for each SVC number listed, the absolute total number of calls for this SVC in the analyzed area.

Column REL(%) TO ALL SVCS IN AREA indicates the corresponding percentage share of this SVC in relation to the total number of SVC calls analyzed here.

The SVCs are output sorted by the frequency of their occurrence in the selected program. Within the individual SVC analysis areas, the related modules are sorted by their number of SVC calls.

For the special modules "*** OVERLAPPING MODULES" and "*** OUT OF MODULES ***" absolute addresses are output instead of module-specific addresses. If no module load information exists for a program, "*ABS+" is output instead of the module name. In this case the address under OFFSET is an absolute address.

Output for MODULE analysis:

```
                    SM2-PA SVC STATISTICS (MODULE EVALUATION)

  PROGRAM      :     :W:$OBN.SM2-PA                                    TOTAL SVC-CALLS:       27
  ADDRESS RANGE:     *STD     - *STD        OF  ITPOPCX
```

SVC DEC	SVC HEX	SVC NAME	OFFSET	CALLS SVCS AT LOCATION	REL (%) TO SVCNO TOTAL	OFFSET	CALLS SVCS AT LOCATION	REL (%) TO SVCNO TOTAL	SUM SVCS OF SVCNO	REL (%) TO ALL SVCS IN AREA
186	BA	DMSMGM3	0000103A	5	33.33	00001048	5	33.33		
			00001BB2	5	33.33				15	55.56
144	90	DMSSRV31	0000008E	5	50.00	000000C2	5	50.00	10	37.04
159	9F	FILE	0000159A	1	100.00				1	3.70
135	87	SYSINFO	00001552	1	100.00				1	3.70

Explanation of the output:

The header lines contain the following entries:

PROGRAM:
: Name of the relevant program for analysis.

ADDRESS RANGE:
: Address range monitored for this analysis, including specification of the selected module (all address specifications here are relative to the beginning of the selected module).

TOTAL SVC-CALLS:
: Number of SVC calls recorded in the specified address area.

In the evaluation part, columns SVC DEC and SVC HEX list the SVC number in decimal and hexadecimal form respectively, and column SVC NAME lists the name of the analyzed SVC.

The OFFSET columns list the call addresses within the relevant module for each SVC.

The CALLS SVCS AT LOCATION columns provide the number of calls recorded for this SVC at each call address.

The REL(%) TO SVCNO TOTAL columns show, for each call address, the percentage share of calls at this address in relation to the total number of analyzed calls for this SVC.

The SUM SVCS OF SVCNO column lists, for each specified SVC number, the total number of calls for this SVC in the analyzed area.

The `REL(%) TO ALL SVCS IN AREA` column lists the corresponding percentage share of this SVC in relation to the total number of SVC calls analyzed here.

The SVCs are output sorted by the frequency of their occurrence in the selected module.

List outputs for the PREPARE-TASK-STATISTICS statement (PREP-TASK function)

Detailed output for individual task measurement periods:

SM2-PA TASK STATISTICS (DETAIL)

DESCRIPTOR	0MXL(1)	0731(1)	0731(2)
USERID	OBN	OBN	OBN
TSN	0MXL	0731	0731
JOBNAME	OBNSAST	WS	WS
JOBCLASS	JCDSTD	JCDSTD	JCDSTD
CATEGORY	DIALOG1	DIALOG1	DIALOG1
START-DATE	90-12-12	90-10-15	90-10-15
START-TIME	14:46:38	14:40:58	14:42:20
END-DATE	90-12-12	90-10-15	90-10-15
END-TIME	14:48:46	14:41:55	14:45:20
ELAPSED TIME (S)	128.3593	57.7385	180.7162
TOTAL CPU TIME (S)	20.0714	42.0663	43.2459
TOTAL IO	1899	17521	18066
IO	1733	2	545
SVC / TU STATE	16680	0	302
SVC / TPR STATE	4885	22	1289
PAGE FAULTS	2745	36	784
PAGE READS	65	28	83
PAGE RECLAIMS	0	0	9
1ST PAGE ACCESSES	2680	8	692
WSET (PPC) IN PAGES	176	49	88
ESA PAGES	0	0	0
CLASS 5 + 6 PAGES	2996	999	999
CPU ALLOCATIONS	5116	6	683
CPU TIME (S)	18.9750	0.0238	1.1571
ACTIVE WAITS	197	4	67
DURATION (S)	1.5337	0.0634	0.3353
DISK IO WAITS	1456	0	513
DURATION (S)	27.4401	0.0000	14.4984
NON DISK IO WAITS	0	0	0
DURATION (S)	0.0000	0.0000	0.0000
INACTIVE WAITS	1	0	0
DURATION (S)	1.0488	0.0000	0.0000
ADMISSIONS	5	0	3
DURATION (S)	68.0000	0.0000	10.0000
BOURSE LONG WAITS	6	2	22
DURATION (S)	63.2476	56.5512	161.8640
SERVICE UNITS	557875	551	32077
CPU SERVICE UNITS	317227	453	19810
IO SERVICE UNITS	15776	16	5466
MEM SERVICE UNITS	224872	82	6801
HIGHEST CPU CONSUMER	2:$RZV110.ASSXT 17.7471	*NONE 0.0000	W:$OBN.SM2-PA 0.9171
HIGHEST IO CONSUMER	2:$RZV110.ASSXT 1259	*NONE 0	W:$OBN.SM2-PA 389
HIGHEST S-U CONSUMER	2:$RZV110.ASSXT 527296	*NONE 0	W:$OBN.SM2-PA 25443
HIGHEST WS CONSUMER	2:$RZV110.ASSXT 167	*NONE 0	W:$OBN.SM2-PA 79
HIGHEST PRIORITY	210	210	210
LOWEST PRIORITY	210	210	210
INPUT MSG (1/S)	0.0467	0.0000	0.0000
AVG INP.-LGTH (BYTES)	30	0	0
OUTPUT MSG (1/S)	0.2804	0.0000	0.0000
AVG OUTP.-LGTH(BYTES)	103	0	0
PAM-PG PER DISK IO	1.5516	1.0000	2.0146
KB PER NON DISK IO	0.0000	0.0000	0.0000
VECTOR UNIT TIME (S)	0.0000	0.0000	0.0000

Output of task-related sum values
(total values for the measurement periods of selected tasks):

SM2-PA TASK STATISTICS (TASK-SUM)

DESCRIPTOR	SUM: 0MXL	SUM: 0731	SUM: 4KZS
TSN	0MXL	0731	4KZS
# TASK MEASUREMENTS	1	2	1
ELAPSED TIME (S)	128.3593	238.4547	6.7054
TOTAL CPU TIME (S)	20.0714	85.3122	8.9334
TOTAL IO	1899	35587	2946
IO	1733	547	1
SVC / TU STATE	16680	302	0
SVC / TPR STATE	4885	1311	11
PAGE FAULTS	2745	820	6
PAGE READS	65	111	0
PAGE RECLAIMS	0	9	0
WSET (PPC) IN PAGES	176	137	98
ESA PAGES	0	0	0
CLASS 5 + 6 PAGES	2996	1998	1265
CPU ALLOCATIONS	5116	689	2
CPU TIME (S)	18.9750	1.1809	0.0170
ACTIVE WAITS	197	71	1
DURATION (S)	1.5337	0.3988	0.1506
DISK IO WAITS	1456	513	0
DURATION (S)	27.4401	14.4984	0.0000
NON DISK IO WAITS	0	0	0
DURATION (S)	0.0000	0.0000	0.0000
INACTIVE WAITS	1	0	0
DURATION (S)	1.0488	0.0000	0.0000
ADMISSIONS	5	3	0
DURATION (S)	68.0000	10.0000	0.0000
BOURSE LONG WAITS	6	24	1
DURATION (S)	63.2476	218.4152	5.5260
SERVICE UNITS	557875	32628	371
CPU SERVICE UNITS	317227	20263	246
IO SERVICE UNITS	15776	5482	8
MEM SERVICE UNITS	224872	6883	117
HIGHEST CPU CONSUMER	I:2:$RZV110.ASSXT 17.7471	I:W:$OBN.SM2-PA 0.9171	I*NONE 0.0000
HIGHEST IO CONSUMER	I:2:$RZV110.ASSXT 1259	I:W:$OBN.SM2-PA 389	I*NONE 0
HIGHEST S-U CONSUMER	I:2:$RZV110.ASSXT 527296	I:W:$OBN.SM2-PA 25443	I*NONE 0
HIGHEST WS CONSUMER	I:2:$RZV110.ASSXT 167	I:W:$OBN.SM2-PA 79	I*NONE 0
HIGHEST PRIORITY	0	0	0
LOWEST PRIORITY	0	0	0
INPUT MSG (1/S)	0.0467	0.0000	0.1491
AVG INP.-LGTH (BYTES)	30	0	31
OUTPUT MSG (1/S)	0.2804	0.0000	0.2982
AVG OUTP.-LGTH(BYTES)	103	0	97
PAM-PG PER DISK IO	1.5516	3.0146	1.0000
KB PER NON DISK IO	0.0000	0.0000	0.0000
VECTOR UNIT TIME (S)	0.0000	0.0000	0.0000

Output of global sum values
(total values for all selected tasks and measurement periods):

```
        SM2-PA TASK STATISTICS ( SUM-ALL )

I # TASK MEASUREMENTS  I                                  4 I
I ELAPSED TIME (S).....I.........................373.5193 I
I TOTAL CPU TIME (S)   I                         114.3171 I
I TOTAL IO.............I.............................40432 I
I IO                   I                            2281 I
I SVC / TU STATE.......I.............................16982 I
I SVC / TPR STATE      I                            6207 I
I PAGE FAULTS..........I.............................3571 I
I PAGE READS           I                             176 I
I PAGE RECLAIMS........I................................9 I
I 1ST PAGE ACCESSES    I                            3386 I
I WSET (PPC) IN PAGES..I.............................411 I
I ESA PAGES            I                               0 I
I CLASS 5 + 6 PAGES....I.............................6259 I
I CPU ALLOCATIONS      I                            5807 I
I   CPU TIME (S).......I...........................20.1730 I
I ACTIVE WAITS         I                             269 I
I   DURATION (S).......I...........................2.0831 I
I DISK IO WAITS        I                            1969 I
I   DURATION (S).......I...........................41.9385 I
I NON DISK IO WAITS    I                               0 I
I   DURATION (S).......I...........................0.0000 I
I INACTIVE WAITS       I                               1 I
I   DURATION (S).......I...........................1.0488 I
I ADMISSIONS           I                               8 I
I   DURATION (S).......I...........................78.0000 I
I BOURSE LONG WAITS    I                              31 I
I   DURATION (S).......I.........................287.1887 I
I SERVICE UNITS        I                          590874 I
I CPU SERVICE UNITS....I.............................337736 I
I IO  SERVICE UNITS    I                           21266 I
I MEM SERVICE UNITS....I.............................231872 I
I HIGHEST CPU CONSUMER I:2:$RZV110.ASSXT           17.7471 I
I HIGHEST IO  CONSUMER.I:2:$RZV110.ASSXT.............1259 I
I HIGHEST S-U CONSUMER I:2:$RZV110.ASSXT            527296 I
I HIGHEST WS  CONSUMER.I:2:$RZV110.ASSXT..............167 I
I HIGHEST PRIORITY     I                               0 I
I LOWEST  PRIORITY.....I................................0 I
I INPUT MSG (1/S)      I                          0.1958 I
I AVG INP.-LGTH (BYTES)I...............................61 I
I OUTPUT MSG (1/S)     I                          0.5787 I
I AVG OUTP.-LGTH(BYTES)I..............................200 I
I PAM-PG PER DISK IO   I                          5.5663 I
I KB PER NON DISK IO...I...........................0.0000 I
I VECTOR UNIT TIME (S) I                          0.0000 I
```

Explanation of the output:

List outputs are more comprehensive than screen outputs, as the output is adapted to the list format. Three evaluations for individual task measurement periods or task-related totals can be represented next to each other. List outputs also contain a few additional task-specific values. For the meanings of the monitored values see page 101.

`DETAIL / TASK-SUM / SUM-ALL`
: The header line states whether detailed values (for individual measurement periods) or totals are output.

`tsn(index) / SUM: tsn`
: The '`DESCRIPTOR`' line states, via the relevant TSN, to which task the individual or sum evaluation refers; for detailed output, the index in parentheses indicates the task measurement period to which the results apply.

Individual evaluations first report general information on the monitored tasks:

`USERID`	–	User identification
`TSN`	–	Task sequence number
`JOBNAME`	–	Job name
`JOBCLASS`	–	Job class
`CATEGORY`	–	Category

as well as the beginning (`START-DATE`, `START-TIME`) and end (`END-DATE`, `END-TIME`) of monitoring.

`# TASK MEASUREMENTS:`
: Sum evaluations state the number of task measurement periods over which the individual monitored values have been collated.

Monitored values and their meanings

Monitored value	Meaning
ACTIVE WAITS	Number of voluntary active wait states in the task measurement period (tmp) (Queues Q2 and Q4 except I/O dwell times)
ADMISSIONS	Number of admissions in the tmp
AVG INP.-LGTH (BYTES)	Average input length in bytes
BOURSE LONG WAITS	Number of voluntary inactive wait states in the tmp due to bourses (queue Q12)
CLASS 5 + 6 PAGES	Maximum user adress space occupancy (sum of class 5 and 6 memory); this value also includes unused memory poolpages reserved via ENAMP
CPU ALLOCATIONS	Number of requests to the central processor(s) in the tmp. This figure does not include those requests where the task retains the CPU after interruptions (all exists from queue0 to another queue are counted)
AVG OUTP.-LGTH (BYTES)	Average output length in bytes
CPU SERVICE UNITS	CPU service units included in the tmp
CPU-TIME (S)	CPU time (TU/TPR share) in the tmp (in seconds)
DISK IO WAITS	Number of wait states for disk I/Os
DURATION (S)	Dwell time (in seconds) during - voluntary active wait states in the tmp (——> ACTIVE WAITS) - voluntary inactive wait states in the tmp except for bourses (——> INACTIVE WAITS) - voluntary inactive wait states in the tmp due to bourses (——> BOURSE LONG WAIT) - wait states for I/O operations to disk devices (——> DISK IO WAITS) - wait states for I/O operations to other devices (——> NONDISK IO WAITS); Wait time prior to admission (in seconds) (——> ADMISSIONS)

Monitored value	Meaning
ELAPSED TIME (S)	Task measurement period: difference between the STOP and START times of a monitoring cycle
ESA PAGES	Maximum allocation of data spaces
HIGHEST CPU CONSUMER	Indicates the program with the most CPU time consumed (in seconds)
HIGHEST IO CONSUMER	Program with the most I/O operations
HIGHEST PRIORITY	Highest priority assigned to the task
HIGHEST S-U CONSUMER	Program with the largest consumption of service units
HIGHEST WS CONSUMER	Program with the largest working set
INACTIVE WAITS	Number of voluntary inactive wait states in the tmp except for bourses (queues Q10, Q11 and Q13)
INPUT MSG (1/S)	Number of input messages per second for this task
IO	Total number of I/Os (except for paging) in the tmp
IO SERVICE UNITS	I/O service units added in the tmp
KB PER NON DISK IO	Average extent of I/O operations to devices, with the exception of disk devices (in Kbytes)
LOWEST PRIORITY	Lowest priority assigned to the task
MEM SERVICE UNITS	Memory service units added in the tmp
NON DISK IO WAITS	Number of wait states for I/O operations to devices other than disk devices
OUTPUT MSG (1/S)	Number of output messages per sec. for this task
1ST PAGE ACCESSES	Number of page error interrupts for the first access to a page in the tmp

Monitored value	Meaning
PAGE FAULTS	Number of page error interrupts in the tmp
PAGE READS	Number of pages read from background memory in the tmp
PAGE RECLAIMS	Number of page error interrupts in the tmp for which the addressed page is still in main memory
PAM-PG PER DISK IO	Average number of PAM pages per I/O operation to disk devices
SERVICE UNITS	Service units added in the tmp
SVC / TPR STATE	Number of SVC calls from TPR state (P2) in the tmp
SVC / TU STATE	Number of SVC calls from TU state (P1) in the tmp
TOTAL CPU TIME (S)	Accumulated CPU time (TU/TPR share) since task generation time (in seconds)
TOTAL IO	Accumulated number of all I/O operations (except for paging) since task generation time
VECTOR UNIT TIME (S)	Vector unit time in the tmp (in seconds)
WSET (PPC) IN PAGES	Average working set (PPC) in the tmp

Table 2 Monitored values and their meanings

For a more detailed explanation of the monitored values see the SM2 manual [1] (glossary), as well as the Performance Handbook [3].

List output for the SHOW-MEASURED-OBJECTS statement

```
                        CONTENTS OF SM2 FILE :                  :2OS6:$OBN.PA.TUTTI                  PAGE:    1


0MXL(  1)                                                    PC-STATISTICS        SVC-STATISTICS
UNLOAD                                            (  1)          0 SAMPLES             2 EVENTS
:W:$OBN.C.SRCID                                   (  1)          2 SAMPLES            95 EVENTS
NO MODULE INFORMATION FOR THIS PROGRAM
:2:$RZV110.ASSXT                                  (  1)      15519 SAMPLES         16583 EVENTS
 MEASUREMENT FROM 1990-12-12 14:46:38  TO  1990-12-12  14:48:46
-------------------------------------------------------------------------------------------------
0731(  1)
 MEASUREMENT FROM 1990-10-15 14:40:58  TO  1990-10-15  14:41:55
-------------------------------------------------------------------------------------------------
0731(  2)                                                    PC-STATISTICS        SVC-STATISTICS
:W:$OBN.SM2-PA                                    (  1)        544 SAMPLES           302 EVENTS
 MEASUREMENT FROM 1990-10-15 14:42:20  TO  1990-10-15  14:45:20
 MISSED  RECORDS FOR THIS TASK:               1
-------------------------------------------------------------------------------------------------
4KZS(  1)
 MEASUREMENT FROM 1991-04-18 11:18:53  TO  1991-04-18  11:18:59
-------------------------------------------------------------------------------------------------
4KZS(  2)                                                    PC-STATISTICS        SVC-STATISTICS
:W:$OBN.FFAUSW                                    (  1)          0 SAMPLES              OFF
:W:$OBN.FFAUSW                                    (  2)          4 SAMPLES              OFF
:W:$OBN.SM2-PA                                    (  1)          0 SAMPLES              OFF
 MEASUREMENT FROM 1991-04-18 11:19:22  TO  1991-04-18  11:20:47
-------------------------------------------------------------------------------------------------
4KZS(  3)                                                    PC-STATISTICS        SVC-STATISTICS
:W:$OBN.FFAUSW                                    (  3)             OFF              33 EVENTS
:W:$OBN.FFAUSW                                    (  4)             OFF              55 EVENTS
 MEASUREMENT FROM 1991-04-18 11:21:20  TO  1991-04-18  11:22:11
-------------------------------------------------------------------------------------------------
4KZS(  4)                                                    PC-STATISTICS        SVC-STATISTICS
:W:$OBN.FFAUSW                                    (  5)             OFF              33 EVENTS
 MEASUREMENT FROM 1991-04-18 11:23:05  TO  1991-04-18  11:23:25
-------------------------------------------------------------------------------------------------
0E41(  1)                                                    PC-STATISTICS        SVC-STATISTICS
SM2PA                                             (  1)        122 SAMPLES           839 EVENTS
:2BV:$TSOS.EDT                                    (  1)         82 SAMPLES          1361 EVENTS
SM2A                                              (  1)         66 SAMPLES           403 EVENTS
*SYSTEM                                           (  1)         15 SAMPLES           715 EVENTS
 MEASUREMENT FROM 1990-05-18 10:12:29  TO  1990-05-18  10:25:12
 MISSED  RECORDS FOR THIS TASK:               3
-------------------------------------------------------------------------------------------------
0E41(  2)                                                    PC-STATISTICS        SVC-STATISTICS
SM2PA                                             (  2)        122 SAMPLES           839 EVENTS
:2BV:$TSOS.EDT                                    (  2)         82 SAMPLES          1361 EVENTS
SM2A                                              (  2)         66 SAMPLES           403 EVENTS
*SYSTEM                                           (  2)         15 SAMPLES           715 EVENTS
 MEASUREMENT FROM 1990-05-18 10:12:29  TO  1990-05-18  10:25:12
 MISSED  RECORDS FOR THIS TASK:               3
-------------------------------------------------------------------------------------------------
SM2W(  1)                                                    PC-STATISTICS        SVC-STATISTICS
*SYSTEM                                           (  1)        148 SAMPLES           232 EVENTS
NO MODULE INFORMATION FOR THIS PROGRAM
 MEASUREMENT FROM 1990-10-22 10:28:32  TO  1990-10-22  10:47:58
-------------------------------------------------------------------------------------------------
SM2W(  2)                                                    PC-STATISTICS        SVC-STATISTICS
*SYSTEM                                           (  2)        148 SAMPLES           232 EVENTS
NO MODULE INFORMATION FOR THIS PROGRAM
 MEASUREMENT FROM 1990-10-22 10:28:32  TO  1990-10-22  10:47:58
-------------------------------------------------------------------------------------------------
SM2W(  3)                                                    PC-STATISTICS        SVC-STATISTICS
*SYSTEM                                           (  3)        148 SAMPLES           232 EVENTS
NO MODULE INFORMATION FOR THIS PROGRAM
 MEASUREMENT FROM 1990-10-22 10:28:32  TO  1990-10-22  10:47:58
```

Explanation of the output:

An information block is output for every monitoring cycle contained in the SM2 output file, specifying the TSN for which the measurement occurred.
Listed are the programs monitored in the relevant period, as well as the appropriate task-specific index for the program name.
(The index serves to distinguish multiple calls for the same program: the program run to be analyzed can thus be addressed unambiguously during monitored object selection.)

`PC-STATISTICS:`
`SVC-STATISTICS:`
: These entries indicate whether the program counter and/or SVC statistics were activated during program monitoring and how many program counter samples (`SAMPLES`) or SVC calls (`EVENTS`) were recorded, or whether these statistics were deactivated (`OFF`).

`NO MODULE INFORMATION FOR THIS PROGRAM`
: This message appears if module information is missing for a program.

`MEASUREMENT FROM ... TO ...`
: The beginning (`FROM`) and end (`TO`) of the monitoring cycle (date and time) are listed.

`MISSED RECORDS FOR THIS TASK:`
: Indicates the number of records that could not be written to the SM2 output file during monitoring.

Table of contents for list output

When statistics are written to an SM2-PA output file, a table of contents at the end of the file indicates the monitored objects and selection parameters for which evaluations were performed and the locations in the file where the individual evaluation results are situated.

```
                    T A B L E   O F   C O N T E N T S
                    ==================================

                                                                        PAGE

CONTENTS OF FILE: :2OS6:$OBN.PA.TUTTI                                     1

SELECTED OBJECTS FOR EVALUATIONS:
---------------------------------

    EVAL-FILE :  :2OS6:$OBN.PA.TUTTI
    PROGRAM   :  :W:$OBN.SM2-PA
    OF TSN    :  0731
    WITH INDEX:    1


    TASK      :  0MXL
    WITH INDEX:    1

    TASK      :  0731
    WITH INDEX:    1,  2

    TASK      :  4KZS
    WITH INDEX:    1

EVALUATIONS:
------------

SVC STATISTICS    (SUMMARY EVALUATION)                                     4
SVC STATISTICS    (MODULE  EVALUATION)                                     6
SVC STATISTICS    (PROGRAM EVALUATION)                                     7
PCOUNT STATISTICS (SUMMARY EVALUATION)                                     8
PCOUNT STATISTICS (MODULE  EVALUATION)                                     9
PCOUNT STATISTICS (PROGRAM EVALUATION)                                    10
TASK STATISTICS (SUM ALL)                                                 11
TASK STATISTICS (TASK SUM)                                                12
TASK STATISTICS (TASK DETAIL)                                             13
```

Explanation of the output:

PAGE
Specifies the page of the generated list that contains the relevant output information.

CONTENTS OF FILE:
The contents of the analyzed SM2 output file are listed on the first page.

SELECTED OBJECTS FOR EVALUATIONS:
This information block provides data on valid monitored object selections.

EVAL-FILE:	Name of the analyzed SM2 output file
PROGRAM:	Name of the program selected as current monitored object for program-run-related statistics
OF TSN:	Detailed measurement selection (specific program
WITH INDEX:	runs) is reflected by task sequence number and index specifications
TASK:	The tasks selected for task statistics are listed
WITH INDEX:	with their respective TSNs and task-specific indices (task measurement period)

EVALUATIONS:
Under this heading the requested statistics reports are listed. They always refer to the SELECTED OBJECTS FOR EVALUATIONS indicated above. If the user made a new monitored object selection during the SM2-PA run, this is represented in an additional SELECTED OBJECTS FOR EVALUATIONS: block before the references to the statistics reports in the table of contents.

5 Installation

(1) Read in the product tape

The following files are provided on the product tape for SM2-PA V2.0:

SM2-PA	Program phase
SYSMSV.SM2-PA.020	(Complete) message file
SYSMSA.SM2-PA.020	Message file (output texts)
SYSMSR.SM2-PA.020	Message file (help texts)
SYSSDF.SM2-PA.020	Syntax file for SDF statements
SYSMSP.SM2-PA.020.D	PLI1 text file (German)
SYSMSP.SM2-PA.020.E	PLI1 text file (English)

(2) Merge the syntax file SYSSDF.SM2-PA.020 into the system syntax file with the aid of SDF-I.

Example:

`&OLDSYSTEM`	=	Name of the system syntax file into which the SM2-PA statements are to be merged.
`&NEWSYSTEM`	=	Name of the system syntax file after merging. This syntax file must not yet exist.
`&SM2PASYST`	=	SYSSDF.SM2-PA.020
`&NEWVERSION`	=	Version of the syntax file (arbitrary)

```
START-PROGRAM FROM-FILE=$SDF-I
  OPEN INPUT-FILE  =&OLDSYSTEM,
       OUTPUT-FILE =&NEWSYSTEM,
       VERSION     =&NEWVERSION

  MERGE FILE=&SM2PASYST

  END
```

Following the merge the newly created syntax file must be activated.
For instructions and further information see the "SDF Management" manual [4], SDF-I.

(3) Assign the message file SYSMSA.SM2-PA.020 using the BS2000 command /MODIFY-MSG-FILE-ASSIGNMENT.

Note:

The PLI1 text file SYSMSP.SM2-PA.020.D or SYSMSP.SM2-PA.020.E must be assigned via the link name TEXTLINK before the program is started.

6 Messages

NPA0001 ASSIGNED INPUT FILE EMPTY

Meaning
The assigned SM2-PA input file with link name PADTA contains no records.

NPA0002 ASSIGNED INPUT FILE IS NOT A PA-FILE

Meaning
The input file with link name PADTA does not correspond to the format of SM2-PA input files and therefore cannot be evaluated.

NPA0003 NO INPUT FILE ASSIGNED

Meaning
No input file is assigned by linkname PADTA

Response
Assign input file by means of //MODIFY-FILE-ASSIGNMENT statement and then try again.

NPA0004 ERROR IN COMMAND /SET-FILE-LINK

Meaning
File couldn’t be assigned by means of /SET-FILE-LINK

NPA0005 SVC FILE IS EMPTY

Meaning
The assigned SVC file is empty.

NPA0006 ERROR IN SYNTAX OF SVC-FILE

Meaning
The syntax of assigned SVC file is not correct.

Response
Correct SVC file.

NPA0007 NO OUTPUT FILE ASSIGNED

Meaning
No output file assigned by linkname PALST.

Response
Assign an output file by means of //MODIFY-FILE-ASSIGNMENT statement and then try again.

NPA0051 SYSTEM ERROR WHEN PROCESSING SDF STATEMENTS. SDF-RC '(&00)'

Response
Contact the system administrator.

NPA0053 NO TASK SELECTED. STATEMENT REJECTED

Meaning
No TASK has been selected by means of the //SET-EVALUATION-OBJECTS statement. As a result, task evaluation is not possible.

Response
Select the desired TASK by means of the //SET-EVALUATION-OBJECTS statement and then try again.

NPA0054 NO SELECTION WILL BE MADE

Response
Correct the statement and try again.

NPA0055 NO PROGRAM SELECTED, STATEMENT REJECTED

Meaning
No program has been selected by means of the //SET-EVALUATION-OBJECTS statement. As a result, SVC or PCOUNTER evaluation is not possible.

Response
Select the desired program by means of the //SET-EVALUATION-OBJECTS statement and try again.

NPA0056 TASK INFORMATION MISSING. NO EVALUATION

Meaning
Information on taskstatistics could not be found in the input file (LINK=PADTA). As a result, it is not possible to prepare a taskstatistic.

NPA0058 OPERAND VALUE '(&00)' NOT CORRECT.

NPA0059 SELECTED PROGRAM CONTAINS NO SVC-INFORMATION

Meaning
No SVC-information available for selected program.

NPA0060 SELECTED PROGRAM CONTAINS NO PCOUNTER INFORMATION

Meaning
No pcounter information available for selected program.

NPA0061 ACCESS ERROR TO SDF SYNTAX FILE OR INCORRECT SYNTAX FILE

Meaning
No or a wrong or a nonaccessible syntax file is attached.

Response
Look for the attached syntax files via 'SHOW-SDF-OPTIONS' command. Attach a new syntax file via 'MODIFY-SDF-OPTIONS' command.

NPA0151 SPECIFIED PROGRAM NAME '(&00)' DOES NOT EXIST

Meaning
The program name specified in the //SET-EVALUATION-OBJECTS statement is not contained in the input file assigned via LINK=PADTA.

NPA0152 SPECIFIED PROGRAM '(&00)' DOES NOT EXIST IN SELECTED TASK '(&01)'

Meaning
The specified TSN does not exist in input file or by the TSN operand selected task does not contain the specified program.

Response
Get information about programs contained in the file (LINK=PADTA) by means of the statement //SHOW-MEASURED-OBJECTS.

NPA0153 SPECIFIED PROGRAM '(&00)' DOES NOT EXIST IN SELECTED TASK '(&01)' WITH GIVEN INDEX (INDICES) '(&02)'

Meaning
By TSN operand selected task does not contain any by INDEX given program start of specified program.

Response
Get information about the different program starts of a program in the task by means of the statement //SHOW-MEASURED-OBJECTS.

NPA0154 SPECIFIED TASK(S) '(&00)' DO(ES) NOT EXIST

Meaning
The tasks specified in the statement //SET-EVALUATION-OBJECTS are not contained in the input file assigned via LINK=PADTA.

NPA0155 SPECIFIED TASK '(&00)' DOES NOT EXIST WITH GIVEN INDEX(ES) '(&01)'

Meaning
The task specified by indexes in the statement SET-EVALUATION-OBJECTS is not contained in the input file assigned via LINK=PADTA.

NPA0251 MODULE INFORMATION MISSING. NO EVALUATION

Meaning
Information on module names and the corresponding load addresses and lengths of the modules could not be found in the input file (LINK=PADTA). As a result, it is not possible to assign SVCs or PCOUNTER measurements to particular modules (*MODULE or *SUMMARY evaluation).

Response
Possible reasons for the missing module information can be found in the "SM2-PA" manual.

NPA0252 INVALID ADDRESS AREA. NO EVALUATION

Meaning
The start address specified either implicitly by *STD or explicitly by X'..' string is greater than the end address specified in the same way. As a result, evaluation is not possible.

NPA0253 SPECIFIED MODULE '(&00)' DOES NOT EXIST. NO EVALUATION

Meaning
The module name specified for the *MODULE evaluation could not be found in the module information for the input file (LINK=PADTA).
- Either it contains a syntax error, or
- the modul is contained in an area that is deemed invalid because of overlapping load addresses of different modules, or
- the modul has been unloaded before program termination (and thus before the load address was specified).

NPA0255 SPECIFIED ADDRESS AREA NOT OR NOT COMPLETE IN MODULE

NPA0256 MORE THAN 32760 MODULE; ADDITIONAL MODULES IGNORED

Meaning
Only 32760 modules can be handled.

NPA0353 NUMBER OF LINES GREATER THAN 32760. NO EVALUATION

Meaning
The number of table lines requested implicitly via the BY operand (BY=BYTES) is greater than 32760.

NPA0500 NO PROGRAM SELECTED

Meaning
No program has been selected from the SET-EVALUATION-OBJECTS-MASK. As a result, SVC or PCOUNTER evaluation is not possible.

Response
Select a program from the SET-EVALUATION-OBJECTS-MASK and try again

NPA0502 NO TASK SELCETED

Meaning
No task has been selected from the SET-EVALUATION-OBJECTS-MASK. As a result, task evaluation is not possible.

Response
Select a task from the SET-EVALUATION-OBJECTS-MASK and try again.

NPA0504 NO INPUT-FILE ASSIGNED

Meaning
No input-file (LINK = PADTA) is assigned for evaluation.

Response
Assign correct input-file.

NPA0505 SELECTION NOT POSSIBLE

Meaning
The selection of:
– a module and a menupoint
– two or more menupoints
– two or more modules
– programs or tasks and the menuepoints ’SET-EVAL’, ’PRINT’, ’PRINT-EVAL’ or ’END’
is not possible.

Response
Correct input.

NPA0509 NO MODULE SELECTED

Meaning
No modul is selected for evaluation.

Response
Select module and try again.

NPA0511 MODUL-SELECTION IS CLEARED. DISPLAY FIRST PAGE

NPA0518 TO SELECT *** OUT OF MODULES *** IS NOT POSSIBLE

Meaning
PCount-evaluation for module *** OUT OF MODULES *** is not possible.

NPA0520 INVALID CHARACTERS

Meaning
Invalid characters for FROM-, TO-ADDRESS, BYTES or LINES given.
Valid characters are: 0..9 A..F > 0 for FROM-, TO-ADDRESS
0..9 > 1 for BYTES, LINES

Response
Correct input.

NPA0521 NO SVC'S IN SPECIFIED ADDRESS-AREA

Meaning
There are no SVC's in specified address-area.

NPA0522 INVALID ADDRESS AREA. NO EVALUATION

Meaning
Possible reasons:
– no FROM-Address given
– no TO-address, BYTES or LINES given
– address not within address area
– no different values for FROM- and TO-address given
– BYTES and LINES not possible at the same time.

Response
Correct input

NPA0530 NUMER OF LINES GREATER THAN 32760. NO EVALUATION

Meaning
The number of lines is limited to 32760.

Response
Correct input.

NPA0531 BYTE-INPUT TOO LARGE

Meaning
The byte-number exceeds the limit of the address-area.

Response
Try lower byte-input.

NPA0532 32 PROGRAMS SELECTED. SURPLUS PROGRAM-SELCTIONS IGNORED

Meaning
More than 32 programs of the same task or of different tasks were selected in the SET-EVALUATION-OBJECTS-Mask. As the number of programs that can be evaluated is limited to 32. Any surplus program-selections are ignored.

NPA0533 LINE INPUT TOO GREAT

Meaning
The line input exeeds the limit of address area.

Response
Try lower line input.

NPA0534 TWO DIFFERENT PROGRAMS SELECTED

Meaning
Two different programs were selected. Only same programs can be evaluated.

Response
Correct program-selection.

NPA0536 MORE THAN 16 TASKS SELECTED. SURPLUS TASKS IGNORED

Meaning
More than 16 TSN’s of the same task or of different tasks were selected from the SET-EVALUATION-OBJECTS-Mask. As the number of tasks that can be evaluated is limited to 16. Any surplus task-selections are ignored.

Appendix

SDF syntax description

This syntax description is valid for SDF Version 3.0A. The syntax of the SDF command/statement language is explained in the following three tables.

Table 1: Notational conventions

Certain characters and representations are used in the command/statement formats; their meaning is explained in Table 1.

Table 2: Data types

Variable operand values are mapped in SDF by data types. Each data type represents a specific set of values. The number of data types is limited to those described in Table 2.

The description of the data types is valid for the entire set of commands/statements. Therefore only deviations (if any) from Table 2 are mentioned in the relevant operand descriptions.

Table 3: Suffixes for data types

Data type suffixes define additional rules for data type input. They can be used to extend or limit the value set. The following short forms are used in this manual for data type suffixes:

cat-id	cat
completion	compl
correction-state	corr
generation	gen
lower-case	low
manual-release	man
odd-possible	odd
separators	sep
underscore	under
user-id	user
version	vers
wildcards	wild

The description of the ’integer’ data type in Table 3 contains a number of items in italics; these are not part of the syntax and are only used to make the table easier to read.

The description of the data type suffixes is valid for the entire set of commands/statements. Therefore only deviations (if any) from Table 3 are mentioned in the relevant operand descriptions.

Table 1: Notational conventions

Representation	Meaning	Examples
UPPERCASE	Uppercase designates keywords. Some keywords begin with *	**MODE** = **UNCH**ANGED **NAME** = ***ALL**
UPPERCASE in boldface	Uppercase letters in boldface designate guaranteed or suggested abbreviations of keywords.	**CHECK-VERS**ION = ***NO**
=	An equals sign associates an operand name with the corresponding operand values.	**SCOPE** = **TEMP**ORARY
< >	Angle brackets designate variables whose set of possible values is described using data types and suffixes (see Tables 2 and 3).	**NAME** = ***NONE** / <name 1..8>
underscore	An underscore designates the default value for an operand.	**REPL**ACE**-PROD**UCT = **YES** / **NO**
/	A slash separates alternative operand values.	**MODE** = **UPD**ATE / **READ**
(...)	Parentheses designate operand values which introduce a structure.	**TYPE** = **GROUP**(...)
[ ]	Square brackets designate optional operand values which introduce a structure. The structure which follows can be specified without the introductory operand value.	**LOG**GING = [**PAR**AMETERS](...)

Representation	Meaning	Examples

indentation	Indentation indicates dependence on the next higher-level operand.	**OBJECT** = **DOMAIN**(...)
		  DOMAIN(...)
		  | **NAME** = ***ALL**

|	A vertical bar designates operands which belong together in a structure. Its extent shows the beginning and end of a structure. Within one structure there may be other structures. The number of vert. bars in front of an operand shows the structure's depth.	**SUP**PORT = **TAPE**(...)
		  TAPE(...)
		  | **VOL**UME = ***ANY**(...)
		  | ***ANY**(...)
		  | | ...

,	A comma is shown before additional operands at the same structure level.	,**SIZE** = **MIN**IMUM ,**FORM** = **UNGUID**ED
list-poss(n):	A list can be formed from the operand values which follow list-poss. If (n) is specified, the list can consist of a maximum of n elements. If the list contains more than one element, the list must be enclosed in parentheses.	list-poss: **SAM** / **ISAM** list-poss(40): <structured-name 1..30> list-poss(256): ***OMF** / ***SYSLST**(...) / <full-filename 1..54>

Table 2: Data types

Data type	Character set	Comments
alphanum-name	A...Z 0...9 $,#,@	
cat-id	A...Z 0...9	Maximum of 4 characters
command-rest	all characters	
composed-name	A...Z 0...9 $,#,@ hyphen period	Alphanumeric string which can be subdivided into a number of substrings separated by periods and hyphens.
c-string	EBCDIC characters	Must be enclosed in single quotes; the letter C can be prefixed; single quotes within a c-string must be doubled.
date	0...9 structure indicator: hyphen	Input format: yyyy-mm-dd yyyy: year; optionally 2 or 4 digits mm : month dd : day
device	A...Z 0...9 hyphen	A string which is up to 8 characters long and corresponds to a device available on the system. In guided dialog, SDF displays the permissible operand values. Notes on the possible devices can be found in the operand descriptions.
fixed	+ - 0...9 period	Input format: [char][numbers].[numbers] [char] : + or - [numbers] : 0...9 Must contain at least one number, but may contain up to 10 characters (0...9, period) besides sign prefix.
full-filename	A...Z 0...9 $,#,@ hyphen period	Input format: :cat:$user.{file | file(num) | group | group {(*abs) | (+rel) | (-rel)}}

Data type	Character set	Comments
full-filename (cont.)		:cat: Optional specification of catalog ID; character set limited to A...Z and 0...9; max. 4 characters; enclosed in colons; default is the catalog ID associated with the user ID in the user catalog entry. $user. Optional specification of user ID; character set limited to A...Z and 0...9; max. 8 characters; $ and period must be entered; default value is the user's own ID. $. (exception) System default ID file File or job variable name; final character may not be a hyphen or period; max. 41 characters; must contain at least A...Z. #file (exception) @file (exception) # or @ as first character Identifies - depending on how the system was generated - temporary files and job variables. file(num) Tape file name num: version number; character set is A...Z, 0...9, $, #, @. Parentheses must be entered. group Name of a file generation group (character set: see under "file") group[(*abs) (+rel) (-rel)] Name of a file generation (character set: see under "file"). (*abs) Absolute generation number (1-9999) * and parentheses must be entered.

Data type	Character set	Comments
full-filename (cont.)		(+rel) (-rel) Relative generation number (0-99); sign and parentheses must be entered.
integer	0...9,+,-	+ or - can be initial character only
name	A...Z 0...9 $,#,@	May not begin with 0...9
partial-filename	A...Z 0...9 $,#,@ hyphen period	Input format: :cat:$user.partname. :cat: $user. } see full-filename partname Optional specification of the first part of a name held in common by files and file generation groups. The last character of partname must be a period. At least one of the parts (:cat:, $user. or partname) must be specified.
product-version	A...Z 0...9 period single quotes	Input format: [’][V][n]n.nann[’] correction status release status where n is a number and a is a letter Release and correction status must be specified. product-version may be enclosed in single quotes. The version number may begin with the letter V.
structured-name	A...Z 0...9 $,#,@ hyphen	Alphanumeric string which can be subdivided into a number of substrings separated by hyphens; initial character: A...Z or $, #, @
text	all characters	The input format is given in the individual operand descriptions.

Data type	Character set	Comments
time	0...9 structure indicator: colon	Time specification Input format: {hh:mm:ss | hh:mm | hh} hh: hours } leading zeros mm: minutes } may be ss: seconds } omitted
vsn	a) A...Z 0...9 b) A...Z 0...9 $,#,@	a) Input format: pvsid.seqnumber max. 6 characters pvsid : 2-4 characters; entry of PUB not allowed seqnumber : 1-3 characters b) max. 6 chars; PUB may be prefixed, but then $,#,@ may not follow.
x-string	hexadecimal: 00...FF	Must be enclosed in single quotes; the letter X must be prefixed.
x-text	hexadecimal: 00...FF	Not to be enclosed in single quotes; the letter X may not be prefixed. The number of characters may be uneven.

Table 3: Suffixes for data types

Suffix	Meaning
x..y *unit*	a) for data type "integer": interval specification x minimum value permissible for integer. x is a whole number which may be preceded by a sign. y maximum value permissible for integer. y is a whole number which may be preceded by a sign. *unit* for integer only: additional units The following are used: *days* *byte* *hours* *2Kbyte* *minutes* *4Kbyte* *seconds* *Mbyte* b) for the other data types: length specification x minimum length for the operand value; x is a whole number. y maximum length for the operand value; y is a whole number. x=y The operand value must have precisely the length x.

<table>
<tr><th>Suffix</th><th>Meaning</th></tr>
<tr><td>with</td><td>Expands the possible values for a data type.</td></tr>
<tr><td>-compl</td><td>For specifications of data type "date", SDF transforms 2-digit year values entered in the form yy-mm-dd as follows:
- 20yy-mm-dd if yy < 60
- 19yy-mm-dd if yy ≥ 60</td></tr>
<tr><td>-low</td><td>Upper and lowercase are differentiated.</td></tr>
<tr><td>-under</td><td>Permits underscores '_' for data type "name".</td></tr>
<tr><td>-wild(n)</td><td>Parts of a name may be replaced by the following wildcards. n indicates the maximum entry length when wildcards are used.
<table>
<tr><th>Wildcard</th><th>Meaning</th></tr>
<tr><td>*</td><td>Replaces any string, including an empty string. A leading * followed by other characters must be doubled unless the string contains at least one further wildcard.</td></tr>
<tr><td>/</td><td>Replaces one and only one arbitrary character.</td></tr>
<tr><td><s_x:s_y></td><td>Replaces a string meeting the criteria below:
- it is at least as long as the shortest string (s_x or s_y)
- it is at most as long as the longest string (s_x or s_y)
- it lies in the alphabetical sequence between s_x and s_y; numbers are sorted after letters (A...Z0...9)
- s_x may also be an empty string, which stands at the beginning of the alphabetical sequence.</td></tr>
<tr><td><s_1,...></td><td>Replaces all strings which match one of the character combinations indicated by s. s can also be an empty string. Any of the strings designated by s can also be a range "s_x:s_y" (see above).</td></tr>
<tr><td>-s</td><td>Replaces all strings which do not match the specified string s. The minus sign may only stand at the beginning of the string s.</td></tr>
</table>
Wildcards are not permitted in generation and version specifications of file names. Wildcards may be used in user IDs by the system administration only.</td></tr>
</table>

Suffix	Meaning
without	Restricts the possible values for a data type.
-cat	The specification of a catalog ID is not permitted.
-corr	Specifications of data type product-version may not contain the correction status. The entry format is: ['][V][n]n.na[']
-gen	The specification of a file generation, or a file generation group, is not permitted.
-man	Specifications of data type product-version may not contain the release status or correction status. The entry form is: ['][V][n]n.n[']
-odd	The data type x-text permits only an even number of characters.
-sep	For data type "text", the specification of the following delimiters is not permitted: ; = ( ) < > ␣ (semicolon, equals sign, left and right parentheses, left and right angle brackets, and blanks)
-user	The specification of a user ID is not permitted.
-vers	The specification of the version (see file(num)) is not permitted for tape files.

References

[1] **SM2**
(BS2000/OSD)
Software Monitor
User Guide

Target group
- Computer center and system support staff
- System users

Contents
The monitoring system SM2 supplies the user with statistical data on the performance of a dp system and on resource utilization. The manual describes the SM2 monitor, the utility routine SM2U1 and the analysis routine SM2R1.
SM2 collects monitored values and displays or stores them.
SM2U1 is used for editing and administrating SM2 output files.
SM2R1 analyzes the monitored values.

[2] **PLI1** (BS2000)
PL/I Compiler
User's Guide

Target group
PL/I users in BS2000

Contents
- Invocation and control of the PLI1 compiler
- Input and compilation of source programs
- Creation and management of object and load modules
- Generation of shareable programs
- Control of program execution
- File access
- Debugging aids
- Optimization
- Internal representation of data
- Procedure interfaces
- Service procedures
- PLI1/Assembler macro interface

[3] **BS2000/OSD-BC V1.0**
Performance Handbook

Target group
Computer center and system support staff
Contents
The manual helps system users employing BS2000/OSD-BC V1.0 to evaluate the performance of their dp system and points out how to use hardware and software cost-effectively and how to improve system performance.

[4] **SDF V3.0A**
(BS2000/OSD)
SDF Management
User Guide

Target group
This manual is intended for the system administration and experienced BS2000 users.
Contents
It describes how SDF is installed and administered using SDF commands and the SDF-I and SDF-U utility routines A full description of the SDF-I and SDF-U statements is included.

[5] **BS2000/OSD-BC V1.0**
User Commands (SDF Format), Volume 1
User Guide

Target group
Nonprivileged BS2000/OSD users (privilege STD-PROCESSING)
Contents
This manual contains BS2000/OSD commands A-Q available to the nonprivileged user in the basic configuration of BS2000/OSD V1.0. The user is given hints on command input in interactive and batch mode. Commands R-Z can be found in Volume 2 (order no. U21070-J-Z125-1-7600).
Further products discussed include:
- SDF V3.0A
- SDF-P-BASYS V1.0B
- SPOOL V2.7A
- RSO V2.2A
- JV V11.0A
- RFA V11.0A
- FT V5.0A

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Contents

SM2-PA V2.0

User Guide

Target group
This manual is intended for applications programmers, system programmers and system administrators.
Contents
The manual describes the SM2-PA program analyzer for user-specific output files of the SM2 software monitor. It covers the SM2-PA scope of functions, prerequisites for use, operation, and sample outputs. SM2-PA supplies information on resource utilization by tasks and on the performance behavior of user programs.

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