AD-A060 517 MICHIGAN UNIV ANN ARBOR DEPT OF INDUSTRIAL AND OPERA--ETC F/G 9/2
USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
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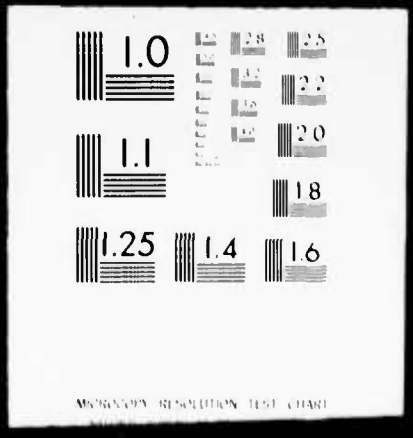

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USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VERSION 3.3

ISDOS Project
University of Michigan
Department of Industrial and Operations Engineering
Ann Arbor, Michigan 48109

July 1978

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(18) (19) **REPORT DOCUMENTATION PAGE**

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1. REPORT NUMBER: ESD-TR-78-131	2. GOVT ACCESSION NO. (9)
3. RECIPIENT'S CATALOG NUMBER: Rept. for	
(6) 4. TITLE (and Subtitle): User Requirements Analyzer (URA) User's Manual H6180/Multics/Version 3.3.	5. TYPE OF REPORT & PERIOD COVERED: August 1977 to January 1978. Manual
	6. PERFORMING ORG. REPORT NUMBER: CDRL Item 020
7. AUTHOR(s): ISDOS Project (15)	8. CONTRACT OR GRANT NUMBER(s): F19628-76-C-0197
9. PERFORMING ORGANIZATION NAME AND ADDRESS: University of Michigan, Department of Industrial and Operations Engineering, Ann Arbor, MI 48109	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: PE64740F (16) Project 2237
11. CONTROLLING OFFICE NAME AND ADDRESS: Deputy for Technical Operations, Electronic Systems Division, Hanscom AFB, MA 01731 (11)	12. REPORT DATE: July 1978
	13. NUMBER OF PAGES: 580
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): (12) 595 p.	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE: N/A

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Computer-Aided Design
Information Processing
Information Systems Requirements
Requirements Analysis
Requirements Language
Requirements Specification
Specification Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is part of a series that deals with a Computer-Aided Design and Specification Analysis Tool (CADSAT). The purpose of the tool is to describe the requirements for information processing systems and to record such descriptions in machine processable form. The major components of CADSAT are the User Requirements Language (URL) and the User Requirements Analyzer (URA) which can operate in an interactive computer environment. This report describes the capabilities and the commands associated with URA and its operation on a Honeywell 6180 Multics Computer.

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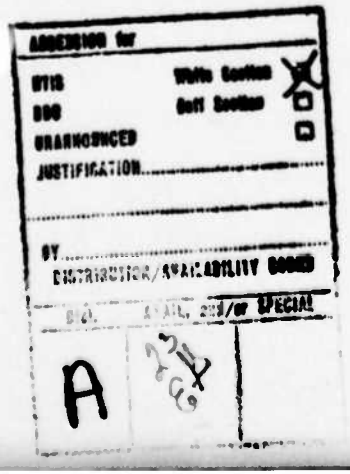

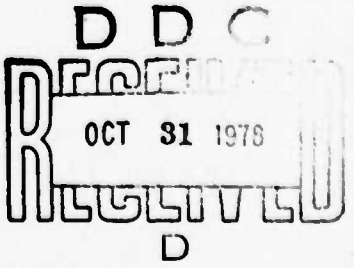

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PART I USER REQUIREMENTS ANALYZER

The goal of Part I is to assist the User Requirements Analyzer (URA) user in effectively using the URA Modifier Commands specified in Part IV, "User Requirements Analyzer Command Descriptions." This paper illustrates the usage of Version 3.3 of the User Requirements Analyzer and specifies the steps in creating the URA data base, inputting User Requirements Language (URL) statements, modifying the contents of the data base, generating URA outputs, and correcting syntactical and logical errors.

Since URA is used in conjunction with an operating system, this part should be used in conjunction with Part II which presents installation dependent features to be considered when using URA. This part covers installation independent features of URA, general concepts, etc. Each section of this part has a corresponding section in Part II. This allows easy reference between general concepts and the actual practice of applying them in a particular installation.

PART II USAGE OF THE USER REQUIREMENTS ANALYZER UNDER MULTICS

The purpose of Part II is to assist the URA user in effectively manipulating the URA command language under Multics. This paper covers those installation dependent features of URA and is intended to be used in conjunction with the User Requirements Analyzer, Part I. Each section of this Part has a corresponding section in the User Requirements Analyzer. This Part illustrates the usage of Version 3.3 of the User Requirements Analyzer.

PART III URA OUTPUTS

The goals of Part III are to assist the User Requirements Analyzer user in generating reports from the information in a URA data base, describe the standard reports available in URA, and finally, provide general guidelines on using these reports to aid in the logical system design process. In order to generate the reports described in this paper it is necessary to understand the information presented in Part I and Part II for the installation in which URA is being used. It is also desirable to use the "User Requirements Analyzer Commands Descriptions," Part IV as a reference for a better understanding of the URA commands and parameters used to generate a particular report.

This part describes those URA reports available in Version 3.3 of the User Requirements Analyzer.

PART IV USER REQUIREMENTS ANALYZER COMMAND DESCRIPTIONS

The objective of Part IV is to give the user of the User Requirements Analyzer (URA) the list of the commands available, the correct syntax of these commands, and the parameters allowable for each command. This part is not intended as a handbook on how to use URA, but rather as a reference for the commands available. Part I and Part II describe how to use these commands and present a detailed description of each of the outputs generated by these commands. This paper describes the facilities of Version 3.3 of the User Requirements Analyzer.

The manner in which URA directly interfaces with a particular operating system is given in Appendix F. Also included in this Appendix is a formal description of the URA commands available only under that particular operating system.

PART V AUTOMATED DOCUMENTATION SYSTEM USER'S MANUAL

The objective of Part V is to provide detailed operating instructions for the Automated Documentation System (ADS). ADS is a stand-alone program and file structure that operates on a URL data base to produce requirements specifications in standard formats (e.g., MIL STD 483).

PART I

USER REQUIREMENTS ANALYZER

1. INTRODUCTION

The first step in use of the URL/URA system consists of specifying a problem statement in URL statements. The second step consists of using URA to enter the problem statement into a computer data base. URA extracts information from the URL statements and stores it in a URA data base. Once this information (a problem statement) is in the data base, it can be modified, new information can be added to it, and reports presenting the status of the problem statement can be generated. These actions are implemented by the URA commands available in the URA processing mode. This mode of operation may be attained by accessing the URA software available on a particular operating system. Therefore, by understanding the operating commands that interact with URA and the URA command language, the problem definer (user) can effectively manipulate the contents of a URA data base. Part I, of this manual, serves as a guide to using the URA commands.

Operating system and URA commands can only be used in their respective processing modes. Operating System commands can be used from time of signing on to the system, to the time access to the URA software is acquired. At this point, only URA commands may be used until the problem definer returns control to the operating system or terminates processing to be done in URA mode (through use of the URA "STOP" command). Operating system commands then can again be used up to the time of signing off. This interaction between operating system and URA modes is illustrated by Figure 1. An exception to this rule is the URA command "MTS" which allows one to execute an operating system command while in URA mode.

The first five sections of Part I deal with URA at an introductory level. Section 2 presents introductory information about the use of URA. Section 3 explains the procedure of initializing URA once on the operating system. Sections 4 and 5 present practical concepts and conventions to be known before using URA. (Once access to URA has been achieved, various commands are available; these commands are described in Section 6, 7 and 8.) Several examples are given in these sections in order to better illustrate the results of specific implementations. Sections 9 and 10 deal with handling errors encountered in the use of URA. Appendix A presents a list of all URA commands available (and the parameters for each command) as well as the abbreviations for all these to serve as a quick reference. Throughout Part I the long forms of URA commands and parameters are used interchangeably with their abbreviations.

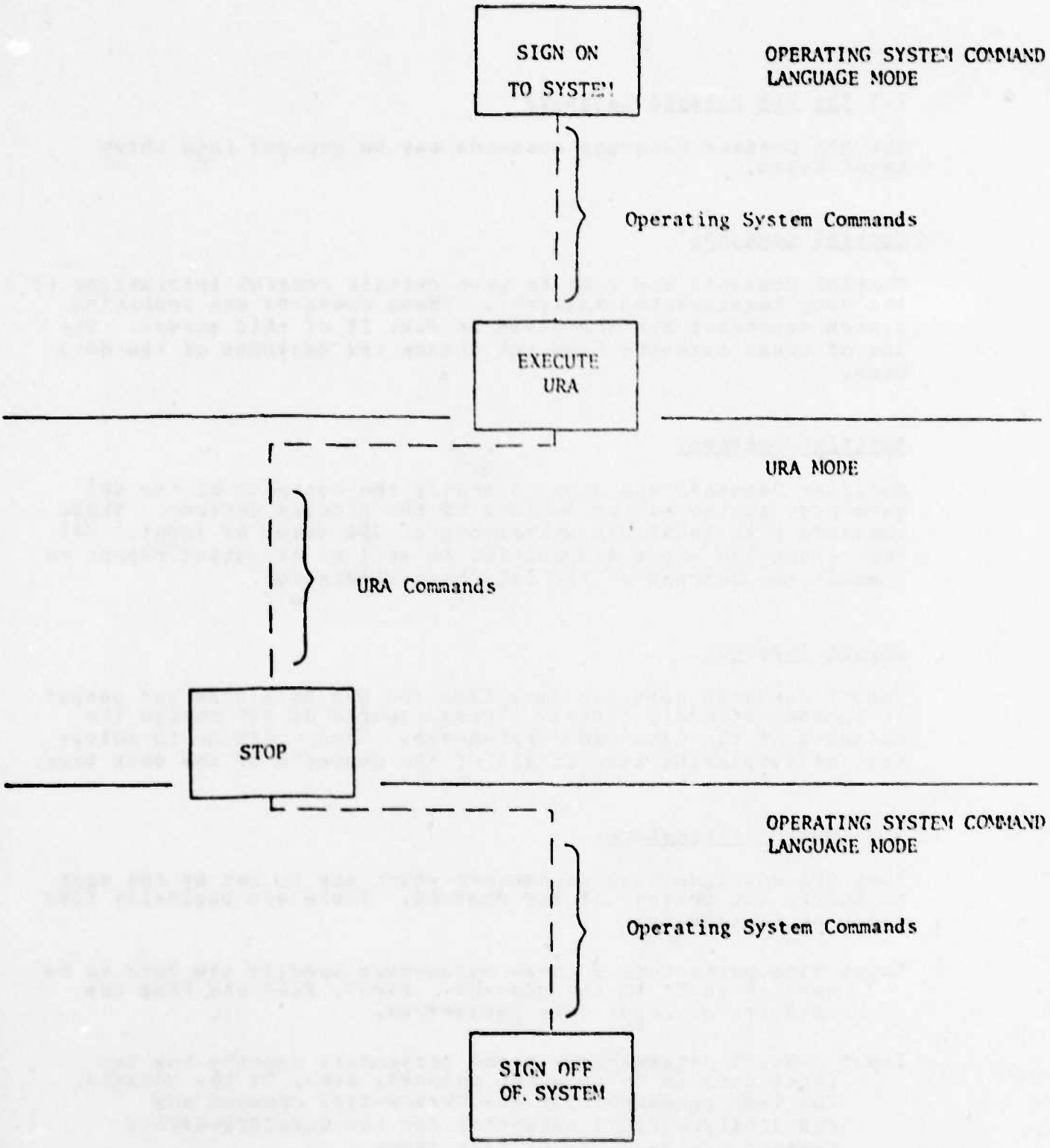


Figure 1: Interaction between Operating System and URA processing modes

2. USING URA

2.1 The URA Command Language

The URA Command Language commands may be grouped into three major types.

Control Commands

Control Commands are used to pass certain control information to the User Requirements Analyzer. These commands are operating system dependent and are given in Part II of this manual. The use of these commands does not change the contents of the data base.

Modifier Commands

Modifier Commands are used to modify the contents of the URA data base in the manner defined by the problem definer. These commands take legal URL statements or URL names as input. URA then generates error diagnostics as well as an output report to present the outcome of the data base alteration.

Report Commands

Report Commands retrieve data from the URA data base and output it in some standard format. These reports do not change the contents of the data base whatsoever. Their purpose is solely that of displaying some or all of the contents of the data base.

2.2 Command Parameters

Most URA commands have parameters which may be set by the user to modify the actions of the command. There are basically five types of parameters:

Input data parameters - these parameters specify the data to be used as input to the command. INPUT, FILE and NAME are examples of Input data parameters.

Input control parameters - these parameters specify how the input data is to be used, changed, etc., by the command. The TYPE parameter for the CHANGE-TYPE command and CONTAINED/CONSISTS parameter for the CONSISTS-MATRIX command are examples of this type.

Output data parameters - these parameters specify if output is to be generated from the command and the form in which it is presented. The PUNCH and PRINT parameters are examples of this type of parameter.

Output option parameters - these parameters specify options which may be included or omitted from the output. The LEVELS parameter for the CONTENTS command and the DESCRIPTION parameter for the DICTIONARY command are examples of this type.

Output format parameters - these parameters specify alternate formats for presenting the information in the output from the command. The NEW-PAGE parameter and HMARG parameter for the FPS command are examples of this type.

2.3 Sequence of Commands

Although all of the commands can be issued independently of each other, it is often advantageous to use some commands in sequence since the output of one command may be used as input by another. The most common instance of this is when NAME-GEN is used to select certain names (say all PROCESSES for example) which can then be used as input to a Report Command (possibly PICTURE, for a PICTURE REPORT for all PROCESS names). Though NAME-GEN is technically classified as a Report Command one of its major functions is to selectively retrieve names stored in the data base. PUNCH-COMMENT-ENTRY and REPLACE-COMMENT-ENTRY often occur in sequence. For more information about use of these commands, see "URA Outputs"[1] and "URA Command Descriptions."[2]

2.4 The HELP Command

The HELP Command provides the user with information about the syntax and parameters of URA commands. The HELP command does not affect the manner in which URA operates nor accesses information in the data base. For this reason, it is not classified as a Control, Modifier or Report Command. When the HELP command is given, URA displays a list of all available URA commands and their abbreviations. By specifying a particular URA command name as a parameter to the HELP command:

```
HELP CONTENTS
```

for example, all the parameters available for this command will be printed. If the "LONG" parameter were given in conjunction with a command name:

---

[1] Part III
[2] Part IV

HELP FPS LONG

all parameters for the FORMATTED-PROBLEM-STATEMENT command would be printed out as well as a description of the function of each of these parameters for the command. This description is presented in the same format as that in "User Requirements Analyzer Command Descriptions."[1] To illustrate an example, when "HELP CONTENTS" was given the following information was printed:

```
CONTENTS

Prototype: CONTENTS(CONT) [parameter] ...

Parameters:

     FILE[=fdname], NAME(N)=user name  Default: FILE
     INDEX, NOINDEX                    Default: NOINDEX
     LEVELS=integer, LEVELS=ALL        Default: ALL
     NCFLAG, NONCFLAG                  Default: NONCFLAG
     PRINT-SECURITY-INFORMATION(PSI)   Default: PRINT-SECURITY-
                                                INFORMATION
     NOPRINT-SECURITY-INFORMATION(NPSI)
```

3. THE URA ENVIRONMENT

The considerations necessary for using URA and preparing for using URA define the URA environment. The following points must be considered:

- How the data base is prepared.
- How URA is executed.
- How URA is used.
- How batch use of URA is different from terminal use.

The first three points are presented in section 3.1, "Initiating URA," and the last point is presented in section 3.2, "Batch Versus on-line Use of URA."

---

[1] Part IV

3.1 Initiating URA

The steps required to prepare a URA data base for access by URA are:

i) The URA data base file must be created.

Creation of the data base file occurs only once. Once created, any changes to be made (including emptying the whole file) can be made without destroying it.

ii) The data base must then be initialized in order to be accessed by URA.

Initialization, for the most part, occurs only once, at the time of creating the data base. The data base must be reinitialized if emptied.

Executing URA involves running the URA program. This allows the user to specify URA commands to change the contents of the data base or generate reports about its contents.

Once the URA program has been invoked the following steps are suggested in using URA:

i) The data base to be accessed by the URA commands must be specified.

This should be done any time URA is used to ensure that the user is accessing the correct data base. In some cases the data base to be used will set by default any time the user executes URA. Even if this is the case, the user should be aware that the default is in effect.

ii) URA commands are given to modify, update and/or generate reports on the data base information.

Any of the commands given in "User Requirements Analyzer Command Descriptions"[1] can be issued to accomplish these tasks. The order in which commands are given is determined by the user.

iii) The STOP command is given to terminate the URA session.

---

[1] Part IV

3.2 Batch Versus On-line Use of URA

The manner in which a user interacts with URA via batch processing differs from on-line (terminal) usage. There are various advantages and disadvantages to either approach. A few of these are given in Table I.

The procedures given in section 3.1 are the same for both on-line and batch use of URA. The specific manner in which URA commands are given by the user, however, is different.

In batch processing of URA commands, URA commands are given, one per card, following the card which executes the URA program. Any errors detected in specifying the command (or its parameters) cause the command to be ignored, and URA then moves to the next command.

When executing URA in on-line mode, the user must wait for the message:

ENTER COMMAND (AND ANY PARAMETERS)

before giving any commands. After typing in the command followed by a carriage return, the user must wait again until the command prompting message is issued before entering the next command. If an error occurs when specifying the command (or its parameters) the user will be prompted for a replacement.

On-line Use of URA

ADVANTAGES

- The user is able to handle errors as they occur. Errors can be corrected before any attempt is made to modify or retrieve information in the data base.

- Which URA commands to be issued and the order in which they are given does not have to be predetermined, i.e., the user may issue commands ad hoc.

- Utilizing the edit facility of the operating system allows the user to make changes to information in the data base quickly and efficiently.

DISADVANTAGES

- Loss of connection between terminal and computer (line hits) may cause the contents of the data base to become unusable. Recovery procedures would be required to restore the data base contents.

- On-line use is generally more expensive than batch because of connect time costs and other additional costs related to terminal access.

Table 1.

Comparison of ON-Line Versus Batch Use of URA

Batch Use of URA

ADVANTAGES

- Requires the URA user to think out procedures (list of URA commands) to be executed before they are executed.
- Cheaper to run than on-line use.
- All output generated by URA is printed in a usable format, i.e., via the line printer. Output generated at the terminal may be part of the terminal listing and interspersed with other information.

DISADVANTAGES

- Turn-around time for jobs may be long.
- Editing of information in the data base may require two batch runs; one to retrieve, one to replace.
- Errors are ignored and any subsequent URA commands would be run regardless.

Table 1. Continued

4. SPECIFYING INPUT TO URA COMMANDS

For most URA commands, one or more names (specified by the user) can be used as "input" to the command. This can be done by utilizing the "input data" parameters for the command. In the case of Modifier Commands, the modification is made for each name used as input. For Report Commands, information is retrieved for each of the names used as input. Except for the INPUT-PSL command, all names used as input to the Modifier and Report Commands must be names already stored in the problem definer's URA data base.

4.1 The NAME Parameter

There are two methods of specifying names to be input to a command. The simplest way is to use the NAME parameter. When this parameter is used, the modification will be made, or a report will be generated, for only that name specified by the NAME parameter. For example, if NAME=T-CARD were used for the DELETE command, only T-CARD would be deleted from the data base. Likewise, if NAME=T-CARD were used as a parameter for the CONTENTS command, the CONTENTS REPORT would be generated for the name T-CARD, and no others.

4.2 The FILE and INPUT Parameters

The second way to specify names as input to a URA command is to put all the names for which the modification is to be made, or a report generated, into a file and specify that the contents of that file are to be used as input. At most installations this specification can simply be done via the FILE and INPUT parameters, but varies slightly from one installation to the next. (See Part II.) FILE and INPUT are different in the way names can be formatted within the file specified by these parameters. When using the FILE parameter, each name in the specified file must begin in the first column of each line of the file and only one name per line is allowed. The format for files specified by the INPUT parameter varies according to the URA command using this parameter. For example, if a file is used as input to the INPUT-PSL command, the file must consist of URL statements to be entered into the URA data base. For those Modifier Commands that allow the INPUT parameter, the particular format needed for the input file is specified in the description of each command.

If one particular file name is used throughout a given terminal session to contain various information and name lists to interact with URA commands, the user should remember to empty the file before each time new data is to be written into it. Otherwise, information used as input to a previous command may be leftover when using the file with subsequent commands.

4.3 Entering Data Into an Input File

The manner in which data is entered into a file is installation-dependent. See Part II, Section 4, for the details of this procedure.

4.4 Using NAME-GEN

One alternative to specifying input to Modifier and Report Commands is to let NAME-GEN generate the input file. The various parameters for NAME-GEN allow selection of particular types of names that are desired (e.g., all GROUPS and ENTITIES) and retrieval of those names which are then put into a file by URA. The names are formatted, one name per line starting in the first column of the line. The contents of this file can be used as input to a Report Command or Modifier Command. For example, by specifying:

```
NAME-GEN S='ENTITY OF GROUP'
CONTENTS
```

in sequence, the CONTENTS REPORT will be generated for all

ENTITY and GROUP names in the URA data base. In addition, the contents of the file produced by NAME-GEN are maintained until the next NAME-GEN is issued.

4.5 Using PUNCH Files

PUNCH files are files which have formats acceptable by FILE or INPUT parameters. The file described in the previous section is a PUNCH file from the NAME-GEN command. Output from NAME-GEN is put into its assigned PUNCH file so that it may be used as input to any of the FILE parameters for Modifier and Report Commands. The PUNCH file format is different from the report format for the command that generates both of them. For example, upon execution of the NAME-GEN command for all PROCESSES, the report generated will consist of a report heading, line numbers for the contents of the report, the names of all PROCESSES in the data base and their corresponding name type (which is, of course, PROCESS). The contents of the PUNCH file produced by this command will only contain the names of the PROCESSES, without report headings, etc. In other words, the PUNCH file contains similar information to the report output from the command, but in a format acceptable to the FILE and INPUT parameters of other URA commands.

At most installations, the PUNCH file to be used (name of the file) can be specified by the PUNCH parameter for the command. The manner of assignment varies slightly from one installation to the next. (See Part II, Section 4.) Specific usage of the PUNCH parameter is given in the descriptions of the individual commands that utilize this parameter. The specific names of the PUNCH files used can be found in the appropriate Addendum for Appendix E.

5. RECEIVING OUTPUT FROM URA COMMANDS

Several URA commands allow the user to specify whether output is generated from the command or not.[1] This is done via the "output data" parameters for the particular command. When generating outputs from URA, the information is put into a file or printed on a device such as a line printer or terminal. If this file or device is not specified then all outputs are written to the main output file or device. This means that output will be written on the terminal when in conversational mode and on the line printer when running batch. There are several reasons why

---

[1] This section only deals with receiving outputs in the form of reports (as specified in Part III). Receiving output as presented via the PUNCH parameter is discussed in the previous section.

outputs might be routed elsewhere, expecially for on-line processing:

- Large quantities of output would take too long to be printed at the terminal.

- Depending on the type of terminal, some portions of the output may not be printed because of physical restrictions imposed by the terminal.

- The handling of printout from the terminal can sometimes be awkward and the format not aesthetically pleasing.

- No copy of the output is desired. (Only the PUNCH file may be needed as a step in a modification procedure.)

Most methods of receiving and controlling output from URA commands are installation dependent and therefore given in Part II, Section 5.

5.1 The NOPRINT Parameter

Several URA commands allow the option of not having the output printed via the NOPRINT parameter. The commands that allow this parameter are:

DELETE-COMMENT-ENTRY (DCOM)

FORMATTED-PROBLEM-STATEMENT (FPS)

LIST-CHANGES (LC)

NAME-GEN (NG)

PRINT-COMMENT-ENTRY (PCOM)

PROCESS-INPUT-OUTPUT (PRIO)

REPLACE-COMMENT-ENTRY (RCOM)

The two Modifier Commands, RCOM and DCOM, have this parameter available because the printout can be fairly large and may not be needed for future reference. The report heading for the RCOM or DCOM output and any error diagnostics are still printed to provide a hard-copy record of the command execution.

The remaining four Report Commands can use this parameter in conjunction with the PUNCH parameter. The option of the NOPRINT parameter is provided because when PUNCH information is desired, there may be no need for the printout.

5.2 The INDEX Parameter

Several commands allow the user to specify that an index (alphabetic listing of names used) for the report be generated by the command. The index also specifies the pages on which these names occur in the report. This is done by specifying INDEX as a parameter for the command. The commands which allow this parameter are:

CONTENTS
DICTIONARY
EXTENDED-PICTURE
FORMATTED-PROBLEM-STATEMENT
FREQUENCY
INTERVAL-CONSISTENCY
PICTURE
PROCESS-CHAIN
PROCESS-INPUT-OUTPUT
PROJECTED-COST
RESOURCE-CONSUMPTION-ANALYSIS
SECURITY-ANALYSIS
STRUCTURE

5.3 The NOSOURCE and XREF Parameters

The NOSOURCE and XREF parameter have the same function for the INPUT-PSL and DELETE-PSL commands as the NOPRINT and INDEX parameter for other URA commands. The report produced by XREF, however, (the URA CROSS REFERENCE LISTING) specifies the lines rather than the pages where the names occur.

6. CONTROL COMMANDS

All control commands are installation-dependent. For this reason all control commands available to a particular installation and the descriptions and usage of these commands are given in Part II, Section 6.

7. MODIFIER COMMANDS

All the commands in this section modify the UPA data base in some manner and generate an output to present the result of the modification. These outputs provide the user with a permanent record of changes made to the problem statement in the data base.

Effect of Modifier Commands on the Data Base Structure

There are basically three types of information stored in a UPA data base:

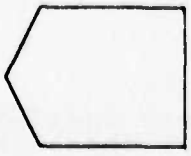
1) Name and types of objects defined by the user.

2) Comment entries (narrative and free format descriptions of objects).

3) Connections among objects and between an object and comment entry.

All this information is entered into the data base via INPUT-PSL from the URL statements used as input to this command. In most cases the section header statements define the type of objects and names of the objects, comment entry statements (DESCRIPTION, for example) define comment entries to be stored, and other URL statements define relationships or connections among the named objects in the data base. To present the structure of the data base in a graphical manner, the following symbols will be used:

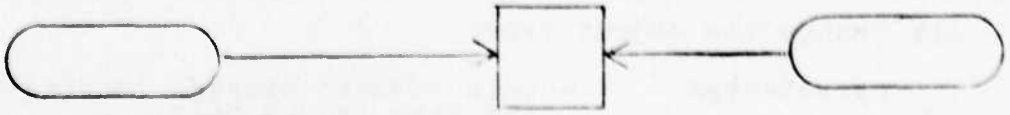
- symbol for record used to describe a given named object (name record).



- symbol for comment entry stored in data base.

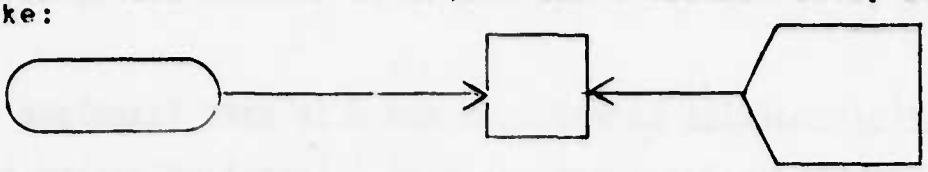
- symbol for a NUB, a type of record used to make connections among objects and between an object and comment entry.

Using the above notation, a simple relationship between two objects (name records) many look like:



Data in the NUB defines the type of connection (RECEIVES, for example) and the direction of the arrows defines the manner in which the relationship should be interpreted, i.e., which object does the RECEIVING.

A connection between an object and a comment entry may look like:



The data in the NUB defines the type of comment entry (PROCEDURE, for example).

It is important to note that the connections made among objects are different from the connection made between an object and comment entry.

INPUT-PSL creates records for named objects, the NUB records connecting the objects, and the comment entries. Commands must also be available to do the following:

1) Change a name record

   i) change the name of the object

   ii) change the object type

2) Delete a connection between objects

3) Delete a name record (and any connections it had with other objects)

4) Change a comment entry

5) Delete a comment entry

URA has facilities to perform all of these modifications on the data base information. The following URL commands perform the actions corresponding to the above:

1) Change a name record:

   i) Change the name of an object:

      RENAME - This command changes information within the name record only.

   ii) Change the object type:

      CHANGE-TYPE - This command changes information within the name record only.

2) Delete connections among objects:

DELETE-PSL - This command deletes NUBS (and thus connections) among name records in the data. It does not delete name records or comment entries.

3) Delete name records:

DELETE - This command deletes name records. Names to be deleted having connections with other names and/or having comment entries associated with them, will have corresponding NUBS (and comment entries) deleted.

4) Change comment entries:

REPLACE-COMMENT-ENTRY
- This command changes information within the comment entry only.

5) Delete comment-entries:

DELETE-COMMENT-ENTRY
- This command deletes comment entries and also deletes corresponding NUBS.

Modifier Command Description Format

Each Modifier Command will be described in the following format:

Command Name (command abbreviation)

When specifying the command to be executed, either the long form of the command name or legal abbreviations of the name may be given.

Modification Made

All Modifier Commands change information in the URA data base. What type of information is changed and how it is changed is described. Also, the checks made by URA before the change is made are presented.

Output Description

All Modifier Commands generate an output to present the result of the modification(s) made. The name of the output, purpose of the output, contents, and diagnostics given in the output are

presented to aid in using it.

Execution

The basic form of specifying the command to be executed is described. An example of how this is done and the results from the action are given.

Options and Alternatives

All Modifier Commands can be executed in more than one way. For example, a different form of the command may be used to change one name in the data base versus a number of names. Also, the effect which the parameters for the command have on modifying the data is described. Examples are given to illustrate the alternatives.

Common Errors

It is possible to make particular errors in the use of each Modifier Command. Some of the particular logical and syntactical errors that occur when executing the command are given.

The following commands are described in this section in alphabetical order:

7.1 CHANGE-TYPE
7.2 DELETE
7.3 DELETE-COMMENT-ENTRY
7.4 DELETE-PSL
7.5 INPUT-PSL
7.6 PUNCH-COMMENT-ENTRY
7.7 RENAME
7.8 REPLACE-COMMENT-ENTRY

7.1 CHANGE-TYPE (CT)

Modification Made

Each name specified as input to this command has its corresponding name type changed if the new type does not conflict with the context in which the name has previously been used. This modification is most often used to change an underlined name (*** UNDEFINED ***) to a specific name type (such as GROUP or ELEMENT). Various "checking" facilities must be used to ascertain that legal changes are being made. For each name type change, URA must check to see that:

i) The name whose name type is to be changed exists in the data

base.

ii) The assignment of the new name type is consistent with the context in which the name was used previously.

Output description

The output generated by this command is the CHANGE-TYPE REPORT. This report presents for each name used as input to the CHANGE-TYPE command, the name, the old name type associated with it and the new name type now assigned to it. Any error diagnostics which may occur during the name type change will also be printed. The names are printed out in the same order in which they were read as input to the CHANGE-TYPE command.

Execution

To change the name type of only one name, the following command format is issued:

```
CHANGE-TYPE NAME=gross-pay TYPE=GROUP
```

Previously in the problem statement, "gross-pay" had been defined as a ELEMENT. It was more appropriate to call it a GROUP, and the CHANGE-TYPE command made it easy to facilitate this change. The resulting CHANGE-TYPE REPORT is shown in Figure 2. Options and Alternatives

1) The name types of several names can be changed at one time if the names are put into a file and the file is specified as input to the command.[1] (This is usually done via the FILE parameter.) Figure 3 is an output resulting from using a file as input to CHANGE-TYPE. All the names in the example are shown to have been previously defined as ELEMENTS. The report shows that "birthdate" was changed to a GROUP, "number-of-deductions" became a GROUP, "surname" a GROUP and "gross-pay" changed back to an ELEMENT. Each line of the input file consists of the name of an object followed by the new name type to be assigned to it. The format is acceptable if the name is followed by its new name type and the two are within the first eighty columns of the file line and there is at least one blank between them. The file used to generate Figure 3 was:

```
birthdate GROUP
number-of-deductions GROUP
surname GROUP
gross-pay ELEMENT
```

---

[1] That exact manner in which the file is specified is given in Part II, Section 7.1.

FIGURE_2

Change Type Report

```
PARAMETERS FOR: CHANGE-TYPE

  NAME=gross-pay TYPE=GROUP

1*  gross-pay
  OLD TYPE - ELEMENT
  NEW TYPE - GROUP
```

FIGURE_3

Change Type Report

PARAMETERS FOR: CHANGE-TYPE

FILE

1* birthdate
OLD TYPE - GROUP
NEW TYPE - GROUP

2* number-of-deductions
OLD TYPE - ELEMENT
NEW TYPE - GROUP

3* surname
OLD TYPE - GROUP
NEW TYPE - GROUP

4* gross-pay
OLD TYPE - GROUP
NEW TYPE - ELEMENT

2) The TYPE parameter can also be used effectively with an input file. All names in the input file will have their name types changed to the name type specified by the TYPE parameter. If the file from the previous example was specified as input and the TYPE parameter was also used, only the names in the file would be read as input; the name types would be ignored. All the names specified in the input file would have their name types changed to that given by the TYPE parameter. Figure 4 presents the output resulting from a CHANGE-TYPE command with TYPE=ELEMENT and the names used as input are the same as that used for Figure 3.

3) It is sometimes advantageous to use NAME-GEN in conjunction with CHANGE-TYPE, i.e., use the output produced by NAME-GEN as input to CHANGE-TYPE. This is most often done when all names of a particular type (usually UNDEFINED) are changed to another type (GROUPS or ELEMENTS). To change all undefined names in the data base to GROUPS:

```
NAME-GEN S='UNDEFINED'
CHANGE-TYPE FILE TYPE=GROUP
```

The NAME-GEN command selects all undefined names and places them in a file. The CHANGE-TYPE command then uses the file produced by NAME-GEN as its input file. The TYPE=GROUP parameter specifies that all the names in the input file should be changed to GROUPS. Figure 5 presents the result of this procedure.

Common Errors

If neither an input file nor NAME is specified for the command, the message: "NO NAME GIVEN" will be printed by URA. If a file or NAME is given, but no name types are given in the file or no TYPE is given, the message: "NO TYPE GIVEN WITH "NAME=" OR "FILE" PARAMETER will be printed. Should either of these messages be generated, URA will not execute the CHANGE-TYPE command. The command and its parameters should be re-entered with the necessary corrections. Another common error is attempting to assign a new name type to a name that has previously been used in a way that conflicts with its new name type. For example, if the name XYZ was previously defined to be CONTAINED in SET S1, this would imply that XYZ must be either an ENTITY, INPUT or OUTPUT. If an attempt was made to change its type to a GROUP (which cannot be CONTAINED in a SET) the error message:

```
URA029:MAINCT: CONFLICT WITH EXISTING CONNECTIONS
```

would be given and the change would not be made. If it is still desired that XYZ be a GROUP, XYZ should be deleted from the data base and proper UPL statements for XYZ should be entered via

FIGURE_4

Change Type Report

PARAMETERS FOR: CHANGE-TYPE

FILE TYPE=ELEMENT

1* birthdate
OLD TYPE - GROUP
NEW TYPE - ELEMENT

2* number-of-deductions
OLD TYPE - GROUP
NEW TYPE - ELEMENT

3* surname
OLD TYPE - GROUP
NEW TYPE - ELEMENT

4* gross-pay
OLD TYPE - ELEMENT
NEW TYPE - ELEMENT

FIGURE_5

Change Type Report

PARAMETERS FOR: CHANGE-TYPE

FILE TYPE=GROUP

1* invalid-job
OLD TYPE - *** UNDEFINED ***
NEW TYPE - GROUP

2* job-validity-check
OLD TYPE - *** UNDEFINED ***
UBA029:MAINCT : CONFLICT WITH EXISTING DATA BASE CONNECTIONS job-validity-check
3* outstanding-performance
OLD TYPE - *** UNDEFINED ***
UBA029:MAINCT : CONFLICT WITH EXISTING DATA BASE CONNECTIONS outstanding-performance
4* time-card-listing-optin
OLD TYPE - *** UNDEFINED ***
UBA029:MAINCT : CONFLICT WITH EXISTING DATA BASE CONNECTIONS time-card-listing-optin
5* transaction
OLD TYPE - *** UNDEFINED ***
NEW TYPE - GROUP

6* transaction-listing-option
OLD TYPE - *** UNDEFINED ***
UBA029:MAINCT : CONFLICT WITH EXISTING DATA BASE CONNECTIONS transaction-listing-option
7* wage-premium-eligibility
OLD TYPE - *** UNDEFINED ***
UBA029:MAINCT : CONFLICT WITH EXISTING DATA BASE CONNECTIONS wage-premium-eligibility

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INPUT-PSL. All conflicting connections are listed. They all must be resolved before the change of type can occur.

7.2 Delete (DEL)

Modification Made

For each name specified as input to the DELETE command, all its relationships (i.e., USES, SUBPARTS, etc.), with other names in the data base are removed, its comment entries (such as DESCRIPTION or PROCEDURE) are deleted and finally the name is deleted from the data base. Before any of these modifications are made, URA checks that the name to be deleted exists in the data base. If the name cannot be found, no attempt will be made by URA to delete the name.

Output Description

The DELETION REPORT is produced each time this command is initiated. Each name used as input to the DELETE command is printed on the report along with the status of the change (i.e., if it did or did not work). The names on the output appear in the same order as read by the DELETE command.

This report serves as a permanent record of names that have been deleted from the URA data base. It is intended to aid the analyst in keeping track of modifications to the data base. Once there is a record of a particular name being deleted, the analyst has the option of re-using the name.

Execution

The following command deletes one name from the data base:

```
DELETE NAME=remaining-funds
```

The DELETION REPORT for this action is shown in Figure 6.

Options and Alternatives

1) Several names can be deleted from the data base if the names are put into a file and the file is specified as input to the command.[1] (This is usually done via the FILE parameter.) The format of the input file consists of one name per line, beginning in column one. Figure 7 is an output resulting from using a file as input to the DELETE command. All the names in

---

[1] The exact manner in which the file is specified is given in Part II, Section 7.2.

FIGURE_6

Deleted Names Report

```
PARAMETERS FOR: DEL

   NAME=remaining-funds

DELETED - remaining-funds
```

FIGURE_7

Deleted Names Report

```
PARAMETERS FOR: DEL

   FILE

DELETED - error-listing
DELETED - hired-employee-report
DELETED - hourly-employee-report
DELETED - pay-statement
DELETED - paysystem-outputs
DELETED - salaried-employee-report
DELETED - terminated-employee-report
```

the report had been defined in the data base. The report shows that deletion of each name was successful.

Common Errors

DELETE should not be used to delete the entire contents of the data base. Operating system command should be utilized for this procedure. The data base should be emptied and then reinitialized.

When doing minor editing of a URL description for a name in the data base the information connected to that name (URL statements) should be saved before deleting the name. A FORMATTED-PROBLEM-STATEMENT for the name should be generated using the PUNCH parameter. Then the name can be deleted (via DELETE) from the data base. At this point, the old information in the PUNCH file can be edited to suit the problem definer and then re-entered via the INPUT-PSL command using the PUNCH file produced by the PPS as input.

If a file is used as input to the command, all names to be deleted must begin in the first column of the file line. Any preceding blanks will be interpreted as part of the name.

If neither an input file nor NAME is specified for the command, the message: "NO NAME OR FILE WAS SPECIFIED" will be printed by URA. Should this happen, URA will not execute the DELETE command. The command and its parameters should be reentered with the necessary corrections.

7.3 DELETE-COMMENT-ENTRY (DCOM)

Modification Made

The DELETE-COMMENT-ENTRY takes those names specified as input and deletes, for each input name, the comment entries associated with those comment entry types designated as command parameters.[1] If no comment entry types are specified by the parameters, no comment entries will be deleted. Checking is performed to see if the comment entry exists in the data base before it is deleted. If the comment entry cannot be found, no attempt is made to delete it.

Output Description

The output report generated by this command is called DELETED

---

[1] An example of a comment entry type is a URL "DESCRIPTION" or "PROCEDURE" statement. The comment entry associated with this comment entry type would be the text specified by the user

COMMENT ENTRIES. For each comment entry to be deleted from the data base, the following information is printed on the output:

- name in the data base to which the comment entry belonged.

- the type of comment entry (i.e., DESCRIPTION, PROCEDURE, etc.) which is being deleted.

- the full text of the comment entry.

The order of the output names is the same as the order of the input names.

This serves as a hard copy record for those comment entries deleted from the system description. As stated before, it is desirable to have all modifications to the system description documented.

Execution

The following command deletes the PROCEDURE comment entry associated with one name.

```
DCOM NAME=employee-processing PROCEDURE
```

This was done because the problem definers wanted to delete current PROCEDURE comment entry and did not want to replace it. If the comment entry could be correct if edited or a replacement was available, then it would be more appropriate to use the REPLACE-COMMENT-ENTRY command (see section 7.8). The output generated by this command is shown in Figure 8.

Options and Alternatives

1) Multiple comment entries can be deleted for a name:

```
DCOM NAME=new-info-validation PROCEDURE DESCRIPTION
```

In this case, the PROCEDURE and DESCRIPTION comment entries would be deleted for the PROCESS, "new-info-validation."

2) The following types of comment entries can be deleted when specified as parameters for DELETE-COMMENT-ENTRY:

```
DERIVATION
DESCRIPTION
FALSE-WHILE
PROCEDURE
TRUE-WHILE
VOLATILITY
VOLATILITY-MEMBER
VOLATILITY-SET
```

FIGURE_8

Deleted Comment Entries Report

PARAMETERS FOR: DCOM

NAME=new-employee-processing NODESCRIPTION PROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER NOVOLATILITY-SET NODERIVATION NOTRUE-WHILE NOFALSE-WHILE PRINT NOFILE

```
1*   new-employee-processing
               PROCEDURE;
          1              1. add new employee information
          2              2. increment count of number of employees in appropriate
          3                 department
          4              3. specify relationship between employee information and
          5                 department
          6              4. initialize all appropriate fields in employee information.
          7              5. print the new hire section of the h-t report. ;
```

3) Several names can have their comment entries deleted if the names are put into a file and the file is specified as input. The comment entries deleted for these names are those specified as parameters for the command. If the user specifies that the DESCRIPTION and PROCEDURE comment entries be deleted for a GROUP name, the DESCRIPTION comment entry will be deleted and the message:

URA104:DELSET: PROCEDURE COMMENT ENTRY NOT FOUND

will be given because GROUPS may not have PROCEDURE statements.

Figure 9 shows the output resulting from executing the DELETE-COMMENT-ENTRY command with a file of names as input and DESCRIPTION and PROCEDURE comment entry types as parameters. The example shows for each name used as input, each comment entry deleted for the name.

4) Printing of the DELETED COMMENT ENTRIES output may be suppressed by specifying NOPRINT as a parameter:

DCOM NAME=payroll-processing DESCRIPTION NOPRINT

Common Errors

If neither an input file nor NAME is specified for the command, the message "NONAME OR FILE SPECIFIED" will be printed by URA. Should this happen, URA will not execute the DELETE-COMMENT-ENTRY command. The command and its parameters should be reentered with the necessary corrections.

7.4 DELETE-PSL (DPSL)

Modification Made

This command takes as input, any URL statements in the format specified in the "User Requirements Language, Version 3.3 Language Reference Manual."[1] For each section header statement (i.e., PROCESS, DEFINE, etc.)[2] all the URL statements following this section header (up to the next section header statement) will be deleted from the URA data base for those names specified in the header statement. This command only deletes relationships between names and does not delete any comment entries (this is handled by the DCOM command) nor deletes names (this is handled by the DELETE command). If some of the information presented by the URL statements is contradictory, an

---

[1] Part II of the URL User's Manual.
[2] See Appendix F of the URL User's Manual. List of all possible section header types.

FIGURE_9

Deleted Comment Entries Report

PARAMETERS FOR: DCOM

DESCRIPTION PROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER NOVOLATILITY-SET NODERIVATION
NOTRUE-WHILE NOFALSE-WHILE PRINT FILE

```
1*   hourly-employee-processing
          DESCRIPTION;
     1              This process performs those actions needed to interpret
     2              time cards to produce a pay statement for each hourly
     3              employee. ;


2*   hourly-employee-processing
          PROCEDURE;
     1              1. compute gross pay from time card .
     2              2. compute tax from gross pay.
     3              3. subtract tax from gross pay to obtain net pay.
     4              4. update hourly employee information accordingly.
     5              5. update department information accordingly.
     6              6. generate paycheck.
     7             Note: if status code specifies that the employee did not work
     8               this week, no processing will be done for this employee
     9               information. ;


3*   salaried-employee-processing
          DESCRIPTION;
     1              This process produces the pay statement for salaried
     2              employees once a month. ;


4*   salaried-employee-processing
          PROCEDURE;
     1              1. salary defines gross pay.
     2              2. compute taxes from gross pay.
     3              3. subtract taxes from gross pay to obtain net pay.
     4              4. update salaried employee information accordingly.
     5              5. update department information accordingly.
     6              6. generate paycheck
     7             Note: hours worked is assumed to be 40 ;
```

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Deleted Comment Entries Report

```
5*   process-library
           DESCRIPTION;
      1              These are routines used by one or more processes
      2              in the system. ;
```

error message will be given for that statement. Error diagnostics are also given when syntactical errors occur. URA attempts to continue the procedure until too many errors are encountered.[1]

Output Description

The two outputs that may be generated by this command are DELETED URL and the URA CROSS REFERENCE. The DELETED URL output is a record of all information (except names and comment entries) deleted from the URA data base. It aids the analyst in finding errors in the deletion procedure and produces error diagnostics in sufficient detail to aid the analyst in correcting these errors. This output displays, line for line, the data used as input to the DELETE-PSL command. No reordering is done on the input data.

The URA CROSS REFERENCE is intended as an aid to the analyst in correcting errors that appear in the DELETED URL output. It consists of an alphabetical list of all user defined names, i.e., non-URL names that appear in the DELETED URL output. For each name that appears in the CROSS REFERENCE, its corresponding name type (as given in the DELETED URL output) is printed and a list of all lines in the DELETED URL output where the name appeared is also given.

Execution

The most common method of deleting URL statements is by first writing all statements to be deleted into a file (or punching them on cards) and then using this as input to the command.[2] (This is usually done via the INPUT parameter.) Only the first 72 columns of each line in the file may contain URL statements. Anything after column 72 is ignored. Figure 10 is the output resulting from this type of procedure. The EOF statement must be given to specify the end of URL statements to be deleted.

Options and Alternatives

1) In many cases the amount of input is relatively large (a few hundred lines); hence, there may be a need for the URA CROSS REFERENCE. It will be generated by specifying the XREF parameter with the command.

2) If no input file is specified, URA will wait for URL statements to be typed in (from the terminal), or when in

---

[1] See Section 9 for the limit of errors allowed.
[2] The exact manner in which the file can be specified is given in Part II, Section 7.4.

FIGURE_10

Deleted URL

```
PARAMETERS FOR: DPSL

  SOURCE NOXREF

 LINE  S T M T                                              ID FIELD

    1 >GROUP: check;
    2 >  CONTAINED: pay-statement;
    3 >RELATION: comp-pay-info;
    4 >OUTPUT: paycheck;
    5 >  CONSISTS: pay-stub;
    6 >  RECEIVED BY: employee;
    7 >EOF
```

batch mode, interpret any following cards up through the first "EOF" as URL statements to be deleted. When URL statements are entered at the terminal, each line entered is echoed back by URA along with any errors encountered for that statement (i.e., an AS-IS SOURCE LISTING). This allows the user to correct errors as they occur.

3) Printing of the DELETED URL output may be suppressed by specifying NOSOURCE as a parameter.

Common Errors

The most common errors are typing errors encountered in interpreting the URL statements. A typing mistake can cause many different types of syntactical and semantic errors.

Only the first 72 columns of each line in the input file are read so all URL statements should fit in this region. Anything over column 72 will be truncated and an error message will be generated in most cases.

Omitting the semicolon at the end of a URL statement is a common cause for several errors.

DELETE-PSL will not delete comment entry statements from the data base so these statements are ignored if encountered in the input file. No names other than SYNONYMS can be deleted from the data base via DELETE-PSL.

The last line of the input file containing the URL statements should have the word EOF signifying the end of input. This should also be typed when inputting the data interactively. EOF allows the return to the URA command handler. No URL statements are read after EOF.

7.5 INPUT-PSL (IP)

Modification Made

This command takes as input, any URL statements in the format specified in "User Requirements Language, Version 3.3, Language Reference Manual."[1] For each section header statement (i.e., PROCESS, DEFINE, etc.)[2] the user defined names specified by that section header will be added to the list of names in the data base (if not already in the data base). All the URL statements following this section header up to the next section header statement, specify connections to be made with other names in

---

[1] Part II of the URL User's Manual.
[2] See Appendix F of the URL User's Manual. All possible section header types.

the data base. URA first performs syntax and semantic checks on each input line before any more complex checking is performed. An "in context" check is made for each name used as input. If the name is not in the user's data base, it is added. If it is, a check is made to see that the context in which the name is used in the new input agrees with the manner in which the name is used in the data base. If there is a conflict, an error message will be produced and URA will skip to the next input statement. URA attempts to continue the input procedure until too many errors are encountered.[1] If redundant information is given, i.e., specifying the same relationship more than once, the redundant information will not be added to the information already in the data base. No diagnostic message is given to denote redundant information.

Output Description

The two outputs that may be generated by this command are the URA AS-IS SOURCE LISTING and the URA CROSS REFERENCE. The URA AS-IS SOURCE LISTING is a record of all information input into the URA data base, and is intended as an aid to the analyst. It aids the analyst in finding errors in the input data and produces error diagnostics in sufficient detail to aid the analyst in correcting these errors. The output displays, line for line, the data used as input to the INPUT-PSL command. The order of the input data is not changed.

The URA CROSS REFERENCE is intended as an aid to the analyst in correcting errors that appear in the URA AS-IS SOURCE LISTING and also to resolve ambiguities in assigning name types to the undefined names in the listing. It is useful in correcting errors, as any name involved in an error can be quickly referenced to find all places in the AS-IS LISTING where the name is used, and the name type assigned to that name.

From this information, the analyst will be able to determine what information has to be reentered to correct the error. Since the CROSS REFERENCE also presents all those names which have an ambiguous name type (one that was not defined in previous input), the analyst can resolve those ambiguities by use of the CHANGE-TYPE or INPUT-PSL commands. The output consists of an alphabetical list of all user defined names, i.e., non-URL names, that appear in the AS-IS LISTING. For each name that appears in the CROSS REFERENCE, its corresponding name type (as given in the AS-IS LISTING) is printed and a list of all lines in the AS-IS LISTING where the name appeared is also given.

---

[1] See Section 9 for the limit of errors allowed.

Execution

The most common method of inputting URL statements is by first writing all statements to be added into a file (or punching them on cards) and then using this as input to the command.[1] (This is usually done via the INPUT parameter.) Note that only the first 72 columns of each line in the file may contain URL statements. Anything after 72 is ignored. Figure 11 is the output resulting from this type of procedure. The EOF statement must be given to specify the end of URL statements to be added. The UPDATE parameter specifies that the URA data base is to be modified by the input. If this parameter is not given, none of the information will be added to the data base.

Options and Alternatives

1) In many cases, when the amount of input is relatively large (a few hundred lines) there may be a need for the URA CROSS REFERENCE. By simply specifying XREF as a parameter, it will be generated. Figure 12 presents an AS-IS LISTING and CROSS REFERENCE for a small problem statement.

2) In most cases, it is advantageous to first do a syntax and semantic check of the input data before attempting to put it in the data base. By not specifying the UPDATE parameter, these checks will be made without actually putting the information into the data base. This will generate an AS-IS LISTING with error diagnostics for the URL statements used as input. Since most problem statements have one or two typing errors anyway, this proves to be an inexpensive way to catch errors early. After the source of the errors has been determined and corrected, the command can be issued again using UPDATE as a parameter.

3) If no input file is specified, URA will wait for URL statements to be typed in (from the terminal), or when in batch mode, interpret any following cards up through the first "EOF" as URL statements to be added to the data base. When URL statements are entered at the terminal, each line entered is echoed back by URA along with any errors encountered for that statement (i.e., an AS-IS SOURCE LISTING). This allows the user to correct errors as they occur.

4) Printing of the AS-IS SOURCE LISTING may be suppressed by specifying NOSOURCE as a parameter.

5) The DBREF parameter allows referencing of the data base

---

[1] The exact manner in which the file can be specified is given in Part II, Section 7.5.

FIGURE_11

A S - I S S O U R C E L I S T I N G

```
'ARAMETERS FOR: SYNU

  SOURCE NOXREF NOUPDATE DBREF

 LINE  S T M T                                                    ID FIELD

    1 >/* Communication Aids 8 */
    2 >
    3 >INPUT: employee-infor  ion;
    4 >     SYNONYM: emp-info,i1;
                              $
'*** emp-info
    LEVEL  2,UPA205:SETSYN  : ALREADY SYNONYM FOR SOMETHING ELSE                    ****
                              $
'*** i1
    LEVEL  2,UPA205:SETSYN  : ALREADY SYNONYM FOR SOMETHING ELSE                    ****
    5 >     DESCRIPTION;
    6 >          This input represents all the necessary information to
    7 >          produce the outputs from the paysystem. ;
    8 >
    9 >OUTPUT: paysystem-outputs;
   10 >     SYNONYM: payouts,o1;
   11 >     DESCRIPTION;
   12 >          This output represents all the required outputs of the
   13 >          target paysystem as defined by policy. ;
   14 >
   15 >SET: payroll-master-information;
   16 >     SYNONYM: pay-mast,master-file,s1;
   17 >     DESCRIPTION;
   18 >          This set contains one unit of information
   19 >          for each employee on the payroll, that is,
   20 >          those employees who are to receive paychecks.;
   21 >
   22 >INTERFACE: departments-and-employees;
   23 >     SYNONYM: dept-emp,r1;
   24 >     DESCRIPTION;
   25 >          This is the entity which will receive all the outputs and
   26 >          supply all the inputs. ;
   27 >
   28 >PROCESS: payroll-processing;
   29 >     SYNONYM: payproc,p1;
```

FIGURE_11

A S - I S S O U R C E L I S T I N G

```
LINE  S T M T                                                    ID FIELD

   30 >     DESCRIPTION;
   31 >          This process represents the highest level process
   32 >          in the target system.  it accepts and processes
   33 >          all inputs and produces all outputs.;
   34 >
   35 >EOP
```

FIGURE_12

A S - I S S O U R C E L I S T I N G

PARAMETERS FOR: SYNU

SOURCE XREF UPDATE DBREF

LINE	S T M T	ID FIELD
1	>/* System Flow 8 */	
2	>	
3	>INPUT: employee-information;	
4	>	
5	>OUTPUT: paysystem-outputs;	
6	>	
7	>SET: payroll-master-information;	
8	>	
9	>INTERFACE: departments-and-employees;	
10	> GENERATES: employee-information;	
11	> RECEIVES: paysystem-outputs;	
12	>	
13	>PROCESS: payroll-processing;	
14	> UPDATES payroll-master-information;	
15	> RECEIVES: employee-information;	
16	> GENERATES: paysystem-outputs;	
17	>	
18	>EOP	

FIGURE_12

Cross Reference

SEQ	NAME		TYPE	
1	departments-and-employees	9	INTERFACE	
2	employee-information	3	INPUT 10	15
3	payroll-master-information	7	SET 14	
4	payroll-processing	13	PROCESS	
5	paysystem-outputs	5	OUTPUT 11	16

when semantic as well as syntax checks are desired for URL statements used as input. This must be in effect when UPDATE is given as a parameter. NODBEFF may be specified if only a syntax check of the statements is desired and the data base is not to be updated.

Common Errors

The most common errors are typing errors encountered in interpreting the URL statements. A typing mistake can cause so many different types of syntactical and semantic errors that it will be handled in a later section (section 10).

It is also possible to input the new information into the wrong data base. It is important that the data base to be used has been specified. Otherwise, the data base may be set to some default which may not be the data base file desired.

The INPUT-PSL command only reads the first 72 columns of each line in the input file so all URL statements must fit in this region. Anything over column 72 will be truncated and an error message will be given in most cases.

Omitting the semicolon at the end of a URL statement is a common cause for several errors. It is important that the syntax of each URL statement be correct.

The last line of the input file containing the URL statements should have the word EOF signifying the end of input. This should also be typed when inputting the data interactively. EOF allows the return to the URA command handler. (See Figures 11 and 12 to see how EOF is used correctly.) No URL statements are read after EOF.

7.6 PUNCH-COMMENT-ENTRY (PCOM)

Modification Made

Technically, the output produced by this command is a report presenting narrative information in the manner of a glossary. It makes no modifications to the data base, but is presented here because its main objective is to aid the analyst in changing comment entries in conjunction with the REPLACE-COMMENT-ENTRY command. The idea of using the output as a glossary (for final specifications perhaps) however, should not be overlooked. A message is given when no comment entry is available for a particular comment entry type or the name specified is not in the data base.

Output Description

The PUNCHED COMMENT ENTRIES output is generated by this command. It presents selected comment entries for each name used as input to the command. Any type of name may be used as input to the command. Depending on the type of name the following comment entries may be retrieved:

DERIVATION	(DER)
DESCRIPTION	(DESC)
FALSE-WHILE	(FW)
PROCEDURE	(PRCD)
TRUE-WHILE	(TW)
VOLATILITY	(VOL)
VOLATILITY-MEMBER	(VOLM)
VOLATILITY-SET	(VOLS)

For each name used as input to the command, the name is printed on the output in the order in which it was read and associated with that name, the type of comment entry and the text for that comment entry (for each type of comment entry as specified in the parameter list).

Execution

To obtain the DESCRIPTION comment entry for one name the following command might be given:

```
PCOM NAME=payroll-processing DESCRIPTION
```

This will generate the report shown in Figure 13. A PUNCH file will also be generated with the same information as the report. The manner in which the file to contain the PUNCH data is specified is installation dependent and given in Part II, Section 7.6. If the procedure is done at the terminal, the PUNCH file can then be edited and used as input to the REPLACE-COMMENT-ENTRY command to modify the comment entry. If the procedure is done in batch, the contents of the PUNCH file produced should be punched on cards (by the system if possible). Then the deck of cards produced can be modified and used as input to REPLACE-COMMENT-ENTRY in the next batch run.

Options and Alternatives

1) Several names can have comment entries printed and/or PUNCHED if the names are put into a file and the file is specified as input to the command.[1] (This is usually done via the FILE parameter.) Figure 14 is an output resulting from using a file as input to the PCOM command.

---

[1] The exact manner in which the file is specified is given in Part II, Section 7.6.

FIGURE_13

Punched Comment Entries

```
PARAMETERS FOR: PCOM

   NAME=payroll-processing DESCRIPTION NOPROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER
   NOVOLATILITY-SET NODERIVATION NOTRUE-WHILE NOFALSE-WHILE PRINT PUNCH


1*   payroll-processing
     DESCRIPTION;
          1              This process represents the highest level process
          2              in the target system.  it accepts and processes
          3              all inputs and produces all outputs.;
```

FIGURE_14

Punched Comment Entries

```
PARAMETERS FOR: PCOM

  FILE DESCRIPTION NOPROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER NOVOLATILITY-SET NODERIVATION
  NOTRUE-WHILE NOFALSE-WHILE PRINT PUNCH


1*   employment-termination-form
     DESCRIPTION;
          1              This input contains the information necessary to
          2              delete an employee from the payroll.;

2*   hourly-employment-form
     DESCRIPTION;
          1              This input contains the information necessary to
          2              add a new hourly employee to the payroll.;

3*   paysystem-inputs
     DESCRIPTION;
          1              This input represents all the necessary information to
          2              produce the outputs from the paysystem.;

4*   salaried-employment-form
     DESCRIPTION;
          1              This input contains the information necessary to
          2              add a new salaried employee to the payroll.;

5*   tax-withholding-certificate
     DESCRIPTION;
          1             This input contains tax information necessary to
          2             compute the employee's paycheck.;

6*   time-card
     DESCRIPTION;
          1              This input contains the information about the hours that an
          2              hourly employee worked the preceding week;
```

2) Multiple comment entries, such as DESCRIPTION and PROCEDURE, can be generated for several names when a file is specified as input and more than one comment entry type is specified as parameters. This is illustrated in Figure 15.

3) When the objective of executing this command is to generate a PUNCH file, printing of the report may be suppressed by issuing NOPRINT as a parameter.

4) When the objective of executing this command is to generate the report (and no PUNCH data is desired), production of data in the PUNCH file may be suppressed by issuing NOPUNCH as a parameter.

5) The NAME-GEN can also be used in conjunction with PCOM to retrieve all names of a particular name type (such as INTERFACE) to be used as input to the PCOM command. For example:

```
NAME-GEN S='INTERFACE'
 PCOM     DESCRIPTION
```

This procedure retrieves all INTERFACE names defined in the data base and produces the PUNCHED COMMENT ENTRIES report for all these names and their corresponding DESCRIPTIONS. This could also be done for more than one type of name:

```
NAME-GEN S='SET OR PROCESS'
 PCOM DESCRIPTION PROCEDURE
```

Notice that the PROCEDURE parameter is given, but SETS cannot have PROCEDURE statements associated with them. Only the DESCRIPTION statements will be retrieved for SET names while both DESCRIPTION and PROCEDURE statements will be retrieved for PROCESS names.

Common Errors

The problem definer should note that most of the parameters indicating comment types (i.e., FALSE-WHILE, VOLATILITY, etc.) can apply to only one type of name (CONDITION, ENTITY, respectively).

7.7 RENAME (REN)

Modification Made

The RENAME command takes an old name (of some object in the problem statement data base) and a new name as input. If the new name is not a UFL reserved word or a name already in the data base, the command will replace the old name by the new

FIGURE_15

Punched Comment Entries

```
PARAMETERS FOR: PCOM

  FILE DESCRIPTION PROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER NOVOLATILITY-SET NODERIVATION
  NOTRUE-WHILE NOFALSE-WHILE PRINT PUNCH


1*   new-employee-processing
     DESCRIPTION;
          1              This process produces the new hire section
          2              in the h-t report.;

2*   new-employee-processing
     PROCEDURE;
          1              1. add new employee information
          2              2. increment count of number of employees in appropriate
          3                 department
          4              3. specify relationship between employee information and
          5                 department
          6              4. initialize all appropriate fields in employee information.
          7              5. print the new hire section of the h-t report.;

3*   terminating-emp-processing
     DESCRIPTION;
          1              This process deletes data, for those employees who
          2              are no longer on the payroll, from the files. It also
          3              prints a list of all employees no longer on the
          4              payroll.;

4*   terminating-emp-processing
     PROCEDURE;
          1              1. determine type of employee by employment status item
          2              2. from this, retrieve the contents of the appropriate
          3                 employee information and print in report format
          4              3. update number of employees field in appropriate
          5                 department information
          6              4. delete employee information.;
```

name. Before a name is changed, URA checks that:

- the old name exists in the data base.
- the new name is not already used in the data base.
- the new name is a legal URL name (see the "User Requirements Language, Version 3.3 Language Reference Manual").[1]

If any of these requirements are violated, no change will be made.

Output Description

The output generated from this command is called the RENAME REPORT. For every name changed by the RENAME command, this report presents the "old name" which appeared in the data base and the "new name" which has taken its place. When the name change is not successful, error diagnostics are also printed specifying the cause of the error. Again, the names are printed on the output in the same order as they are read as input.

Execution

To change one name in the data base, the following command might be given:

```
RENAME OLD=employee-identification-number NEW=employee-id
```

Upon first defining the target system, "employee-identification-number" was used to represent a certain piece of data. Later it was found that this data was actually called "employee-id" and the change was made to be consistent with organization terminology. See Figure 16 for the report generated by this command. This command is also beneficial for changing misspelled names in the data base. Through typing errors, "employee-number" may have gone in as "emplyee-nuber". This mistake can be corrected by:

```
RENAME OLD=emplyee-nuber NEW=employee-number
```

Options and Alternatives

As with most of the modifier commands, the problem definer has the option of changing several names at one time. The old-new name pairs must first be put in a file to be used as input to the command. (This is usually done via the INPUT parameter.) Figure 17 presents the output resulting from this procedure.

---

[1] Part II, URL Manual

FIGURE_16

RENAME REPORT

PARAMETERS FOR: REN

OLD=employee-identification-number NEW=employee-id

SEQ	OLD NAME	NEW NAME
1	employee-identification-number	employee-id

FIGURE_17

RENAME REPORT

PARAMETERS FOR: REN

INPUT

SEQ	OLD NAME	NEW NAME
1	employee-information	paysystem-inputs
2	employee	personnel

Each line of the file must consist of an old name followed by the corresponding new name. The two names may be anywhere in the first 80 columns of the line and must be separated by one or more blanks. The format of the file used to produce Figure 17 is given below:

```
employee-information        paysystem-inputs
employee                    personnel
```

Common Errors

The most common error in using RENAME is specifying a name already in the data base or a URL reserved word as the new name. URA will not make the change if this is the case. The command would have to be reissued with another new name to take the place of the illegal one.

If neither an input file or an OLD/NEW pair of parameters is specified for the command, the message: "MUST GIVE OLD AND NEW, OR INPUT" will be printed by URA. Should this happen, URA will not execute the RENAME command. The command and its parameters should be reentered with the necessary corrections.

7.8 REPLACE-COMMENT-ENTRY (RCOM)

Modification Made

This command takes as input names which exist in the data base, each followed by a URL comment entry statement. If the comment is a DESCRIPTION comment entry, for example, then the command will replace the old DESCRIPTION comment entry by the one used as input. What RCOM actually does is delete the old comment entry and put the new comment entry in its place. This is done after a check has been made to ascertain that the "old comment entry" exists in the data base and the "new comment entry" is legal for the particular application being used (e.g., not attempting to enter a PROCEDURE comment entry for a SET name). A check is made to see if the input name is in the data base.

If an attempt is made to replace a comment entry for a name that did not have a comment entry specified for it, the message:

```
URA126:RLPSET: WARNING - THERE IS NO COMMENT ENTRY TO DELETE
```

will be given and the designated comment entry will be connected to the name.

Output Description

The output generated by this report is called REPLACED COMMENT ENTRIES. For each "old comment entry" to be replaced, the

output depicts, in the following order:

- name to which the "old comment entry" belongs.
- the type of comment entry which is being changed.
- the entire text of the "old comment entry."
- the entire text of the "new comment entry" which replaces the old one.

Error diagnostics referring to problems encountered in executing the command are also printed here.

Execution

Any information to be supplied as input to RCOM must first be placed in a file and the file must be designated as input.[1] (This is usually done via the INPUT parameter.)

The contents of the file must be in the following format:

```
name
comment entry type;
.
.
.
comment entry
.
.              ;
.
etc.
```

The contents of the file used to produce the output shown in Figure 18 was:

```
new-employee-processing
DESCRIPTION;
          This process produces the new hire section
          in the h-t report.;
new-employee-processing
PROCEDURE;
          1.  add new employee information
          2.  increment count of number of employees in
          appropriate
          department
          3.  specify relationship between employee information
          and
          department
```

---

[1] The exact manner in which the file is specified is given in Part II, Section 7.8.

FIGURE_18

Replaced Comment Entries

```
PARAMETERS PCB: PCOM

   PRINT


** DELETED COMMENT ENTRY **
  1*   new-employee-processing
                DESCRIPTION ;
            1               This process stores information about new employees and
            2               then prints out a corresponding report.;

** INSERTED COMMENT ENTRY **
  1*   new-employee-processing
                DESCRIPTION ;
            1               This process produces the new hire section
            2               in the h-t report.;



** DELETED COMMENT ENTRY **
  2*   new-employee-processing
                PROCEDURE ;
            1               1. add new employee information
            2               2. increment count of number of employees in appropriate
            3                  department
            4               3. specify relationship between employee information and
            5                  department
            6               4. initialize all appropriate fields in employee information.;

** INSERTED COMMENT ENTRY **
  2*   new-employee-processing
                PROCEDURE ;
            1               1. add new employee information
            2               2. increment count of number of employees in appropriate
            3                  department
            4               3. specify relationship between employee information and
            5                  department
            6               4. initialize all appropriate fields in employee information.
            7               5. print the new hire section of the h-t report.;
```

4. initialize all appropriate fields in employee information.
5. print the new hire section of the h-t report.;

Options and Alternatives

1) It is often the case that only some minor editing of a comment entry need be done to make it correct. This can be done when the output from the PUNCH-COMMENT-ENTRY command is edited and used as input to the ECOM command. This is described in section 7.6 of this paper.

2) To suppress printing of the REPLACED COMMENT ENTRIES report the NOPRINT parameter may be specified.

Common Errors

The major problem in using this command is specifying the file format correctly. (This is not a problem, however, if the contents of the file used was produced by PUNCH-COMMENT-ENTRY.) Although the command allows free formatting of the file, the order: name, comment-entry type, comment-entry must be maintained. Each must begin on a new line.

8. REPORT COMMANDS

Report Commands retrieve specific types of information from the data base and present it in formats which aid the problem definer to analyze the problem statement for correctness and completeness. Many of the formats can serve as final specifications of the system being designed.

Most report commands allow the report to be generated for a single name (via the NAME parameter) or for a number of names placed in a file and specified as input to the command.[1]

The descriptions of these report commands, their usage and interpretation, and the usage of reports produced by them are given in "URA Outputs."[2]

---

[1] The exact manner in which this is done is installation-dependent and is given in Part II, Section 8.
[2] Part III

9. ERROR DIAGNOSTICS

URA has extensive checking facilities to prevent errors in the problem statement. At the URA command mode level, checks are made to insure that all commands given are legal URA commands and that all parameters given are legal parameters for that command. If an illegal command, an illegal parameter, or illegal parameter for that command is given when in on-line mode, the following message will be generated:

```
INVALID PARAMETER -
ENTER REPLACEMENT OR BLANK LINE
?
```

The user must enter the replacement following the question mark and then hit the carriage return key. If the command is accepted, processing of that command commences. Should an error be encountered while processing the command, one of the following three types of error diagnostics will be given:

i) Data Base Management System Errors

These errors are encountered when there may be some danger of destroying the contents of the URA data base or there is an error in the URA software. Even though the URA software might be the cause of the error, it is doubtful if it will do anything to harm the contents of the user's data base. A complete list of these error messages is given in "A Data Base Management System for URA Based on DBTG 71."

*** ERROR 16 - DATA BASE FILE INCONSISTENT

This error message is given if the user attempts to modify or retrieve information from a URA data base which has had its contents altered so that it is unusable by the URA software.

*** ERROR # n FOUND IN ROUTINE # m

An error message of this format usually designates an error in the URA software, where n is the error number. To find out which routine the error occurred in, refer to "A Data Base Management System for URA Based on DBTG 71." If the values of the variables n and m are 16 and 30 respectively, the error designates a data base inconsistency which is usually a user error. Any other errors of this form with different values should be brought to the attention of those persons maintaining the URA software.

ii) URA Command Errors

These errors are encountered in the processing of URA commands and are user errors. These diagnostics are generated when the user presents ambiguous or incorrect information to the URA commands. In most cases, URA will take no action to fulfill the user's request if an error is encountered. The command must be restated in corrected form, before action is taken. All these errors are presented in the following format:

URAnnn:subroutine: error-message

where "nnn" designates the URA error number, "subroutine" denotes the subroutine in the URA software where the error occurred, and "error-message" corresponds to some diagnostics which describe the error condition.

iii) URA Input Errors

These errors are encountered when the INPUT-PSL or DELETE-PSL are used incorrectly. URA always attempts to recover from these errors unless an excessive number of errors have been encountered. Each of these errors is assigned a level number, 1 through 4. The user is allowed to make up to 24 level 1 and 24 level 2 errors, but a single level 3 or level 4 error will terminate processing of the command. The levels are described below.

Level	Description	Limit
1	This statement is ignored.	99
2	Serious user error	24
3	URA unable to recover	0
4	Exceeded URA capabilities	0

These types of errors are presented in the following format:

**** LEVEL j, URAnnn:subroutine: error-message

where "j" designates the level number and "nnn" denotes the URA error number. The last part of the format is the same as the URA command errors.

After processing any URA command, a STOP status message is given. This message designates that processing of the command was successful (STOP 0, i.e., errors were handled effectively, etc.) or that processing was not totally successful (STOP 4 or STOP 8). STOP 4 is given when an error level limit is exceeded for INPUT-PSL errors, for example. The STOP 8 message designates a serious error in attempting to access the data base, usually resulting from an inconsistent data base.

The following is a list of all possible errors that can be

encountered while using UBA. A short description of each error accompanies it as well as suggested action to take should the error occur. More than one error may have a similar explanation, while the software makes a distinction because the error is recognized in different places.

Number	Subroutine	Error Message
2	NLEX	NAME TOO LONG A user defined name has exceeded the 30 character limit allowed by URL/URA. The name is truncated to 30, but is still put in the data base. (See section 10.1, part v.)
3	NLEX	'EOF' NOT FOUND BEFORE END-OF-FILE The user has terminated the input before specifying the URL 'EOF'. Processing of the input is terminated.
4	INDBS	ERROR OPENING DATA BASE FOR -
5	NLEX	END-OF-FILE IN MIDDLE OF COMMENT The end of input has been encountered following the '/*' comment characters. Processing of the input is terminated.
6	SCAN	INVALID LEXICAL TYPE RETURNED FROM NLEX URA software error. Please notify persons maintaining URA should this error occur.
7	SCAN	ILLEGAL CHARACTER - IGNORED An illegal character encountered when scanning an input line. See the "User Requirements Language, Version 4.0 Language Reference Manual" for a complete list of legal characters. The illegal character is ignored and processing of the URL statement continues.
8	COMLOP	PARSE STACK OVERFLOW URA software error. Please notify persons maintaining URA should this error occur.
9	PROK	BAD CASE URA software error. Please notify persons maintaining URA should this error occur.
10	REDUCE	NO APPLICABLE PRODUCTION - SYNTAX ERROR - START SKIPPING Illegal URL statement syntax is encountered. If this is a header statement, following statements will be assigned to the previous header statement. The error may be a result of incorrect usage of a URL reserved word. (See section 10.1, part i.)

11	STACK	ILLEGAL SYMBOL PAIR - SYNTAX ERROR - START SKIPPING Illegal URL statement syntax is encountered. If this is a header statement, following statements will be assigned to the previous header statement. This statement is not entered into the URA data base. (See section 10.1, part i.)
12	ISYMBL	SYMBOL TABLE OVERFLOW Exceeded limits of URA. Reissue INPUT-PSL command at point in the input file where this error occurred.
13	ISYMBL	TOO MANY SYMBOLS Exceeded limits of URA. Reissue INPUT-PSL command at point in the input file where this error occurred.
14	SETYPE	INVALID SYMBOL TABLE POINTER URA software error. Please notify persons maintaining URA should this error occur.
15	STACK	INVALID CASE URA software error. Please notify persons maintaining URA should this error occur.
16	COMENT	END-OF-FILE IN COMMENT ENTRY End of input encountered in URL comment entry. Processing of the input is terminated.
17	SKIP	END OF FILE WHILE SKIPPING Serious error. In attempt to recover from previous errors the end of input has been encountered. Processing of input is terminated.
18	FETCH	PROCESS HAS NO RESOURCE USAGE -
19	RECOV	UNABLE TO RECOVER AT THIS TIME Processing of input is terminated due to serious errors which make it unable to continue.
20	RECOV	LAST STATEMENT SKIPPED Statement where error occurred is skipped so that processing of input may continue.
21	SETINF	INVALID SYMBOL TABLE POINTER URA software error. Please notify

		persons maintaining URA should this error occur.
22	RWLIS2	SAME ATTRIBUTE ALREADY GIVEN WITH DIFFERENT ATTRIBUTE VALUE An attempt was made to assign a second value to the same ATTRIBUTE for a given name. The new value is ignored.
23	UPDTRS	OVERFLOW IN RESOURCE STACK -- CONTINUING
24	MAINRCOM	MISSING SEMICOLON ON LINE AFTER NAME Semicolon is needed to terminate comment entry statement.
25	HEAD	INVALID HEADER STATEMENT - STATEMENTS WILL BE IGNORED Illegal syntax of header statement. All URL statements up to the next header statement will be ignored. (This error is also described in section 10.1, part iii.)
26	IGTYPE	INVALID SYMBOL TABLE POINTER URA software error. Please notify persons maintaining URA should this error occur.
27	PTABIN	INVALID LEXICAL TYPE OF END-OF-FILE URA software error. Please notify persons maintaining URA should this error occur.
28	PTABIN	DUPLICATE RESERVED WORD - IGNORED URA software error. Please notify persons maintaining URA should this error occur.
29	MAINCT	CONFLICT WITH EXISTING DATA BASE CONNECTIONS Attempt made to change name type to one which conflicts with the context in which the name is used. No change is made.
30	UPDTRS	NO MEASURES INFORMATION FOR RESOURCE -
31	MAINCT	BAD INPUT FORMAT The format of the file used as input to the command is incorrect. See the command description for correct format. No change is made.
32	MAINCT	NAME NOT IN DATA BASE Attempt to change name type of name not

defined in the URA data base.

33	MAINCT	INVALID NAME TYPE Attempt to assign an illegal name type to a name. Probably a spelling error.
34	MAINCT	NAME TYPE TOO LONG Attempt to assign an illegal name type to a name. Probably a spelling error.
35	MAINCT	WARNING - STUFF AFTER NAME TYPE The input file contains more than just name and new name type. The extra data will be ignored by the command processor.
36	MAINCT	INVALID NAME - TOO LONG The name for which the change is to be made is over 30 characters. Check spelling.
37	UPDTRS	OVERFLOW IN INFORMATION STACK - CONTINUING
38	MAINREN	OLD NAME NOT IN DATA BASE Attempt to change name of some object which is not defined in the data base. Probably a spelling error.
39	MAINREN	NEW NAME ALREADY IN DATA BASE Attempt to change old name to a name already defined in the data base. User must choose another name.
40	CLREN	MUST GIVE OLD AND NEW, OR INPUT Parameters given for the command do not supply sufficient information for processing. Reissue command.
41	MAINDEL	NAME TO BE DELETED NOT IN DATA BASE Attempt to delete a name which is not defined in the URA data base.
42	MAINDEL	INVALID MEMBER TYPE URA software error. Please notify persons maintaining URA should this error occur.
43	OTHERS	CARDINALITY ALREADY GIVEN AS SYSPAR Attempt to assign a numerical value to a CARDINALITY statement when previously assigned a SYSTEM-PARAMETER name. The value is ignored.
44	OTHERS	CARDINALITY ALREADY GIVEN AS DIFFERENT

		VALUE Attempt to assign a second value to a CARDINALITY statement. The new value is ignored.
45	CLCT	NO TYPE GIVEN WITH "NAME=" OR "FILE" PARAMETER No new name type has been specified. The command must be reissued.
46	CT	TYPE, BUT NO NAME OF FILE GIVEN No name has been specified to have its name type changed. The NAME or FILE parameter must be given.
47	PRERCA	INTERVAL NOT FOUND IN DATA BASE -
48	PPERCA	KEYWORD NOT FOUND IN DATA BASE -
49	ENUMRT	NO NAMES IN DATA BASE Attempt to retrieve names from an empty data base.
50	PLIST	TOO MANY NAMES - REST IGNORED Exceeded 50 name limit. Remaining names should be given in another statement.
51	RWLIST	MUST BE SUBSETTING CRITERION NAME Attempt to define a name which is not a GROUP or ELEMENT to be SUBSETTING CRITERION.
52	IDENTC	NAME NOT IN DATA BASE Attempt to retrieve information about a name which is not defined in the data base.
53	OPTRW	NAME LIST TOO LONG - REST IGNORED Exceeded 50 name limit. Remaining names should be given in another statement.
54	UPDTPR	PROCESS HAS NO PROCESSOR -
55	UPDTPR	OVERFLOW IN PROCESSOR STACK - MUST ABORT
56	UPDTPR	NO HAPPENS INFORMATION FOR -
57	FETCH	SYSTEM PARAMETER HAS NO VALUE -
58	FNDRUP	NO PROCESSOR INFORMATION FOR -
59	PREPRO	ROOT PROCESS NOT FOUND IN DATA BASE -
60	APPLES	SECOND MAILBOX FOR PD ILLEGAL

		Attempt to associate a second MAILBOX to a particular PROBLEM DEFINER.
61	RWLIST	ALREADY PART OF SOMETHING ELSE Attempt to define a structure where an object is PART OF more than one other object. This is contrary to rules specified in the "User Requirements Language, Version 3.3, Language Reference Manual."[1]
62	RWLIST	SECOND PD FOR THIS ITEM ILLEGAL Attempt to assign a second RESPONSIBLE-PROBLEM-DEFINER to an object. This statement is ignored.
63	RWLIST	ALREADY PART OF SOMETHING ELSE Attempt to define a structure where an object is PART OF more than one other object. This is contrary to rules specified in the "User Requirements Language, Version 3.3, Language Reference Manual."[1]
64	MAINDICT	NAME NOT FOUND IN DATA BASE Attempt to retrieve information about a name that is not defined in the data base.
65	MAINCONT	NAME NOT FOUND IN DATA BASE - Attempt to retrieve information about a name that is not defined in the data base.
66	MAINPIC	NAME NOT IN DATA BASE Attempt to retrieve information about a name that is not defined in the data base.
67	MAINPIC	PICTURE NOT AVAILABLE FOR Attempt to generate the report for a name which is not a SET, INPUT, OUTPUT, ENTITY, GROUP, ELEMENT, PROCESS or INTERFACE. Only these types of objects may have PICTURES generated for them.
68	REPSET	WARNING - MISSING SEMICOLON. NEW COMMENT ENTRY ADDED Semicolon not given to terminate comment entry. One is assumed and processing continues.

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[1] Part II of the URL User's Manual.

69	REPSET	NO NEW COMMENT ENTRY - OLD ENTRY HAS BEEN DELETED Since no new comment entry has been given to replace the old, the old comment entry statement is deleted.
70	CLDCOM	NO NAME OR FILE SPECIFIED Either the NAME or FILE parameter must be given for this command to be executed. Parameters given do not supply sufficient information for processing. Reissue command.
71	CLCT	PARAMETER LEGAL ONLY IN MTS VERSION -
72	CLCONT	PARAMETER LEGAL ONLY IN MTS VERSION -
73	CLNG	PARAMETER LEGAL ONLY IN MTS VERSION -
74	CLIP	PARAMETER LEGAL ONLY IN MTS VERSION -
75	CLFPS	PARAMETER LEGAL ONLY IN MTS VERSION -
76	MAINPRIO	NAME NOT IN DATA BASE Attempt to retrieve information about a name that is not defined in the data base.
77	CLDCOM	PARAMETER LEGAL ONLY IN MTS VERSION -
78	CLDEL	PARAMETER LEGAL ONLY IN MTS VERSION -
79	CLDICT	PARAMETER LEGAL ONLY IN MTS VERSION -
80	CLKWIC	PARAMETER LEGAL ONLY IN MTS VERSION -
81	CLPAV	PARAMETER LEGAL ONLY IN MTS VERSION -
82	CLPCOM	PARAMETER LEGAL ONLY IN MTS VERSION -
83	CLPIC	PARAMETER LEGAL ONLY IN MTS VERSION -
84	CLRCOM	PARAMETER LEGAL ONLY IN MTS VERSION -
85	CLREN	PARAMETER LEGAL ONLY IN MTS VERSION -
86	CLSTR	PARAMETER LEGAL ONLY IN MTS VERSION -
87	CLDEL	NO NAME OR FILE WAS SPECIFIED Either the NAME or FILE parameter must be given for this command to be executed. Parameters given do not supply sufficient information for processing. Reissue command.

88	MAINPRIO	NAME NOT A PROCESS NAME Attempt to retrieve information from a name that is not a PROCESS name. Only PROCESS names may be used as input to this command.
89	PROBE	LOOP IN SUBPART/UTILIZES STRUCTURE AT -
90	RWLIST	SSCN IS ONLY LEGAL TYPE IN DEFINE SECTION WHICH CAN BE MAINTAINED Attempt to use MAINTAINED statement for some object which is not SUBSETTING-CRITERION.
91	ADDUSE	TOO MANY USAGES URA software error. Please notify persons maintaining URA should this error occur.
92	MAINPAV	NAME NOT IN DATA BASE Attempt to retrieve information about name which is not defined in the data base.
93	MAINPAV	NAME HAS NO USAGES AS ATTRIBUTE FOR ANYTHING Attempt to retrieve ATTRIBUTE information for a name which is not an ATTRIBUTE.
94	INPAR	COMMANDS IN INCORRECT SEQUENCE
95	CLEI	MUST GIVE EITHER ENTITY OR IDENTIFIER PARAMETER Either the ENTITY or IDENTIFIER parameter must be used in conjunction with this command for successful implementation.
96	MAINSAVE	WRITE ERROR - DATA BASE NOT SAVED
97	MAINSAVE	DATA BASE NOT SAVED - FILE CANNOT BE EMPTIED -
98	CONCOL	NAME NOT IN DATA BASE Attempt to retrieve information about a name not defined in the data base.
99	IDENTE	NAME NOT IN DATA BASE Attempt to retrieve information about a name not defined in the data base.
100	NLIST2	TOO MANY ATTRIBUTE VALUE PAIRS IN SINGLE STATEMENT Limit exceeded. Remaining pairs should be given in another statement.

101	NLIST2	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name defined as something else as an ATTRIBUTE name.
102	NLIST2	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name defined as something else as an ATTRIBUTE-VALUE name.
103	DELSET	DESCRIPTION COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent DESCRIPTION statement.
104	DELSET	PROCEDURE COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent PROCEDURE statement.
105	DELSET	VOLATILITY COMMENT NOT FOUND FOR: Attempt to delete a nonexistent VOLATILITY statement.
106	DELSET	VOLATILITY-MEMBER COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent VOLATILITY-MEMBER statement.
107	DELSET	VOLATILITY-SET COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent VOLATILITY-SET statement.
108	DELSET	DERIVATION COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent DERIVATION statement.
109	DELSET	TRUE WHILE COMMENT ENTRY NOT FOUND FOR: Attempt to delete a nonexistent TRUE WHILE statement.
110	DELSET	FALSE WHILE COMMENT NOT FOUND FOR: Attempt to delete a nonexistent FALSE WHILE statement.
111	MAINDCOM	NAME NOT FOUND IN DATA BASE Attempt to delete information for a name not defined in the data base.
112	PUNSET	NO DESCRIPTION AVAILABLE FOR :
113	CLCM	MUST GIVE EITHER CONSISTS OR CONTAINED PARAMETER Either the CONSISTS or CONTAINED parameter must be used in conjunction with this command.

114	VLIST	ONLY SINGLE VALUE OR RANGE ALLOWED - IGNORED Invalid format for specifying a VALUES statement. See the "User Requirements Language, Version 3.3, Language Reference Manual."[1]
115	VLIST	MIN NOT LESS THAN MAX - IGNORED If a number range is specified the first number must be less than the second number.
116	OTHERS	VALUES ONLY LEGAL FOR ELEMENT, SYSPAR, or ATTRIBUTE-VALUE Attempt to use a VALUES statement for a name which is not an ELEMENT, SYSTEM-PARAMETER or ATTRIBUTE-VALUE.
117	OTHERS	DIFFERENT VALUES ALREADY GIVEN Attempt to assign a second value for a given object. This statement is ignored.
118	CLRCA	FILE= NOT ALLOWED IN THIS IMPLEMENTATION Error encountered in using a SYSTEM-PARAMETER in a given statement. Interpretation of rest of statement becomes confused.
119	CLRCA	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION Attempt to use zero as a SYSTEM-PARAMETER.
120	SNAMET	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name in a context which conflicts in the way it has previously been used.
121	MAINFCOM	NAME NOT FOUND IN DATA BASE Attempt to access information for a name not defined in the data base.
122	MAINFCOM	INVALID TYPE OF COMMENT ENTRY Attempt to replace unrecognizable comment entry statement. Probably a spelling error.
123	MAINFCOM	CANNOT HAVE THIS TYPE OF COMMENT ENTRY Attempt to assign a comment entry statement which is not legal for the particular name type.

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[1] Part II of the URA User's Manual.

124	REPSET	...WITH THIS NAME Used in conjunction with URA123. Specifies the name for which the comment entry was used.
125	MAINPCOM	PROBLEMS SCANNING INPUT FILE - MUST ABORT Incorrect format of file used for input. See command description for correct format.
126	REPSET	WARNING - THERE IS NO COMMENT ENTRY TO DELETE Attempt to delete nonexistent comment entry.
127	PUNSET	DESCRIPTION COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent DESCRIPTION statement.
128	PUNSET	PROCEDURE COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent PROCEDURE statement.
129	PUNSET	VOLATILITY COMMENT NOT FOUND FOR: Attempt to retrieve nonexistent VOLATILITY statement.
130	PUNSET	VOLATILITY-MEMBER COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent VOLATILITY-MEMBER statement.
131	PUNSET	VOLATILITY-SET COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent VOLATILITY-SET statement.
132	PUNSET	DERIVATION COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent DERIVATION statement.
133	PUNSET	TRUE WHILE COMMENT ENTRY NOT FOUND FOR: Attempt to retrieve nonexistent TRUE WHILE statement.
134	PUNSET	FALSE WHILE COMMENT NOT FOUND FOR: Attempt to retrieve nonexistent FALSE WHILE statement.
135	MAINPCOM	NAME NOT FOUND IN DATA BASE Attempt to retrieve information for a name not defined in the data base.

136	PELMT	NO ELEMENTS SATISFY THE REQUESTED ATTRIBUTE-VALUES
137	MAINVAL	NAME NOT IN DATA BASE -
138	MAINVAL	NAME IS NOT AN ATTRIBUTE OR IT HAS NO VALUE -
139	MAINVAL	NO NAMES IN DATA BASE
140	MAINDP	VALUE OF MM IS GREATER THAN THE NUMBER OF MAND.ATTR. - IGNORED
141	CONROW	NAME NOT IN DATA BASE Attempt to retrieve information for a name not defined in the data base.
142	CLRCA	EMPTY NOT ALLOWED IN THIS IMPLEMENTATION Attempt to delete a relationship, between two names, which is not defined in the data base.
143	MAINDP	NAME NOT IN DATA BASE Attempt to retrieve information about a name which is not defined in the data base.
144	DPCOL	TOO MANY COLUMNS Exceeded limits of the software that produces the matrix. Names omitted from the matrix should be used as input to another DP command.
145	DPCOL	TOO MANY ROWS Exceeded limits of the software that produces the matrix. Names omitted from the matrix should be used as input to another DP command.
146	DPCOL	SPARSE MATRIX SYSTEM OVERFLOW Exceeded limits of the software that produces the matrix.
147	DPROW	TOO MANY ROWS Exceeded limits of the software that produces the matrix. Names omitted from the matrix should be used as input to another DP command.
148	DPROW	TOO MANY COLUMNS Exceeded limits of the software that produces the matrix. Names omitted from the matrix should be used as input to another DP command.

149	DPROW	SPARSE MATRIX SYSTEM OVERFLOW Exceeded limits of the software that produces the matrix.
150	DPSUM	NO ROWS No relationships can be specified about the names used as input, so no matrix will be generated.
151	DPSUM	NO COLUMNS No relationships can be specified about the names used as input, so no matrix will be generated.
152	DPSUM	SPARSE MATRIX SYSTEM OVERFLOW Exceeded limits of the software that produces the matrix.
153	MAINDP	INVALID INPUT NAME TYPE Attempt to use a name which is not a PROCESS name as input to the command.
154	MAINDP	INVALID INPUT NAME TYPE Attempt to use a name which is not a SET, INPUT, OUTPUT, ENTITY, GROUP or ELEMENT name as input to the command.
155	DPSUM	INVALID ROW TYPE - SYSTEM ERROR URA software error. Please notify persons maintaining URA should this error occur.
156	CLRCA	NO INTERVAL GIVEN - MUST ABORT Attempt to delete a relationship which has not been defined in the data base.
157	CLRCA	NBP AND NBR NOT ALLOWED TOGETHER - MUST ABORT Attempt to delete a relationship which has not been defined in the data base.
158	DBTCON	NAME NOT IN DATA BASE Attempt to delete a relationship which has not been defined in the data base.
159	DBTCON	NAMES NOT CONNECTED IN THAT FASHION Attempt to delete a relationship which has not been defined in the data base.
160	UDDERS	NAME NOT IN DATA BASE Attempt to delete a relationship which has not been defined in the data base.

161	UDDERS	NO CONNECTIVITY EXISTS Attempt to delete a relationship which does not exist for this name.
162	UDDERS	DIFFERENT CONNECTIVITY IN DATA BASE - NOT DELETED Attempt to delete a relationship which is not stated exactly as it is in the data base.
163	PRTPR	NO PROCESSOR INFORMATION FOUND IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
164	PRTRS	NO PROCESSOR INFORMATION FOUND IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
165	UPDTPR	SYSTEM PARAMETER WITHOUT VALUE - Attempt to delete a relationship which is not defined in the data base.
166	UDDERS	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
167	UDDERS	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
168	UDDERS	DIFFERENT VALUES IN DATA BASE- NOT DELETED Attempt to delete a number or range of numbers that was not defined for the statement.
169	ADJINT	HAPPENS INFORMATION NOT CONVERTIBLE FOR THE INTVL - Attempt to delete a relationship which is not defined in the data base.
170	ADJINT	SYSTEM PARAMETER WITHOUT VALUE ENCOUNTERED - Attempt to delete a relationship which is not defined in the data base.
171	DELSYN	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
172	DELSYN	NAME IS NOT A SYNONYM FOR THIS NAME Attempt to delete a SYNONYM relationship

		which is not defined in the data base.
173	DPFRC	"USING" INFO NOT IN DATA BASE. Attempt to delete a relationship which is not exactly as it is in the data base.
174	DPFRC	WARNING - "USING" INFO IN A DATA BASE. "USING Clause not included although section object has using parts. All "USING" parts have been deleted.
175	DRIVES	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
176	DRIVES	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
177	DRIVES	THESE TWO NAMES NOT CONNECTED IN THAT WAY Attempt to delete a relationship which is not defined in the data base.
178	DHAPNS	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
179	DPFRC	"USING" NAME NOT IN DATA BASE. Attempt to delete a relationship which is not defined in the data base.
180	DHAPNS	NAMES NOT CONNECTED IN THAT FASHION Attempt to delete a relationship which is not defined in the data base.
181	DISCON	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
182	DISCON	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
183	DISCON	NAMES NOT CONNECTED IN THAT FASHION Attempt to delete a relationship which is not defined in the data base.
184	ATTV	NAME DOESN'T HAVE THIS ATTRIBUTE Attempt to delete a relationship which is not defined in the data base.

185	ATTV	NAME NOT IN DATA BASE Attempt to delete a relationship which is not defined in the data base.
186	ATTV	NAME HAS NO ATTRIBUTES Attempt to delete ATTRIBUTE relationship for a name with no ATTRIBUTES.
187	DCNSIS	SYSPAR VALUE IN DATA BASE IS DIFFERENT - IGNORED Attempt to delete a statement using a different SYSTEM-PARAMETER. Statement not deleted.
188	DCNSIS	WARNING - SYSPAR IN DATA BASE Statement deleted though user did not include SYSTEM-PARAMETER with statement.
189	DCNSIS	NAME NOT IN DATA BASE Attempt to delete a CONSISTS relationship using a name not defined in the data base.
190	DCNSIS	CONSISTS/CONTAINED INFORMATION NOT IN DATA BASE Attempt to delete a CONSISTS or CONTAINED relationship not defined in the data base.
191	DCNSIS	NO SYSPAR IN DATA BASE - IGNORED Attempt to delete a relationship which is not defined exactly in the same way as defined in the data base. Statement not deleted.
192	PPERCA	NAME GIVEN AS KEYWORD IS NOT A KEYWORD - Attempt to delete a relationship which is not defined in the data base.
193	PPERCA	NAME GIVEN AS AN INTVL IS NOT A INTVL -
194	PREPRO	NAME GIVEN AS PROCESS IS NOT A PROCESS -
195	MAINSECA	NAME NOT IN DATA BASE - Attempt to delete a relationship which is not defined in the data base.
196	PLONG	COMMENT NOT FOUND ***SYSTEM ERROR *** URL software error. Please notify persons maintaining URI should this error occur.
197	COMNT	COMMENT-ENTRIES NOT ALLOWED IN DPSL Attempt to delete comment-entry

		statements. This can only be done using the DCOM and FCOM commands. Statement not deleted.
198	COMNT	EOF WHILE LCOKING FOR SEMICOLON Improper statement syntax has been encountered. Semicolons are needed to end all URL statements.
199	DHAPNS	DIFFERENT SYSPAR - NOT DELETED Attempt to delete a HAPPENS relationship using a different SYSTEM-PARAMETER than defined in the data base. Statement not deleted.
200	DHAPNS	INTERVAL NOT IN DATA BASE Attempt to delete a HAPPENS relationship using an INTERVAL not defined in the data base.
201	PLIST	NAME NOT PART OF HEADER An illegal statement header has been given. Probably a spelling error. The statement is ignored.
202	NLIST	NAME PREVIOUSLY USED DIFFERENTLY - IGNORED Attempt to use a name in a context different than the way it is defined. (This error is also described in section 10.1.)
203	MAINSECA	INPUT NAME HAS INVALID TYPE Attempt to delete a relationship not defined in the data base.
204	DEFN	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to assign a name type to a name which is used in a different context.
205	SETSYN	ALREADY SYNONYM FOR SOMETHING ELSE Attempt to assign a name to be a SYNONYM for more than one object.
206	SETSYN	UNABLE TO MAKE SYNONYM - TOO COMPLICATED See section 10.1, part vii for explanation and solution to this error.
207	SETSYN	CANNOT BE MADE SYNONYM - DIFFERENT TYPES Attempt to assign a name as a SYNONYM to a different name, both with different name types.
208	MAINNLA	NO NAMES IN DATA BASE

209	CHKCON	STACK OVERFLOW WHILE WALKING CONSISTS STRUCTURE Attempt to use a name which is not an INTERVAL in a CONSISTS statement for an INTERVAL section.
210	PRTNUN	NO NAMES IN DATA BASE Attempt to use a name in a context different than the way the name is defined.
211	OTHERS	NAME MUST BE ENTITY NAME Attempt to use a name in a context where only an ENTITY name is acceptable.
212	OTHERS	RELATION ALREADY EXISTS BETWEEN TWO OTHER ENTITIES Attempt to specify the same RELATION for a different pair of ENTITIES. Different ENTITY pairs imply different RELATIONS.
213	OTHERS	CAN ONLY HAVE ONE CARDINALITY Attempt to specify a second CARDINALITY statement for a name. Objects may have only one CARDINALITY.
214	OTHERS	CONNECTIVITY ALREADY GIVEN FOR THIS RELATION Attempt to specify a second CONNECTIVITY statement for a name. RELATIONS may have only one CONNECTIVITY.
215	RWLIS2	ALREADY CONTAINS WITH DIFFERENT SYSTEM PARAMETER Attempt to specify the same CONSISTS statement, but with two different SYSTEM-PARAMETERS.
216	OTHERS	NAME MUST BE ENTITY NAME BEFORE VIA Attempt to use a name in a statement where only an ENTITY name is allowed.
217	OTHERS	NAME MUST BE RELATION AFTER VIA Attempt to use a name in a statement where only a RELATION name is allowed.
218	OTHERS	RELATION ALREADY EXISTS BETWEEN DIFFERENT ENTITY PAIR Attempt to specify the same RELATION for a different pair of ENTITIES. Different ENTITY pairs imply different RELATIONS.

219	CLSECA	FILE= NOT ALLOWED IN THIS IMPLEMENTATION Attempt to use a name in a statement where only a CONDITION name is allowed.
220	SETSYN	CANNOT MAKE A NAME FOR ITSELF Attempt to specify a basic name as a synonym for itself. Basic names cannot also be synonyms.
221	NLIST	TOO MANY NAMES - REST IGNORED Attempt to specify a list of names for a statement where only a single name is acceptable.
222	CONSUM	NAME MUST BE AN INTERVAL Attempt to use a name in a CONSUMES statement where only an INTERVAL can be used.
223	RWLIS2	INCONSITENCY IN "HAPPENS WITHIN" STATEMENT. Same INTERVAL same SECTION different SYSPAR.
224	OPTRW	NAME MUST BE AN ELEMENT OR CONDITION. Attempt to use a name in a DEPENDING ON statement where only ELEMENTS and CONDITIONS may be specified.
225	RWLIST	CANNOT HAVE KEYWORD FOR KEYWORD Attempt to assign a KEYWORD to a KEYWORD name.
228	RWLIST	CANNOT HAVE SECURITY FOR SECURITY Attempt to assign a SECURITY statement to a SECURITY name.
229	RWLIST	CANNOT HAVE SOURCE FOR SOURCE Attempt to assign a SOURCE to a SOURCE name.
231	RWLIST	SYNONYMS ONLY APPLIED TO FIRST NAME Attempt to assign a SYNONYM to more than one name. The SYNONYM is given only to the first name.
232	APPLES	APPLIES STATEMENT ILLEGAL WITH THIS NAME TYPE Attempt to use APPLIES statement for a name which is not a KEYWORD, MAILBOX, SECURITY or SOURCE.
233	DEFN	TOO MANY NAMES IN DEFINE HEADER - REST

		IGNORED Exceeded 50 name limit, remaining names should be given in another statement.
234	OPTRW	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name in a wrong context. Only a PROCESS name can be used in this context.
235	OPTION	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name in wrong context for an UPDATES relationship.
236	OPTION	NAME LIST TOO LONG - REST IGNORED
237	DPFRC	WARNING. "DEPENDING" INFO IN A DATA BASE. A depending relationship has not been specified. ALL depending relationships have been deleted.
238	DPFRC	WARNING. "FOR EACH" INFO IN A DATA BASE. A for each relationship has not been specified. ALL for each relationships have been deleted.
239	DPFRC	NAME NOT IN DATA BASE. Attempt to delete a relationship which is not defined in the data base.
240	APPLES	KEYWORD CANNOT APPLY TO KEYWORD Attempt to use the APPLIES statement in the wrong context.
241	APPLES	MAILBOX CAN ONLY APPLY TO PD Attempt to use the APPLIES statement in the wrong context.
242	QROPEN	ATTEMPT TO OPEN TOO MANY Q FILES - SYSTEM ERROR
243	QWOPEN	ATTEMPT TO OPEN TOO MANY Q FILES - SYSTEM ERROR
244	INPAPA	COMMANDS IN INCORRECT SEQUENCE
245	GETSEC	*** SYSTEM ERROR
246	APPLES	SECURITY CANNOT APPLY TO SECURITY Attempt to use the APPLIES statement in the wrong context.

247	APPLES	SOURCE CANNOT APPLY TO SOURCE Attempt to use the APPLIES statement in the wrong context.
248	APPLES	MEMO CANNOT APPLY TO MEMO Attempt to use the APPLIES statement in the wrong context.
249	APPLES	INVALID SECTION - WOOPS URA software error. Please notify persons maintaining URA should this error occur.
250	LIOFRE	*** SYSTEM ERROR
251	SNAMET	ATTEMPT TO CHANGE TYPE WHEN ALREADY TYPED URA software error. Please notify persons maintaining URA should this error occur.
252	SETSYN	SYNONYM TABLE OVERFLOW Exceeded URA limits. The user should reissue INPUT-PSL command at point in the input file where this error occurred.
253	RWLIST	INVALID STATEMENT NUMBER URA software error. Please notify persons maintaining URA should this error occur.
254	NAMCR	*** SYSTEM ERROR *** CANNOT CREATE SYNONYM URA software error. Please notify persons maintaining URA should this error occur.
255	SYNTH	NUMBER NOT ALLOWED AS SYSPAR THIS VERSION OF URA
256	RWLIST	CONNECTION ALREADY EXISTS WITH DIFFERENT VALUE OR NAME URA software error. Please notify persons maintaining URA should this error occur.
257	FORMSL	NAME NOT IN DATA BASE -
258	DPFRC	NAME NOT IN DATA BASE. Attempt to delete a relationship which is not defined in the data base.
259	DPFRC	THESE TWO NAMES NOT CONNECTED IN THAT WAY. Attempt to delete a relationship which is

		not defined in the data base.
260	SORTMD	*** SYSTEM ERROR
261	DPFRC	"DEPENDING" OR "FOR EACH" NAME NOT IN DATA BASE. Attempt to delete a relationship which is not defined in the data base.
262	DPFRC	"DEPENDING" OR "FOR EACH" INFO NOT IN THE DATA BASE. Attempt to delete a relationship which is not exactly as it is in the data base. Relationship is not deleted.
263	RWLIS2	INCONSISTENCY IN "HAPPENS AFTER" STATEMENT. Same INTERVAL same SECTION different SYSPAR
264	RWLST2	INCONSISTENCY IN "HAPPENS WITHIN" STATEMENT. Same INTERVAL same SECTION different SYSPAR.
265	RWLIST	CONNECTION ALREADY EXISTS WITH DIFFERENT VALUE OR NAME Attempt to specify same relationship between two INTERVAL names though with different SYSTEM-PARAMETER. Not allowed.
266	ILLST	ILLEGAL STATEMENT IN THIS SECTION Attempt to use a URL statement in a wrong context. See "User Requirements Language, Version 3.3, Language Reference Manual".[1]
267	ILLST	NO CURRENT SECTION Attempt to use an illegal section header statement. See "User Requirements Language Reference Manual".[1]
268	RWLST2	INCONSISTENCY IN "HAPPENS AFTER" STATEMENT. Same INTERVAL same SECTION different SYSPAR.
269	NLIST	NAME LIST TOO LONG, REST IGNORED Limit of 50 names has been exceeded. Remaining names should be given in another statement.

[1] Part II of the URL User's manual.

270	INPAR	ERROR OPENING DATA BASE - MUST ABORT Attempt to use an inconsistent data base. No processing can be done on it. (See section 10.1.)
271	MAINCNC	NAME NOT IN DATA BASE Attempt to retrieve information for a name not defined in the data base.
272	CNCBLD	TOO MANY ROWS - STOPPING HERE Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another CNC command.
273	CNCBLD	NAME DOESN'T CONSIST OF ANYTHING No information can be presented for this name in the matrix.
274	CNCBLD	TOO MANY LEVELS - LOWER LEVEL STUFF IGNORED Too many levels of CONSISTS information to be presented.
275	CNCBLD	***THE FOLLOWING NAMES ARE INVOLVED IN A LOOP: This problem should be corrected by modifying the CONSISTS statements for these names.
276	CNCBLD	TOO MANY LEVELS - LOWER LEVEL STUFF IGNORED Too many levels of CONSISTS information to be presented.
277	CNCBLD	TOO MANY COLUMNS - STOPPING HERE Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another CONSISTS-COMPARISON command.
278	CNCBLD	SPARSE MATRIX OVERFLOW - STOPPING HERE Exceeded limits of software that produces the matrix.
279	CNCSUM	***NO COLUMNS, OR NO ROWS - STOPPING No relationships can be specified about the names used as input, so no matrix will be generated.
280	CNCSUM	LESS THAN 2 ROWS, NO SIMILARITY MATRIX Not enough information is available to generate a matrix.

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USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
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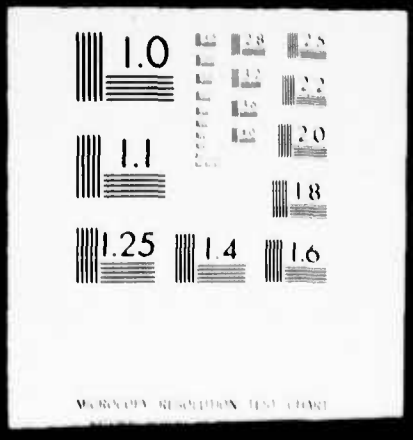

281	CNCSUM	SPARSE MATRIX OVERFLOW - STOPPING Exceeded limits of software that produces the matrix.
282	MUST	STACK OVERFLOW - CONTINUING Exceeded limits of software that produces the report. An attempt is made to recover and process as much data as possible.
283	HAVE	STACK OVERFLOW - CONTINUING Exceeded limits of software that produces the report. An attempt is made to recover and process as much data as possible.
284	MAINSTP	TOO MANY LEVELS - CONTINUING Exceeded limits of software that produces the report. An attempt is made to process as much data as possible.
285	ERRPS	THE FOLLOWING NAMES ARE INVOLVED IN LOOPS Through incorrect specification of PARTS/SUBPARTS statements, loops have been implied in structures of objects in the problem statement. The user should determine which PARTS/SUBPARTS relationships should be changed and delete them via the DELETE-PSL command.
286	FRINTV	NO FREQUENCY INFORMATION IN DATA BASE No HAPPENS statements have been specified in the problem statement stored in the data base. If any output is desired from this report, at least one HAPPENS statement must be in the data base.
287	MAINIDX	NO NAMES IN INDEX Attempt to generate an index into a report presenting no information about any names. This is merely a warning.
288	STATPS	NO NAMES AT LEVEL ONE Attempt to generate STRUCTURE report for names of particular name type (i.e., PROCESS, INPUT, OUTPUT or INTERFACE), but no names of this type currently exist in the data base. To generate this report for PROCESS names, for example, at least one PROCESS must be defined in the data base.
289	PCLERT	NO PICTURE AVAILABLE FOR Attempt to generate a PICTURE for names

		which legally have a PICTURE, but no information that was specified for this name can be presented in PICTURE format. Information that may be presented in a PICTURE is any dealing with interaction of data and PROCESSES and structure (CONSISTS and SUPPARTS statements).
290	SETSYN	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to assign a name of UNDEFINED name type as a SYNONYM to another name which has been used in some context in conflict with the manner in which the UNDEFINED name has been used.
291	INPDUM	ERROR OPENING DATA BASE FOR -
292	INPDUM	DATA BASE IS EMPTY
293	MAINPRES	INVALID INPUT CODE
294	INPRES	ERROR OPENING DATA BASE FOR -
295	INPRES	DATA BASE MUST BE EMPTY
296	ABPRES	****** RUN ABORTED ******
297	INPRES	NULL OR INVALID FIRST CARD
298	GETDMC	SEQUENCE ID OUT OF ORDER
299	GETDMP	SEQUENCE ID OUT OF ORDER
300	PUTRNG	INVALID RANGE SPEC
301	IDENTR	***TOO MANY COLUMNS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another ENTITY-IDENTIFIER command.
302	IDENTR	***TOO MANY ROWS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another ENTITY-IDENTIFIER command.
303	IDENTR	***MATRIX OVERFLOW -- MUST STOP HERE*** Exceeded limits of software that produces the matrix.

304	IDENTF	THE FOLLOWING NAMES DO NOT IDENTIFY ANYTHING: No information can be presented in the matrix for these names because they do not "IDENTIFY" any ENTITIES.
305	IDENTC	***TOO MANY COLUMNS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another ENTITY-IDENTIFIER command.
306	IDENTC	***TOO MANY ROWS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another ENTITY-IDENTIFIER command.
307	IDENTC	***MATRIX OVERFLOW -- MUST STOP HERE*** Exceeded limits of software that produces the matrix.
308	IDENTC	THE FOLLOWING NAMES ARE NOT IDENTIFIED BY ANYTHING: No information can be presented in the matrix for these names because no "IDENTIFIED" relationships have been specified for them.
309	CONROW	***TOO MANY COLUMNS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another CONSISTS-MATRIX command.
310	CONROW	***TOO MANY ROWS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another CONSISTS-MATRIX command.
311	CONROW	THE FOLLOWING ARE NOT CONTAINED IN ANYTHING: No information can be presented in the matrix for these names because no "CONTAINED IN" relationships have been specified for them.
312	CONFOW	***MATRIX OVERFLOW -- MUST STOP HERE*** Exceeded limits of software that produces this matrix.
313	CONCOL	***TOO MANY COLUMNS -- MUST STOP HERE*** Exceeded limits of software that produces

		the matrix. Names omitted from the matrix should be used as input to another CONSISTS-MATRIX command.
314	CONCOL	***TOO MANY ROWS -- MUST STOP HERE*** Exceeded limits of software that produces the matrix. Names omitted from the matrix should be used as input to another CONSISTS-MATRIX command.
315	CONCOL	THE FOLLOWING DO NOT CONSIST OF ANYTHING: No CONSISTS statements have been used in conjunction with the names listed.
316	CONCOL	***MATRIX OVERFLOW -- MUST STOP HERE*** Exceeded limits of software that produces this matrix.
317	CHKREL	NAME ALREADY USED IN DIFFERENT CONTEXT Attempt to use a name in a context different from its initial context.
318	RCOD5	INVALID T CODE - SYSTEM ERROR
319	RCOD5	INVALID T CODE - SYSTEM ERROR
320	RCOD5	INVALID T CODE - SYSTEM ERROR
321	RCOD6	INVALID T CODE - SYSTEM ERROR
322	RCOD6	INVALID T CODE - SYSTEM ERROR
323	RCOD6	INVALID T CODE - SYSTEM ERROR
324	RCOD6	MISSING CODE 10 CARD - SYSTEM ERROR
325	CLCM	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
326	CLCNC	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
327	CLCONT	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
328	CLCT	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
329	CLDCOM	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
330	CLDEL	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
331	CLDICT	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
332	CLDP	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
333	CLDP	MUST GIVE DATA OR PROCESS PARAMETER

334	CLDPSL	INPUT= NOT ALLOWED IN THIS IMPLEMENTATION
335	CLEI	FILE= PARAMETER NOT ALLOWED IN THIS IMPLEMENTATION
336	CLFPS	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
337	CLIP	INPUT= NOT ALLOWED IN THIS IMPLEMENTATION
338	CLKWIC	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
339	CLNG	EMPTY NOT ALLOWED IN THIS IMPLEMENTATION
340	CLPCOM	EMPTY NOT ALLOWED IN THIS IMPLEMENTATION
341	CLPAV	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
342	CLPCOM	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION
343	CLPIC	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
344	CLPRIO	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
345	CLRCOM	INPUT= NOT ALLOWED IN THIS IMPLEMENTATION
346	CLREN	INPUT= NOT ALLOWED IN THIS IMPLEMENTATION
347	CLFPS	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION
348	CLFPS	EMPTY NOT ALLOWED IN THIS IMPELEMENTATION
349	CLNG	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION
350	CLPRIO	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION
351	CLPRIO	EMPTY NOT ALLOWED IN THIS IMPLEMENTATION
352	RCOD1	RAN OUT OF ROOM IN DATA BASE - MUST ABORT
353	RCOD3	RAN OUT OF ROOM IN DATA BASE - MUST ABORT
354	RCOD4	RAN OUT OF ROOM IN DATA BASE - MUST ABORT
355	RCOD5	RAN OUT OF ROOM IN DATA BASE - MUST ABORT
356	RCOD6	RAN OUT OF ROOM IN DATA BASE - MUST ABORT
357	CLPRIO	PUNCH AND EMPTY PARAMETERS NOT IMPLEMENTED - IGNORED
358	FORMSL	ILLEGAL NAME TYPE FOR FPS
359	GETSLV	NO NAMES IN DATA BASE

360	OPTION	NAME MUST BE ELEMENT OR CONDITION.
361	OPTION	NAME MUST BE ELEMENT, ENTITY, INPUT, OUTPUT, GROUP, SET.
362	UMU	TOO MANY UNIQUE ACCOUNT NAMES - PROGRAM NEEDS MODIFICATION. There are too many Account-Project names in the Statistics file. Notify persons maintaining the URA software if it is necessary to handle this many Account names.
363	UMC	WRONG FORMAT FOR A STATISTICS FILE. Either the input file is not a Statistics file or it is in the wrong format.
364	UMC	WRONG FORMAT FOR A STATISTICS FILE. Either the input file is not a Statistics file or it is in the wrong format.
365	EPSUCC	BOTH FORWARD AND BACKWARD SPECIFIED. FORWARD and BACKWARD are conflicting parameters and only one should be specified.
366	MAINIC	NAME IS NOT AN INTERVAL. The name given as input to the report is not an interval.
367	INTSTR	NO MORE SPACE FOR ALLOCATING NEW TABLES. The allocation of the five different arrays needed by the RC report was impossible. Restrictions or memory caused this error.
368	CTYCHIC	RAN OUT OF SPACE IN TABLES. Too many different interval names were encountered in the structure of the top interval name. Consistency check will not be performed properly.
369	MAINIC	NAME NOT FOUND IN DATA BASE.
370	MAINDA	NAME NOT IN DATA BASE - Attempt to retrieve information about a name which is not defined in the data base.
371	MAINDA	INVALID NAME TYPE - Attempt to use a name which is not a PROCESS, INPUT, CONDITION, or EVENT name as input to the command.

372	BLDMAT	ROW AREA OVERFLOWED. Exceeded limits of the software that produces the matrix. Input names omitted from the Matrix should be used as input to the next DA command.
373	SUCORS	COLUMN AREA OVERFLOWED. Exceeded limits of the software that produces the matrix.
374	SUCORS	MATRIX ROUTINES OVERFLOW. Exceeded Limits of the software that produces the matrix.
375	SUCORS	STACK OVERFLOW. The number of successors for the input name given is too great. This is a software limitation.
376	DASUM	MATRIX ROUTINES OVERFLOW. Exceeded limits of the software that produces the matrix.
377	DASUM	NO ROWS IN MATRIX There are no rows in the matrix, so it will not be generated.
378	DASUM	NO COLUMNS IN MATRIX No dynamic relationships can be specified about the names used as input, so no matrix will be generated.
379	DASORT	MATRIX ROUTINES OVERFLOW Exceeded limits of the software that produces the matrix.
380	COREL1	STACK OVERFLOW, PICTURE NOT COMPLETE. The number of successors for the input name given is too great. This is a software limitation.
381	CLEP	PUNCH=NOT ALLOWED IN THIS IMPLEMENTATION
382	REL4	STACK OVERFLOW, PICTURE NOT COMPLETE. The number of successors for the input name given is too great. This is a software limitation.
383	CLPC	PUNCH= NOT ALLOWED IN THIS IMPLEMENTATION.
384	STNDUP	STACK OVERFLOW - SYSTEM LIMITATION
385	MAINFROP	NO VALID NAMES.

Either no interval names exist in the data base or no interval names with happens relation were encountered in the data base. The file which would be sorted is empty.

386 DOINTV NO HAPPENS RELATION FOR
The interval name does not contain a HAPPENS relation.

387 RECBLD NO SYSTEM PARAMETER CONNECTED TO
The HAPPENS relation that exists between an interval and a name does not contain a system parameter. Check that the input to the data base was performed properly.

388 RECBLD NO EVENT CONNECTED TO
A HAPPENS relation of the type WITHIN AFTER or AFTER does not contain an EVENT connected to the name and the interval name. Check that the input to the data base was performed properly.

389 CLPC HORIZONTAL BOXES TOO LARGE FOR NUMBER OF COLUMNS ON PAGE
The number of horizontal boxes specified will not fit in the number of columns specified.

390 CLPC VERTICAL BOXES TOO LARGE FOR NUMBER OF ROWS ON PAGE
The number of vertical boxes specified will not fit in the number of rows per page specified.

391 FILMAT NAME NOT IN DATA BASE -

392 FILMAT NAME NOT EVENT OR PROCESS

393 FILMAT SPARSE MATRIX TABLE OVERFLOW, PICTURE NOT COMPLETE
The process chain has gotten too large for the software to handle. This is a system limitation, and to resolve this, the number of links must be decreased.

394 REL1 STACK OVERFLOW, PICTURE NOT COMPLETE
The number of successors for the given input name is too great. This is a software limitation.

395 FILMAT LINK LIMIT SPECIFIED WAS REACHED
This is not so much an error, as a note. To obtain a more complete process chain

picture, the maximum number of links must be increased.

396 CLEP HORIZONTAL BOXES TOO LARGE FOR NUMBER OF COLUMNS ON PAGE
The number of horizontal boxes specified conflicts with the number of columns specified.

397 CLEP VERTICAL BOXES TOO LARGE FOR NUMBER OF ROWS ON PAGE
The number of vertical boxes specified conflicts with the number of rows per page specified.

398 CLEP NEITHER DATA-FLOW NOR STRUCTURE WAS SPECIFIED
Either DATA-FLOW or STRUCTURE must be specified (but not both).

399 CLEP NEITHER FORWARD NOR BACKWARD WAS SPECIFIED
Either FORWARD or BACKWARD must be specified (but not both).

400 CLDA FILE= PARAMETER NOT ALLOWED IN THIS IMPLEMENTATION.
Attempt to use illegal parameter. Check the "User Requirements Analyzer User's Manual" for the manner in which a list of names may be specified to the command.

408 CLEP NEITHER UPWARD NOR DOWNWARD WAS SPECIFIED
Either UPWARD or DOWNWARD must be specified (but not both).

409 MAINEP NAME NOT FOUND IN DATA BASE

410 EPSUCC NAME NOT ACCEPTABLE TYPE FOR EP REPORT
The name given does not have the correct name type for this report. The possible name types are: PROCESS, REAL WORLD ENTITY, INPUT, ELEMENT, GROUP, OUTPUT, ENTITY, SET, UNDEFINED.

411 EPSUCC LINK LIMIT SPECIFIED WAS REACHED
This is not so much an error, as a note. To obtain a more complete Extended Picture, the maximum number of links must be decreased.

412 EPSUCC SPARSE MATRIX TABLE OVERFLOW, PICTURE NOT COMPLETE
Due to software limitations, the Extended

		Picture could not be completed. To resolve this, the maximum number of links must be decreased.
413	REL2	STACK OVERFLOW, PICTURE NOT COMPLETE The number of successors for the input name given is too great. This is a software limitation.
414	REL3	STACK OVERFLOW, PICTURE NOT COMPLETE The number of successors for the input name given is too great. This is a software limitation.
415	CLEP	BOTH DATA-FLOW AND STRUCTURE SPECIFIED Either DATA-FLOW or STRUCTURE must be specified, but not both.
416	CLEP	CONFLICTING PARAMETERS, FORWARD AND BACKWARD OR UPWARD AND DOWNWARD Either FORWARD or BACKWARD must be specified, but not both. The same applies to UPWARD and DOWNWARD.
417	CLPC	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
418	CLEP	FILE= NOT ALLOWED IN THIS IMPLEMENTATION
419	CRLTYP	INVALID RELATION TYPE FOR PL REPORT URA Software error. Please notify persons maintaining URA should the error occur.
420	CLEP	BOTH FORWARD AND BACKWARD SPECIFIED. FORWARD and BACKWARD are conflicting parameters and only one should be specified.
421	CLEP	BOTH THREAD AND BACKWARD SPECIFIED. THREAD and BACKWARD are conflicting parameters and only one should be specified.
422	CLEP	NEITHER FORWARD, THREAD, NOR BACKWARD SPECIFIED. Either FORWARD, THREAD, or BACKWARD must be specified.
423	CLEP	BOTH UPWARD AND DOWNWARD SPECIFIED. UPWARD and DOWNWARD are conflicting parameters and only one should be specified.
424	CLEP	BOTH STRUCTURE AND THREAD SPECIFIED.

		STRUCTURE and THREAD are conflicting parameters and only one should be specified.
425	CLEP	NEITHER DATA-FLOW, THREAD, NOR STRUCTURE SPECIFIED. Either DATA-FLOW, THREAD, or STRUCTURE must be specified.
428	COMENT	DATA BASE OVERFLOW
429	COMFW	DATA BASE OVERFLOW
430	NAMCR	DATA BASE OVERFLOW
431	NUMCR	DATA BASE OVERFLOW
479	MAINCT	WARNING - ERRORS WERE ENCOUNTERED
481	CLILOP	INVALID COMMAND -
493	PCR	ILLEGAL ARITHMETRIC EXPRESSION. Arithmetic expression which is to be parsed does not meet the rules, and/or logically incorrect.
494	PCR	ILLEGAL OPERATOR> There is an operator in the expression which is not legal (i.e., not specified in the user's manual) and the program does not understand the operation.
495	PCR	NON-NUMERIC OPERAND An isolated component in the expression has the form of a legal URA name, but it is neither a system parameter nor an attribute in the data base.
496	PCR	NAME DOES NOT HAVE ATTRIBUTE An isolated component i nthe expression is found to be an attribute-name in the data base but the attribute-name is not specified for the input name.
497	PCR	ATTRIBUTE DOES NOT HAVE NUMERIC VALUE An isolated component in the expression is found to be an attribute-name specified for the input name but the attribute-name does not have a numeric value associated with it.
498	PCR	NEGATIVE VALUE FOR LN OR LOG LN or LOG cannot evaluate negative values. An operand or an arithmetic

		expression in the braces following LN or LOG has a negative value.
499	PCR	ZERO DENOMINATOR. An operand following the operator '/' has the value of zero.
500	PCR	NAME NOT FOUND IN DG - The name for which the arithmetic expression is to be evaluated cannot be found in the data base.
504	F3DCON	NAME NOT IN DATA BASE
505	F3DCON	NAMES NOT CONNECTED IN THAT FASHION
511	APPLES	TRACE-KEY CANNOT APPLY TO TRACE-KEY
512	RWLIST	CANNOT HAVE TRACE-KEY FOR TRACE-KEY
513	ASSERT	TOO MANY TRIPLES, PLST IN THIS STMT IGNORED
514	RWLIS2	ALREADY GIVEN WITH DIFFERENT ATTRIBUTE VALUE
515	UNASRT	NAMES NOT CONNECTED
521	DOOPTR	UNBALANCED PARENTHESES IN SELECTION STRING
522	GETATR	ATTRIBUTE DOESN'T APPLY TO ANYTHING There are no names which have the given ATTRIBUTE.
523	GETNML	NO NAMES WHICH MATCH CRITERION There are no names in the data base which satisfy the selection criteria.
524	NGEVAL	*** SOFTWARE ERROR
525	NGPRS	NAME ON RIGHT DOES NOT MATCH TYPE ON LEFT
526	NGPRS	INVALID SELECTION STRING The selection string given as a parameter for the Name-Gen report is not a legal boolean expression.
527	NGPRS	INVALID ITEM IN SELECTION STRING The item given in the selection string is not a legal operand or a legal operator.
528	PREPAR	TOO MANY ORDER PARAMETERS More than five ORDER parameters have been

		given, or the ORDER parameters have been given incorrectly.
529	PREPAR	NAME IN ORDER LIST NO ATTRIBUTE The name given in the order list is not an ATTRIBUTE.
530	PREPAR	NAME IN ORDER LIST NOT IN DATA BASE
531	PREPAR	NAME IN ORDER LIST TOO LONG The name given has more than 30 characters.
532	GETNMR	NO NAMES WHICH MATCH CRITERION There are no names in the data base which satisfy the selection criteria.
533	NGPRS	*** SOFTWARE ERROR
534	OPTMZ	*** SOFTWARE ERROR
535	NGPPS	TOO MANY LEVELS, MAX OF 50 ALLOWED Too many levels have been specified via the SUBPARTS-OF and SUBLEVEL paramter.
553	CONSM	NAME MUST BE RESOURCE-USAGE-PARAMETER
554	CONSM	NAME LIST TOO LONG - REST IGNORED
560	RWLIS2	INCONSISTENCY IN CLASSIFICATION STATEMENT
561	RWLIS2	INCONSISTENCY IN SECURITY-ACCESS-RIGHT STATEMENT
562	RWLIS2	INCONSISTENCY IN RESOURCE-USAGE STATEMENT
563	RWLIS2	INCONSISTENCY IN RESOURCE-USAGE-PARAMETER-VALUE STATEMENT
565	IGKEY	SOFTWARE ERROR *** SHOULD NOT OCCUR ***
569	RWLIS2	INCONSISTENCY IN CONSUMES/CONSUMED STATEMENT

10. HOW TO CORRECT ERRORS

Once error situations are detected, there must be some method to deal with them. When the errors are caused by problems in generating a report, no action need be taken as no harm will come to the data base. The Report Command can simply be restated in correct format to solve the problem. If, however, an error is encountered in making modifications to the data base (via Modifier Commands) then some immediate action should be taken if the problem definer desires to maintain a correct and complete problem statement.

The errors discovered in making modifications to the data base can be "Input Errors" which are errors discovered by URA in its attempt to process the information needed to update the data base. All these errors are specified by one or more URA error messages. The majority of these errors occur in the process of using the INPUT-PSL command.

The errors discovered in the problem statement by the problem definer are called "Logical Errors." No error diagnostics are generated by URA to denote that an error has occurred. If a name was misspelled in the input information used for INPUT-PSL, the name could be legal by URL/URA conventions yet not correct from the problem definer's standpoint. "BATCH" and "BATHC" are both names that would be perfectly acceptable to URA but not to the problem definer.

The following two sections deal with aiding the problem definer in correcting both Input Errors and Logical Errors should they occur. Treatment of the error correction methodology is still at a cursory level and no attempt is made to present procedures to correct all possible errors.

10.1 Input Errors

As stated before, all input errors cause URA error diagnostics to be printed. There are a few classes of errors which happen again and again and so will be described below.

Inconsistent Data Base

This error is usually identified by getting the URA error: "URA270: INPAB: ERROR OPENING DATA BASE-MUST ABORT." This error might occur after issuing a URA Modifier or Report Command and it specifies that the contents of the file being used as a URA data base cannot be accessed by the URA software. Methods for correcting this situation are installation-dependent since it involves the manner in which files are created and initialized. See section 9 of Part II for solutions to this problem at a particular installation.

Data Base In Use

On some computer operating systems (e.g., MULTICS), it is not possible to prevent two users of URA from accessing the same data base simultaneously for both retrieval and update. In these cases it must be the responsibility of the user to insure that no other user is concurrently accessing the same data base. Otherwise, a data base can become inconsistent.

No URA error messages are produced when two or more users access the data base concurrently. However, if a user attempts to physically rewrite a part of the data base when another write operation is underway, the operating system will abnormally terminate the command. Section 4.3 of Part II describes Multiple Data Base Usage in more detail.

URA Statement Errors

These errors account for the majority of the errors encountered when inputting information into the data base via INPUT-PSL. These errors are caused by improper use of URL statements according to the rules specified in the "User Requirements Language, Version 3.3, Language Reference Manual."[1] An occurrence of any of these errors results in the statement, where the error occurred, being ignored by the system.

The "$" character printed by URA is usually fairly close in pointing out where the error occurred. Some of the more common errors (and solutions) are presented here in hopes that the users will be able to apply the methods of solving these errors to their own, specific needs.

i) Syntax Errors

These errors are often encountered through misspellings, improper format of the statement or improper usage of URL reserved words. URA usually generates either of the two error messages:

```
URA010:REDUCE: NO APPLICABLE PRODUCTION-SYNTAX ERROR-START
SKIPPING
```

or,

```
URA011:STACK: ILLEGAL SYMBOL PAIR-SYNTAX ERROR-START SKIPPING
```

For example, if upon misspelling the RECEIVES statement:

```
RECEIVES FOLDER-A,FOLDER-B;
```

---

[1] Part II, URL User's Manual.

URA will react by printing the URAC10 error message and skip that statement to go on to the next. There are some further problems that can then occur. If the error occurred in a header statement, such as PROCESS, then the header statement is skipped and all statements intended to be related to the header statement will be related to the previous header statement. When a reserved word is misspelled, URA has no way of knowing if the statement was to be a header statement or not. Take the example:

```
GROUP: G1;
CSTS: E1, E2, G2;
PROCCESS: P1;
RCVS: I1, I2;
SUBPARTS: P2, P3;
ELEMENT: E1, E2;
```

PROCESS has been misspelled which results in having that header statement skipped. All the statements following this header are related to the previous header which leads to more problems since statements which can only be associated to a PROCESS are being attributed to a GROUP name. More errors will occur from this resulting; hence, the PROCESS, RCVS and SUBPARTS statements will not be entered into the data base. To correct this error, the statements that were omitted could be entered by another INPUT-PSL command. A far more serious problem occurs if the "previous" header was also a PROCESS. For example:

```
PROCESS PX;
RCVS: I1, I3;
GENS: O1, O2;
PROCCESS P1;
RCVS I1, I2;
SUBPARTS P2, P3;
ELEMENT E1, E2;
```

If this were the case, then only one error would be caught by URA (the misspelled "PROCESS") and the following RCVS and SUBPARTS statements would be attributed to PROCESS PX. If this mistake were discovered, the user would have to delete the two statements from PX and then reinput the information for P1:

```
DELETE-PSL
PROCESS PX;
RCVS I1,I2;
SUBPARTS P2,P3;
EOF
INPUT-PSL UPDATE
PROCESS P1;
RCVS I1,I2;
SUBPARTS P2,P3;
EOF
```

ii) Illegal Statement

This error is designated by the URA error:

URA266:ILLST: ILLEGAL STATEMENT IN THIS SECTION

This error can be caused simply by using a statement that is not allowed for that particular section. Using a CONSISTS statement in a PROCESS section would obviously generate this error. The other case occurs when an error is made in a header section statement and all the following statements might be incompatible with the previous header section name. Whenever this error is encountered, the statement is not put into the data base.

iii) Illegal Header Statement

If an error occurs in a header statement and URA is able to identify it as a header statement, the following error will be given:

URA025:HEAD: INVALID HEADER STATEMENT-STATEMENTS WILL BE IGNORED

This means that all the statements up to the next header statement will be ignored and not input into the data base. All the statements ignored must be reinputted using another INPUT-PSL command to be put into the data base.

iv) Input Line Too Long

If a number of URL statements are used on one line of the input file or if the URL statement is very long, it may run over the 72 column restriction. Should this occur, usually URA010 or URA011 will be generated specifying that improper syntax has been encountered. Note that no error message is generated for the fact that the statement runs over the 72 column restriction. Errors are encountered because anything over column 72 is ignored. Therefore, names may be truncated or a semicolon lost.

v) Name Too Long

It is an easy thing to mistake a 31 or 32 character word for 30 characters. Names longer than 30 characters are caught by URA and flagged by the error:

URA002:NLEX: NAME TOO LONG

The statement that used the name is still entered into the data base but the name is stored in a truncated form in the data base. If the truncated form of the name is not satisfactory, it is a simple matter to change the name via the RENAME command.

vi) Using URA Reserved Words Incorrectly

Most syntax errors are fairly easy to detect; a misspelled word, improper format, etc., but one of the hardest to detect is the improper use of a URL reserved word. For example, the following statement would be flagged by a URADIO or URAOU error message as having a syntax error:

```
ATTRIBUTE TYPE A;
```

The letter "A" happens to be a URL optional word and cannot be used as a user-defined name. Detecting these reserved words can get trickier than this, however, as the statment:

```
PROCESS D,F,G,K;
```

seems correct, but "F" is the abbreviation of the URL reserved word "FALSE." The key to finding these errors is to watch where the "$" character is printed by URA. It is usually printed directly after the location of the source of the error. The statement is ignored should this type of error occur and the only solution is to reinput the data using a different name. A list of all URL reserved words is given in Appendix B of the "User Requirements Language, Language Reference Manual."[1]

vii) Synonym Too Complicated

This error is specified by the URA error:

```
URA206:SETSYN: UNABLE TO MAKE SYNONYM-TOO COMPLICATED
```

This is caused by specifying various relationships about two names and then attempting to make one a SYNONYM of the other. The problem lies in combining these relationships. The statements:

```
GROUP G1;
USED BY P2;
PROCESS LONG-PROCESS-NAME;
SUBPARTS P3,P4;
SYNONYM P2;
```

will generate the error. P2 is implicitly defined to be a PROCESS just in the context in which it is used in the second statement; it also has a relationship with G1. Now LONG-PROCESS-NAME is defined and has relationships formed with P3 and P4. In the last statement, an attempt was made to make P2 and LONG-PROCESS-NAME the same PROCESS and the error is generated. The whole problem could have been avoided if the user had maintained the convention of issuing SYNONYM statement

---

[1] Part II, URL User's Manual.

directly after the header statement as shown below:

```
GROUP G1;
USED BY P2;
PROCESS LONG-PROCESS-NAME;
SYNONYM P2;
SUBPARTS P3;P4;
```

If the statements had been inputted in this manner, LONG-PROCESS-NAME would not have had any relationships formed with other names (P3 and P4 in the previous example) and the assignment of P2 as a SYNONYM would have been successful.

Since the error does occur, there exists a method of correcting this problem:

1) Retrieve all information for one of the names via the PUNCH parameter for the FPS command.

2) Delete the name for which the information was retrieved from the data base.

3) Alter the PUNCH information so that all the information now pertains to the name still in the data base.

4) Enter the modified PUNCH information as input to the INPUT-PSL command.

In this way, all information about P2 is given to LONG-PROCESS-NAME and P2 is assigned as a SYNONYM if future references to the name are necessary. It is much easier to maintain the convention of assigning SYNONYMS directly after the header statement.

viii) Names Used in Wrong Context

This type of error accounts for the majority of the error messages presented in Section 9.

```
URA202:NLIST: NAME PREVIOUSLY USED DIFFERENTLY-IGNORED
```

is an example of diagnostics presented for this type of error. The statement will be ignored and the only way to resolve the problem is to reinput the information in an acceptable format.

ix) Breaking Section/Statement Rules

Several error messages can be generated by attempting to break the rules set forth in the "User Requirements Language, Version

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[1] Part II, URL User's Manual.

3.3, Language Reference Manual,"[1] for statements within a particular section. In using the PART statement, for example, an object may be PART of only one object and failure to comply with this rule will result in:

URA061:RWLIST: ALREADY PART OF SOMETHING ELSE

or some analogous URA error message. These error checks are made to enforce the rules set forth in the "Language Reference Manual" and ensure that the problem statement is still meaningful. Other messages presented for this type of error are:

URA214:OTHERS: CONNECTIVITY ALREADY GIVEN FOR THIS RELATION

or,

URA060:APPLES: SECOND MAILBOX FOR PD ILLEGAL

If the user wishes to replace the information stated in the data base, e.g., replace the MAILBOX for a problem definer, the relationship should be deleted via DELETE-PSL and then the correct information should be inputted using the INPUT- PSL command.

10.2 Logical Errors

These errors occur when inputting information into the data base (as input errors do), but no diagnostics are given in the AS-IS SOURCE LISTING. These errors might be detected by scanning the complete list of names in the data base (NAME-GEN) and the complete problem statement (FORMATTED-PROBLEM-STATEMENT). These errors can also be detected when reviewing the contents of any of the other reports available on URA.

Misspelled Names

A simple spelling error can result in two names which look very similar, but which are treated as two different objects in the data base.

For example, if the name, "CALENDAR-DAY" was used to specify a particular INTERVAL in the data base and then "CALENDAR-DAYS" is used in the statements.

```
INTERVAL: CALENDAR-week;
CONSISTS: 7 CALENDAR-DAYS;
```

the two names become completely different objects (to URA). URA does not know that the two are the same object and it is up to the user to detect and correct this mistake which can be done in the following manner.

1) Retrieve all information for one of the names via the PUNCH parameter for the FPS command.

2) Delete the name for which the information was retrieved from the data base.

3) Alter the PUNCH information so that all the information now pertains to the name still in the data base.

4) Enter the modified PUNCH information as input to the INPUT-PSL command.

The effect of doing this for the previous example would be that:

i) All information given about CALENDAR-DAYS is transferred to CALENDAR-DAY and then CARLENDAR-DAYS is deleted from the data base. If it is desirable to use the plural form of the name in the data base then it should be a SYNONYM, this can be done in a DESIGNATE statement:

```
INPUT-PSL
DESG CALENDAR-DAYS SYNONYM CALENDAR-DAY;
EOF
```

ii) Since names can consist of letters or numbers, and certain special characters, another common misspelling error is to substitute the letter "O" for the number "0". It is often very difficult to detect this and so there appear to be two names, spelled exactly the same in the data base. This can be corrected in the same way as the previous problem.

iii) When the spelling error only involves one name (if TIME-CARD was spelled TIMECARD in all instances) then this problem could easily be solved by using the RENAME command:

```
RENAME O=TIMECAPD N=TIME-CAPD
```

If both TIME-CARD and TIMECARD are defined in the data base, then the same procedure used to change CALENDAR-DAYS must be performed.

Redundant Objects

Another error which occurs quite frequently is to define one object by two different names, not realizing that they are representing the same thing. EMPLOYEE-RECORD and EMPLOYEE-DATA may be defined separately in the data base, but represent the same thing. To resolve this redundancy, the information for the two names must be combined. This can be done in the same manner as given for correcting the misspelled names (involving two names).

Missing Semicolons

Most often, a missing semicolon will be detected as a syntax error (as described in section 10.1). There is one particular case where a missing semicolon would not generate any error message:

```
PROCESS P1;
DESCRIPTION;
     THIS IS A DESCRIPTION COMMENT ENTRY THAT IS MISSING
     THE SEMICOLON.
RCVS I1,I2;
GENS O1,O2;
```

What happens here is that the RCVS statement becomes part of the DESCRIPTION comment entry. A semicolon was omitted in terminating the lines intended to be the comment entry, but URA simply searches for the first semicolon to signify the end of the comment entry. To solve this problem the DESCRIPTION statement must be replaced and the RCVS statement must be added to the data base. This can be accomplished by the following procedure.

1) Generate the incorrect comment entry in the form of PUNCH information (via the PUNCH-COMMENT-ENTRY command).

2) Alter the PUNCH information so that the comment entry is correct.

3) Use the modified PUNCH information as input to the REPLACE-COMMENT-ENTRY command.

4) Add the RCVS statement via an INPUT-PSL command.

Correctness and Completeness

For the most part, it is up to the problem definer to maintain correctness of the problem statement and URA maintains correctness of the data base. The problem definer has the ability to do this through usage of the DELETE-PSL and INPUT-PSL commands. Completeness can also be determined by the problem definer or improved through use of the INPUT-PSL command.

PART II

USAGE OF THE USER REQUIREMENTS ANALYZER UNDER MULTICS

1. INTRODUCTION

URA extracts information from UPL statements and stores it in a URA data base. Once this information (a requirements statement) is in the data base, it can be modified, new information can be added to it, and reports can be generated presenting the status of the requirements statement. These actions are implemented by the URA commands available in the URA processing mode.[1] This mode of operation may be attained by accessing the URA software available under Multics. Therefore, by understanding the Multics commands that aid in interacting with URA, and the URA command language, the URA user can effectively manipulate the contents of a URA data base.

The format of this part serves an important purpose. The first five sections deal with Multics and URA at an introductory level. Section 2 presents necessary information for reference to Multics operating system. Section 3 explains the procedure of accessing URA once on Multics. Sections 4 and 5 present practical concepts and conventions which aid in using URA under Multics. Once access to URA has been achieved, Sections 6, 7 and 8 present the manner in which Multics interacts with the various commands. Several examples are given in those sections in order to better illustrate the results of specific implementations. Section 9 deals with using Multics to handle errors encountered in the use URA. In this chapter, the Multics naming conventions are used, hence, all Multics and URA commands appear in lower case.

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[1] A processing mode is defined by the software system in control when any type of command is issued. The debug, facility, the editor, URA, etc. all define processing modes and thus, a particular set of commands.

2. USING MULTICS

An excellent tutorial on the use of Multics can be found in the Multics User's Guide Honeywell Order Number AL40 and reference material will be found in the Multics Programmer's Manuals. The remaining sections in this chapter assume a familiarity with the Multics command language.

3. THE URA ENVIRONMENT

Assuming that the user is already logged into Multics, he should first gain access to all URA software which is contained in the URA directory. The user may do this by adding the URA directory to his search rules after his working directory. The following command shoud be used:

```
asr >ml>CARA -after working_dir
```

A URA data base with the name uradb may be initialized by the following command:

```
exec_com >ml>CARA>initdb uradb
```

This will create an empty initialized data base of the default size in the current working directory. To create a data base with a non-default size see Appendix B for creating data bases.

Once a data base has been initialized, the user may enter URA mode with the Multics command:

```
exec_com >ml>CARA>ura
```

This command is used whenever the user wishes to enter URA mode, whereas a data base need only be initialized at the beginning of a project. Should a user desire to expand or reorganize his data base, the dump/restore programs described in Appendix C may be used.

4. SPECIFYING INPUT TO URA COMMANDS

This section specifies information relavant to using and manipulating Multics segments to be used as input files to URA commands. The "input" and "file" parameters of URA commands may be used with standard Multics segments or input may be specified as coming from the terminal in an interactive mode.

4.1 Entering Data into a Data Set

Using one of the Multics editors, the user can create segments to be used with the "input" and "file" parameters. Such segments may contain names, URI statements, etc.

If the user has URL statements in the segment named mos.input.url in the current working directory, he may use it as input for the ip command as follows:

```
ip input=mos.input.url update
```

4.2 Specifying Input Data Interactively

It is usually advantageous to enter data into segments before it is used as input to URA as the user may correct errors and omissions without difficulty using the Multics editor. There are times when the user may wish to enter data directly to the Analyzer. In such cases, the user specifies "term" instead of the segment name. For example, to provide input via the terminal for the ip command, use:

```
ip input=term update
```

4.3 Restrictions on Multiple Data Base Usage

On Multics, it is not possible to prevent more than one user from accessing the same data base concurrently. This is not a problem when such users are only retrieving information. However, it is a serious problem if any user is attempting to update the data base because this could make the file inconsistent during the execution of the update command. No URA error message is generated when multiple users access the data base. However, a fortran I/O message is given and the update command aborted if a user attempts to rewrite a portion of the data base while another physical rewrite operation is underway. The message will vary according to the version of Fortran used and the location of URA. A typical message may be of the form

```
fortran_io_: File already busy for another I/O activity.
```

```
Unformatted write on file 2.
By >ml>CARA>bound_dbms$randrw (randrw/40)
fortran_io_: Close files?
```

The user should respond 'yes' and when URA asks for the next command the user should enter

```
mts absent.
```

The user should then determine whether the data base has been made inconsistent by attempting the following:

```
ng s='all'
set output=temp.print
fps
```

5. RECEIVING OUTPUT FROM URA COMMANDS

This section specifies information relevant to using and manipulating Multics segments to be used as output for URA commands. In Multics, output files are specified in the output parameter of the URA set command, and via the punch parameter for other URA comands.

5.1 Using the Output Parmeter

The output parameter in the URA set command allows the problem definer to specify where all reports generated by URA commands are to be printed. If nothing is specified, all output is sent to the terminal. To specify that output is to be sent to a segment:

```
set output=segment-name
```

From this point, all reports generated by URA will be written into this segment. The report output may be reassigned to the terminal by:

```
set output=term
```

5.2 Using Punch Segments

For some commands, a punch file is produced. These are automatically placed into segments in the user's current working directory. If the user does not explicitly assign the punch file, a default segment name will be used. These default segment names are given in Appendix E.

6. CONTROL COMMANDS

These commands control the operation of URA in some way without actually causing any output themselves.

6.1 Set Command

The most common use of this command is to change the default data base, or to reroute the report output. To change the data base to be used on subsequent commands:

```
set db=data-base-segment-name
```

6.2 Display Command

This command displays the current settings of global switches and parameters set using the SET command or merely defaulted to.

For example, if the user wishes to display the settings of all switches and parameters, he should type:

```
display all
```

To check the current data base setting, he should type:

```
display db
```

6.3 Stop Command

This command returns the user to Multics command mode. All parameters changed via the URA set command return to their default values.

7. MODIFIER COMMANDS

change-type
delete
delete-comment-entry
delete-psl
input-psl
punch-comment-entry
rename
replace-comment-entry

8. REPORT COMMANDS

consist-comparison
consist matrix
contents
data-process
dictionary
dynamic-analysis
entity-identifier
extended-picture
formatted-problem-statement
frequency
kwic
interval-consistency
list-changes
name-gen
name-list
picture
print-attribute-values
process-chain
process-input-output
projected-cost-report
punch-comment-entry
resource-consumption-analysis
security-consistency-analysis
structure
summary

9. ERROR CONDITIONS

In addition to error comments generated by the URA system, there are occasional errors associated with the interaction between the URA system and Multics.

9.1 Initial Messages

When the user first enters URA mode, he may receive messages from Multics that "io-switch does not exist." These may be ignored.

9.2 Abnormal Termination

If any of the commands is unable to terminate in the normal manner, the Fortran monitor may be entered before URA has had a chance to close all files. The Fortran monitor will ask the user if these files are to be closed. In all cases, the user should answer "yes."

9.3 Data Base Already Open

It is possible for the user to get into a state where URA cannot open his data base because it thinks that it is already open. If this happens, the user should return to Multics mode, then issue the Multics command:

```
ml>CARA>closeit
```

9.4 Changing Working Directories

If the command "mts cwd new_working_directory" is given any time during the Analyzer, an error condition will occur. The Analyzer session will terminate, probably with the Mutlics error message "Use of star convention resulted in no match. old_working_directory>*.uratemp". If this happens the Analyzer exec will have to be re-executed in which ever working directory the user would like to remain.

PART III

URA OUTPUTS

1. INTRODUCTION

Once a URL description of an information processing system has been entered into a URA data base the user has the option of retrieving the stored information in several different standard formats called URA reports. Each URA report has particular characteristics with respect to its purpose, the amount of retrieval and analysis required to generate the report, the information presented in the report, the format, etc. In this sense, each report can be classified by its characteristics to provide an overall description of the report and to aid in determining how the report may be used to aid problem definers in checking the validty of the URL description and to improve on its completeness.

Only the reports generated by report commands will be presented in this paper. The reports generated by modifier commands are described in the "User Requirements Analyzer User's Manual," Part I. The manner of specifying input to report commands is given in Section 4 of Part I and Section 4 of Part II. The manner of receiving output from report commands is given in Section 5 of Part I and Section 5 of Part II.

Section 2 of Part III presents the objectives of URA reports with respect to those relationships to the logical system design process and their advantages in the system documentation procedure. Section 3 describes the manner in which information is extracted, from a URA data base to produce reports.

Section 4 presents several categories for classifying and describing URA reports based on contents, format and usage. Section 5 consists of descriptions of each of the standard URA reports available in Version 3.3 of URA.

2. OBJECTS OF REPORTS FROM A URA DATA BASE

2.1 Purpose of URA Reports

The purpose of URA Reports is to present information retrieved from a URA data base (which contains the description of a particular system) in a format which is useful to persons who are documenting the target system, who desire to understand the target system, or who are involved in the design of the target system.

This requires that the reports must be of various formats, contain various types and levels of information, and be oriented at the various types of user's.

With respect to those persons documenting the target system, the reports must present information resulting from modifications to the URA data base. (These reports are presented in Part I.) In addition, reports must present the status of the URA data base after modifications have been made (i.e., successful modifications). Those reports are basically the same as those used by people who desire to understand the target system. They present selected portions of the information in the data base in various formats. A few particular reports may also be used to aid those persons designing the target system. They usually present the results of extensive analysis on information in the data base.

2.2 Relation of URA Reports to Logical System Design

There are two major objectives in logical system design:

- To produce a proposed system that is the best possible in terms of what it will cost to build, cost to operate and what it will contribute to the organization.

- To minimize the cost and time to produce this "optimum" target system.

The goal of developing computer-aided methods for use in logical system design is to contribute to the above objectives. At the present time, it is not possible to achieve an optimum solution for both of these objectives. One contribution that can be made by a computer-aided method is to improve the "quality" of the description of the target system. Quality is defined in terms of consistency, unambiguity and completeness.

Consistency means that no statements made in the description contradict, or are incompatible with, other statements and any

particular object is referred to by the same name throughout the description.

Unambiguity means that statements and relationships are made so precisely that interpretation is uniform by all readers.

Completeness means that all necessary relationships are given and no objects have been omitted from the description.

The quality objectives can be aided at three levels:

1) URA will enforce consistency and unambiguity through the syntax analysis and reference checks made when data is entered into the URA data base.

2) The URA reports will make it easier for the problem definer to detect logic errors in the problem statement, unresolved conditions, etc.

3) Some reports are available to the problem definer to aid in detecting incompleteness and inconsistencies of the problem statement

Therefore, the first objective in logical system design can be attained by improving the quality of the documentation.

The second objective, that of minimizing design cost and time, is aided by transferring much of the clerical workload to the computer. The Analyzer, URA, maintains an up-to-date record of all information collected. The preparation of this information for use by analysts,[1] management, etc., can be readily retrieved at request.

To meet these objectives, URA offers three classes of outputs:

- Reports to aid the analyst.

- Reports to aid the project management.

- Reports to aid the designer.

- Final specifications.

Reports to aid the analyst are basically those which aid in resolving inconsistencies, ambiguities, and incompleteness in the logical system design problem statement.

---

[1] NOTE: Throughout Part III, the terms analyst and problem definer are used synonymously. The problem definer is a person responsible for writing a system description (or part of one) in URL. A URA user is a person who uses the URA software to update or retrieve information from a URA data base.

The reports of concern to project management pertain to status of the project in the form of amount of information entered into the UBA data base, etc. The reports which are of benefit to the designer are those which reflect inconsistencies and incompleteness in the problem statement which must be resolved in order to develop a design for the proposed system. They also present information in a manner that optimal or feasible designs may be formulated.

The final specifications are the end result of the logical system design phase using UBL/UBA. They express all the information in the UBA data base in an easy-to-read format. These specifications consist of a series of UBA reports generated in a particular order and format.

2.3 Advantages of Using UBA Reports

In contrast to manually produced documentation, (i.e., handwritten or typed, the UBA reports have several advantages with respect to maintainability, format, usefulness, etc.).

Maintainability

All changes made to the UBL description of an Information Processing System are made via the UBA data base. All documentation (UBA reports) produced from the information in the data base after a change is up-to-date. There is no need to change previous documentation.

Changes made to manually maintained descriptions usually require modification of all existing sets of documentation, and modification of each portion of the documentation affected by the change. This process can cause serious errors in the documentation or require extensive rewriting (and retyping) of the previous documentation.

Format

Each UBA report is formatted according to the purpose of the report, taking into consideration the orientation of persons intended to use the report. Therefore, information consisting of many complex relationships may be presented in a graphical format, to make the information easier to interpret. Likewise, a matrix format may be used to present a large amount of information at one time. Formats are standardized so that interpretation is uniform by all users.

Formats of manually produced documentation are often not standardized leading to problems and conflicts in interpretation. Presentations of large amounts of information on a few pages is often a problem because of difficulties in

completion and keeping the information up-to-date.

Usefulness

Each URA report has been designed for a particular purpose, i.e., to meet the system documentation needs of one or more users. In an effort to maintain this, all information in the reports is presented in a well-structured manner and the reports are designed to be consistent in their presentations.

Many manually produced documents are done ad hoc with possibly no serious considerations on how the documents may be used to benefit the system building process. In addition, the documentation is often difficult to use because of inconsistencies in the manner in which information is presented and seemingly lack of organization.

Availability

Documentation can be produced anytime (on request) once information has been stored in the URA data base. This reduces the lag time usually encountered in the manual production of documentation. This permits important decisions to be made when the problem is encountered rather than "next week, when all the information is available." Physical production of the reports is very fast since this is usually done using a line printer or terminal.

Too often the documentation is produced after the fact. This is especially common if the people are very technically inclined. They would rather sit at the terminal or write program code rather than write documentation. Therefore, when documentation is needed, little is available or the organization of the information makes it very difficult to use. Physical production of the documentation then requires many hours of manual labor behind pencils and typewriters excluding the time and costs of reproducing the original. (It is important to note that in most instances that documentation produced in this way is usually out-of-date by the time it leaves the typewriters.)

Selectivity

URA reports may be generated containing all the information known about the target system as containing specific information about one particular name relevant to the description. This capability allows the user to see only what is desired rather than getting too much or too little.

It would be virtually impossible to incorporate all possible combinations of information in a manually produced system in an effort to anticipate any type of request. Therefore, the

description of the target system is presented in a select number of ways and any information not directly available must be desired from the available information (assuming it is in some way desirable).

Analysis

URA offers reports which aid in checking completeness and consistency of the problem statement as it exists in the URA data base. Many of the reports present information in a manner which allows visual-analysis of the information to check for these qualities. Other reports incorporate these checks as part of the information presented in the report and is referred to as computer-aided analysis. (Visual analysis implies that the checks are made by the user where computer-aided analysis is performed by the computer.)

In most forms of manually produced documentation the formats used make it difficult to check for completeness and inconsistencies in the documentation. Inconsistencies, in particular, go undetected very easily as a result of various spellings of the same name in the description. Where one person may know that all the versions of the name refer to the same thing, others may not.

Extensions

In addition to the standard reports available in a particular version of URA, the users may write their own programs which generate reports to present information particular to their applications of URA. The new reports can be incorporated into any future documentation packages.

Manually produced documentation may incorporate complex reports involving a great amount of computation and analysis in its production, but this requires the same amount of computation and analysis anytime the report is to be presented. Rather than consuming the analyst's time in producing the report, it is more feasible to let the computer do it (and in less time).

3. GENERATION OF REPORTS

All URA reports are produced by issuing commands to URA. All commands available for URA and the reports generated by each are given in "User Requirement Analyzer Command Descriptions." Descriptions of each report and the name(s) of the command(s) used to generate it are given in Section 5 of Part III.

3.1 URA Command Language for Reports

The programs which are initiated by a particular report command, retrieve information from the URA data base and output it in some meaningful format. No modifications are made to the information in the data base; their sole function is to retrieve the information and display it in some manner. In the process of collecting and displaying the information analysis may be done and the results printed as part of the report.

Most report commands have one or more parameters that may be used in conjunction with the command for one of the following purposes:

- To specify data to be used as input to the command (Input data parameters).
- To specify how data used as input is to be interpreted (Input control parameters).
- To specify what options the user has in generating the report with respect to content (Output option parameters).
- To specify what options the user has in generating the report with respect to format (Output format parameters).

The manner of specifying commands and their parameters is given in Part IV and the manner of using the commands and parameters is given in Parts I and II.

3.3 Retrieval of Information from the URA Data Base

There are basically three types of information stored in a URA data base.

1) Names and types of objects defined by the user.

2) Comment entries (narrative and free format descriptions of objects).

3) Connections among objects and between an object and comment entry.

The first type of information is stored as name records, the second as comment entry records, and the last as NUB records.[1]

Each USA report presents information taken from one or more of these different types of records. Table 2 gives the information presented by each report. In addition each USA report may also present information derived from the information in one or more of these different types of records.

The manner in which the information is presented differs from one report to another. The relationship between two name records may be either implied by the report format or explicitly defined. For example, the FORMATTED PROBLEM STATEMENT would present that "employee-address" CONSISTS of "street," "city," "state," and "zip-code." The CONTENTS REPORT, on the other hand would present this in the following format:

```
1 employee-address
  2 street
  2 city
  2 state
  2 zip-code
```

Therefore, there are three major aspects relative to what is contained in a USA report:

1) What type of information is presented:

   a) Names and types of object
   b) Comment Entries
   c) Connections among objects and between an object and comment entry

2) How the information is presented:

   a) As taken from the USA data base
   b) Derived from information in the data base

3) How Relationships are defined:

   a) explicitly
   b) implied

---

[1] See the description of these records as presented in Section 7 of Part I for a better understanding of the data base structure.

Report Name	Name Records	Comment Entries	NUB Records	Update Records
ATTRIBUTE REPORT	Yes	No	Yes	No
CONSISTS COMPARISON MATRIX	Yes	No	Yes	No
CONSISTS MATRIX REPORT	Yes	No	Yes	No
CONTENTS REPORT	Yes	No	Yes	No
DATA BASE SUMMARY[1]	No	No	No	No
DATA PROCESS REPORT	Yes	No	Yes	No
DICTIONARY REPORT	Yes	Yes	Yes	No
DYNAMIC ANLAYSIS REPORT	Yes	No	Yes	No
EXTENDED PICTURE	Yes	No	Yes	No
FORMATTED PROBLEM STATEMENT	Yes	Yes	Yes	Yes
FREQUENCY REPORT	Yes	No	Yes	No
IDENTIFIER INFORMATION REPORT	Yes	No	Yes	No
INTERVAL CONSISTENCY REPORT	Yes	No	Yes	No
KWIC INDEX	Yes	No	No	No
LIST CHANGES	No	No	No	Yes
NAME GEN	Yes	No	No	Yes
NAME LIST	Yes	No	No	Yes
PICTURE	Yes	No	Yes	No
PROCESS CHAIN	Yes	No	Yes	No
PROCESS INPUT/OUTPUT	Yes	Yes	Yes	No
PROJECTED COST REPORT	Yes	No	Yes	No
PUNCHED COMMENT ENTRIES	Yes	Yes	Yes	No
RESOURCE CONSUMPTION ANALYSIS	Yes	No	Yes	No
SECURITY CONSISTENCY ANALYSIS	Yes	No	Yes	No
STRUCTURE	Yes	No	Yes	No

Table 2.

Types of Information Taken and Presented by URA Reports

[1] All information in this report is "derived" from the information taken from each of the different types of records.

ATTRIBUTE REPORT

Purpose

This report is intended to present the system properties aspect of the target system description with respect to the ATTRIBUTES defined and used in the description.

Information Presented

The report presents, for each ATTRIBUTE name used as input, all names in the data base to which the ATTRIBUTE applies and the associated ATTRIBUTE-VALUES for the names. In effect, this presents information given by the ATTRIBUTE statement.

Format

Each ATTRIBUTE name is numbered, 1*, 2*, etc., as it is encountered as input and printed on the report. Each name to which a particular ATTRIBUTE applies is also numbered.

The URA statements:

```
INPUT: time-card;
   ATTRIBUTE arrival-type scheduled;
```

would be presented as:

```
1* ATTRIBUTE: arrival-type

          APPLIES TO:    VALUE:
      1 time-card        scheduled
```

in the ATTRIBUTE REPORT for the ATTRIBUTE arrival-type. Given a particular ATTRIBUTE name, the software generating the report searches the data base for all names the ATTRIBUTE APPLIES to (is connected to) and lists them under the "APPLIES TO:" heading in the report with corresponding ATTRIBUTE-VALUE under the "VALUE:" heading.

The format for the ATTRIBUTE REPORT is considered to be a list format.

Option and Alternatives

The report may be generated for a single ATTRIBUTE name (via the NAME parameter) or for a collection of ATTRIBUTE names specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input in generating the report must be checked that it is an ATTRIBUTE name before further processing continues. The name is then printed on the report. If the input name is not an ATTRIBUTE the message:

URA093:MAINPAV: NAME HAS NO USAGES AS ATTRIBUTE FOR ANYTHING

is printed. Names and corresponding ATTRIBUTE-VALUES are then retrieved pair by pair and listed under the given ATTRIBUTE until no more pairs are found for the ATTRIBUTE.

The next ATTRIBUTE name from the input stream is taken (if there is one) and the process repeats.

Usages

In many applications of the use of the Language and Analyzer, certain ATTRIBUTE names may be designated as mandatory for a description. For example, some applications may require that every PROCESS defined as part of the description must be specified as being either manual or automated via the ATTRIBUTE process-type. Generation of the ATTRIBUTE REPORT for the name process-type allows the analyst to determine if the current description is accurate, complete and consistent in this respect.

The report also presents those names which are logically related because of common ATTRIBUTE-VALUES among them. In the previous example, there were two logical groups, manual and automated. In practice there are usually several possible ATTRIBUTE-VALUES.

Examples

Figure 19 presents the output resulting from generating the ATTRIBUTE REPORT using the names produced by NAME-GEN as input. The following Analyzer commands were given:

```
NAME-GEN S='ATTRIBUTE'
PRINT-ATTRIBUTE-VALUES
```

FIGURE_19

Attribute Report

PARAMETERS FOR: PAY

FILE

1* ATTRIBUTE: arrival-type

	APPLIES TO:	VALUE:
1	time-card	scheduled
2	salaried-employment-form	random
3	hourly-employment-form	random
4	tax-withholding-certificate	random
5	employment-termination-form	random

2* ATTRIBUTE: color

	APPLIES TO:	VALUE:
1	paper	white

3* ATTRIBUTE: complexity-level

	APPLIES TO:	VALUE:
1	salaried-employee-processing	high
2	hourly-employee-processing	high
3	new-employee-processing	medium
4	terminating-emp-processing	low

5* ATTRIBUTE: data-standard

	APPLIES TO:	VALUE:
1	birthdate	date
2	current-date	date
3	employment-date	date

FIGURE_19

Attribute Report

4	pay-date	date
5	termination-date	date

6* ATTRIBUTE: number-of-lines

	APPLIES TO:	VALUE:
1	page	20

7* ATTRIBUTE: occurrence-type

	APPLIES TO:	VALUE:
1	validation	unscheduled

8* ATTRIBUTE: processor-type

	APPLIES TO:	VALUE:
1	validation-clerk	human

9* ATTRIBUTE: type

	APPLIES TO:	VALUE:
1	employee-identification-number	numeric
2	department	numeric
3	job-number	numeric
4	pay-grade-code	numeric
5	salary	numeric
6	total-hours	numeric
7	number-of-deductions	numeric
8	job-title	character
9	supervisor	character
10	city	character
11	state	character
12	street	character

FIGURE_19

Attribute Report

13 employee-name character

CONSISTS COMPARISON REPORT

Purpose

To present data structure information for SET, INPUT, OUTPUT, ENTITY and GROUP names given as input. The report by-passes all intermediate levels of data structure and only presents the lowest level constituents of those names given as input.

Information Presented

Structure information based on CONSISTS statements in the data base can be presented for SET, INPUT, ENTITY and GROUP names given as input. However, rather than presenting all levels of the data structure, only the highest and lowest levels are present ignoring all other levels. For example, the structure:

```
1 hourly-employee-record
  2 employee-name
    3 surname
    3 initial
    3 first-name
  2 employee-identification-number
  2 social-security-number
```

might appear in the CONTENTS REPORT which presents all levels of the data structure for hourly-employee-record. The CONSISTS COMPARISON REPORT, however, would present the names:

```
surname
initial
first-name
employee-identification-number
social-security-number
```

as the low level components of the data structure for hourly-employee-record.

In addition to the data structure relationships presented, similarities among data structures are identified and summarized in the report.

Format

The first part of the report specifies those names given as input, but do not have data structure relationships (CONSIST statements). Two lists are given, one giving all names given as input (and having CONSISTS information), and the other giving all the low level constituents of those names in the first list. Next comes the BASIC CONTENTS MATRIX where each row of the matrix represents one of those names given in the list of low

level constituents and each column of the matrix represents one of the names given in the list of input names. All names in the list and rows and columns are numbered so that the correspondence between a particular row or column and the name that it represents is one to one. A relationship between a name represented by a particular row and a name represented by a particular column is designated by an asterisk entry (*) at the intersection of the row and column in the matrix. A blank entry designates that no such relationship exists.

A second matrix called the CONTENTS SIMILARITY MATRIX is also generated to present similarities in the data structures (for those names given as input) and represented in the BASIC CONTENTS MATRIX. All information in the CONTENTS SIMILARITY MATRIX is derived from information presented in the BASIC CONTENTS MATRIX. All the names used as input are represented by a column number and row number in the matrix. The numbers are the same so that any given object is represented by row I and column J. The matrix should be read from row to column as saying: the data object represented by row I has an integer number of low level constituents in common with the data object represented in column J. When I=J, the number of low level constituents of any object in common with itself is presented. This is, of course, the total number of constituents for that given data object. The final section of this report is the CONTENTS SIMILARITY ANALYSIS which presents those input names that have identical lowest level constituents or which are strict subsets (at the lowest level) of other input names.

Options and Alternatives

No options are available to change format or content of the report.

Analysis

Each name given as input is searched for in the Analyzer data base. If the name is not found, the message:

UBA271: MAINCNC: NAME NOT IN D.B.-

is printed and is not represented in the matrices.

For each name defined in the data base with CONSISTS information, its components are then found via the CONSISTS statement. If its components have CONSISTS information then the procedure is continued until only ELEMENTS are encountered (which may not have any sub-components) or no more CONSISTS information can be found. The lists of input names and low level constituents are then printed on the report.

The BASIC CONTENTS MATRIX is then printed out to illustrate the

relationships between the names in the two lists and each relationship is designated by an asterisk.

The CONTENTS SIMILARITY MATRIX is produced by counting the number of column entries in common between any two rows of the BASIC CONTENTS MATRIX. The diagonal is produced by counting the total number of asterisks in the BASIC CONTENTS MATRIX for a given row.

The CONTENTS SIMILARITY SUMMARY is produced by inspecting the numerical values in the CONTENTS SIMILARITY MATRIX. If a particular number presented in the diagonal occurs elsewhere in the same row of the matrix, it means that a particular name (represented by the row) has all of its constituents, in common with another name. If the other name has the same number of constituents, then the data structures are identical. If the other name has more constituents, then the first name has a data structure which is a subset of the others.

Usage

One use of the CONSISTS COMPARISON REPORT is to detect redundant or similar data structures. Its ability to do this lies in its presentation (ignoring all intermediate levels of data structure).

This aids the analyst in detecting possible errors in the target system description and simplifying it should similarities in structures occur. This is usually beneficial when the report is generated for all INPUT, OUTPUT and ENTITY names in the description as input.

The report is also beneficial to the system designer who may utilize it to optimize structures that the software will eventually have to access. Identical or similar structures for different ENTITIES, for example, may be mapped into the same type of storage structure to reduce complexity of the software.

Examples

Figure 20 presents the results of generating the CONSISTS COMPARISON REPORT for all INPUT and OUTPUT names in a particular data base. The following commands were used to generate the example:

```
NAME-GEN S='INPUT OR OUTPUT'
CONSISTS-COMPARISON
```

Note that the two names name-six, name-two, and paysystem-inputs are not included in the matrices because they do not have CONSISTS information.

FIGURE_20

Consists Comparison Report

PARAMETERS FOR: CNC

FILE

USA273:CNCBLD : NAME DOESNT CONSIST OF ANYTHING - name-six
USA273:CNCBLD : NAME DOESNT CONSIST OF ANYTHING - name-two
USA273:CNCBLD : NAME DOESNT CONSIST OF ANYTHING - paysystem-inputs

FIGURE_20

Consists Comparison Report

BASIC CONTENTS MATRIX

The rows are the given input names.

The columns are the lowest level objects which are contained in the rows, with intermediate groups ignored.

If any columns are group names, then the definition is incomplete.

If any columns are ambiguous names, they are possible elements.

ROW NAMES		COLUMN NAMES	
1 employment-termination-form	INPUT	1 surname	GROUP
2 hourly-employment-form	INPUT	2 initial	ELEMENT
3 salaried-employment-form	INPUT	3 first-name	ELEMENT
4 tax-withholding-certificate	INPUT	4 social-security-number	ELEMENT
5 time-card	INPUT	5 termination-date	ELEMENT
		6 employee-identification-number	ELEMENT
		7 employment-status	ELEMENT
		8 sex	ELEMENT
		9 birthdate	GROUP
		10 house-number	ELEMENT
		11 street	ELEMENT
		12 apartment-number	ELEMENT
		13 city	ELEMENT
		14 state	ELEMENT
		15 zip-code	ELEMENT
		16 phone	ELEMENT
		17 job-title	ELEMENT
		18 pay-rate	ELEMENT
		19 current-date	ELEMENT
		20 employment-date	ELEMENT
		21 job-number	ELEMENT
		22 pay-grade-code	ELEMENT
		23 supervisor	ELEMENT
		24 department	ELEMENT

FIGURE_20

Consists Comparison Report

BASIC CONTENTS MATRIX

ROW NAMES	COLUMN NAMES	
25	number-of-deductions	ELEMENT
26	status-code	ELEMENT
27	pay-date	ELEMENT
28	regular-hours-worked	ELEMENT
29	overtime-hours-worked	ELEMENT
30	hours-per-day	ELEMENT

FIGURE_20

Consists Comparison Report

BASIC CONTENTS MATRIX

An * in (i,j) means that column j is contained directly or indirectly in row i. The columns do not consist of anything further. Intermediate groups are ignored.

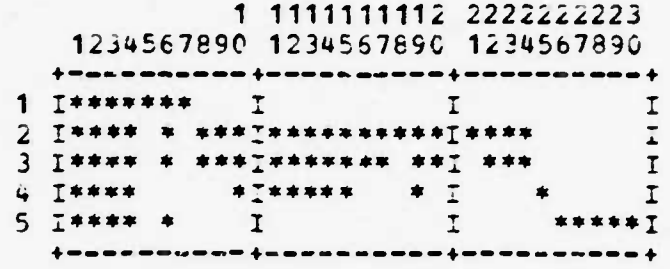


FIGURE_20

Consists Comparison Report

CONTENTS SIMILARITY MATRIX

The number in (i,i) is the number of objects
at the lowest level contained in row i from above.

The number in (i,j) (i not equal j) is
the number of objects at the lowest level in
common between rows i and j from above.

	1	2	3	4	5
1	7	5	5	4	5
2		22	20	11	5
3			20	11	5
4				12	4
5					10

FIGURE_20

Consists Comparison Report

CONTENTS SIMILARITY SUMMARY

ROW#	NAME		ROW#	NAME
3	salaried-employment-form	IS A SUBSET OF	2	hourly-employment-form

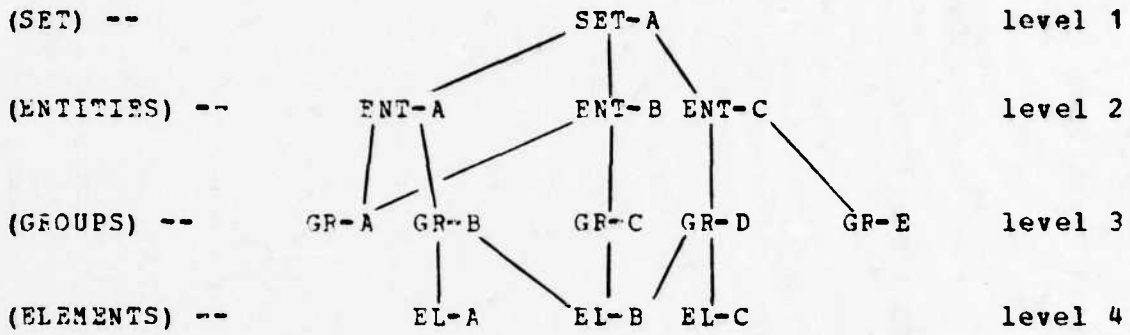
CONSISTS MATRIX REPORT

Purpose

To present the data structure (as specified by the CONSISTS statements), either above or below, each SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT name given as input is involved in.

Information Presented

Each name given as input must be a SET, INPUT, OUTPUT, ENTITY, GROUP or ELEMENT name. The report presents the names that the given input name(s) CONSISTS of (if the report is generated with the CONSISTS parameter in effect) or names the given input name(s) is(are) CONTAINED in (if the report is generated with the CONTAINED parameter in effect). Take the following structure, for example, and assume that its description exists in an Analyzer data base in the form of CONSISTS relationships between the names:



If the CONSISTS MATRIX REPORT were generated for all the above GROUP names, GR-A, GR-B, GR-C, GR-D and GR-E, and the CONSISTS parameter was in effect when generating the report, the ELEMENT names EL-A, EL-B and EL-C would be presented in the report. The report would also designate GR-A and GR-E as not having any CONSISTS information available.

If the report was generating with the CONTAINED parameter in effect, and the same GROUP names as input, the ENTITY names ENT-A, ENT-B and ENT-C would be presented in the report

In essence, the CONSISTS MATRIX REPORT presents one level above or one level below designated starting points in the data structures described in an Analyzer data base.

The report could not be generated for SET names with the CONTAINED parameter in effect because the Language does not allow SETS to be CONTAINED in higher level structures.

Likewise, the report could not be generated for ELEMENT names with the CONSISTS parameter in effect because the Language does not allow ELEMENTS to CONSIST of lower level structures.

The report also presents statistics on the data structure information such as how many low level components a particular name consists of or how many structures it is contained in.

Format

If the CONSISTS parameter is used when generating the report, any names given as input which do not have CONSISTS statements as part of their descriptions are flagged at the beginning of the report. If the CONTAINED parameter is used, any names given as input which do not have CONTAINED statements as part of their descriptions are flagged.

Two lists of names are then presented, one labeled ROW NAMES and the other COLUMN NAMES. If the CONSISTS parameter was used when generating the report, the names designated as COLUMN NAMES are those which were given as input. If the CONTAINED parameter was used when generating the report, the names designated as ROW NAMES are those which were given as input.

In any case, each name under COLUMNS NAMES CONSISTS of zero or more names under ROW NAMES and each name under ROW NAMES IS CONTAINED in zero or more names under COLUMN NAMES. A matrix is then printed to show the relationships between the names designated as ROW NAMES (which are represented by the rows of the matrix) and the names designated as COLUMN NAMES (which are represented by the columns of the matrix). The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list of ROW NAMES and COLUMN NAMES, respectively.

An asterisk (*) entry at the intersection of a particular row and column of the matrix designates that the name represented by the row is CONTAINED in the name represented by the column.

Inspection of an entire row reveals all names that a particular name (represented by the row) is CONTAINED in. Inspection of an entire column reveals all names that a particular name (represented by the column) CONSISTS of.

A summary section is also included in the report presenting for each ROW NAME:

- The row it was represented by in the matrix (ROW).
- Its name type (TYPE).
- The number of * entries in its row (or the number of names CONTAINING it) (COUNT).

The summary presents for each COLUMN NAME:

- The column it was represented by (COLUMN).
- Its name type (TYPE).
- The number of * entries in its column (or the number of names it CONSISTS of) (COUNT).

The summary section for ROW and COLUMN names is ordered in decreasing order of COUNT.

Options and Alternatives

The report must be generated using either the CONSISTS or CONTAINED parameter. If the CONSISTS parameter is used, all names given as input must be SET, INPUT, OUTPUT, ENTITY and/or GROUP names. If the CONTAINED parameter is used, all names given as input must be INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names.

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input is searched for in the data base. If it is not found, the message:

UFAC98: CONCOL: NAME NOT IN D.B.-

is printed.

If the CONSISTS parameter is used, each name given as input must be checked that CONSISTS information is available for it. If no CONSISTS information is available, the name is listed under the message:

UFA313:CONCOL : THE FOLLOWING DO NOT CONSIST OF ANYTHING:

The components of those input names which do have CONSISTS information are found. The list of all input names and the list of all components are then printed on the report.

If the CONTAINED parameter is used, each name given as input must be checked that CONTAINED information is available for it. If no CONTAINED information is available, the name is listed under the message:

UFA311:CONROW : THE FOLLOWING ARE NOT CONTAINED IN ANYTHING:

Those names which the input names are CONTAINED in are found. The list of all input names and the list of names they are CONTAINED in are then printed on the report.

A matrix is printed out to illustrate the relationships between the names in the two lists and each relationship is designated by an asterisk.

A summary is then produced by counting the number of asterisks appearing in each row and each column of the matrix.

Usages

When a list of ELEMENT and/or GROUP names are given as input to the command producing the report and the CONTAINED parameter is specified, the report aids the analyst by identifying which GROUP and ELEMENT names are not incorporated into higher level information structures. It aids the physical system designer by determining utilization of ELEMENT and GROUP names by the logical information structures within the target system description.

Generating the report (using the CONSISTS parameter) for SET, INPUT, OUTPUT, ENTITY and GROUP names determines which of these have identical structures, with respect to one another, and which are empty, i.e., have no CONSISTS relationships. This also identifies similarities in the structures for these types of names. The analyst may then use this information to determine if redundant structures have been defined, if the description is incomplete, etc.

Example

Figure 21 presents the CONSISTS MATRIX REPORT generated with the CONSISTS parameter in effect and using all INPUT and OUTPUT names in a particular data base as input.

Figure 22 presents the report generated with the CONTAINED parameter in ; effect and using all GROUP names in a particular data base as input. The Analyzer commands used to generate this example were:

```
NAME-GEN S='GROUP'
CONSISTS-MATRIX CONTAINED
```

FIGURE_21

Consists Matrix Report

PARAMETERS FOR: CM

FILE CONSISTS

UFA315:COMCOL : THE FOLLOWING DO NOT CONSIST OF ANYTHING:
name-six
name-two
paysystem-inputs

	ROW NAMES			COLUMN NAMES	
1	employee-name	GROUP	1	employment-termination-form	INPUT
2	social-security-number	ELEMENT	2	hourly-employment-form	INPUT
3	termination-date	ELEMENT	3	name-six	INPUT
4	employee-identification-number	ELEMENT	4	name-two	INPUT
5	employment-status	ELEMENT	5	paysystem-inputs	INPUT
6	personal-data	GROUP	6	salaried-employment-form	INPUT
7	hourly-job-data	GROUP	7	tax-withholding-certificate	INPUT
8	salaried-job-data	GROUP	8	time-card	INPUT
9	address	GROUP			
10	number-of-deductions	ELEMENT			
11	current-date	ELEMENT			
12	status-code	ELEMENT			
13	pay-date	ELEMENT			
14	regular-hours-worked	ELEMENT			
15	overtime-hours-worked	ELEMENT			
16	hours-per-day	ELEMENT			

THE ROWS ARE CONTAINED IN THE COLUMNS WITH *S

FIGURE_21

Consists Matrix Report

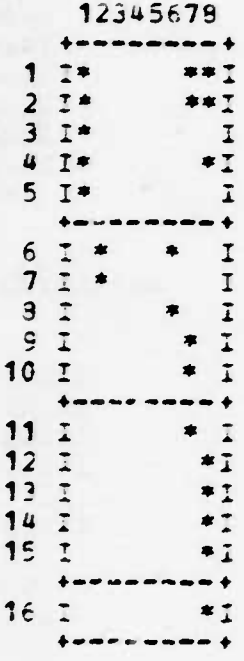


FIGURE_21

Consists Matrix Report

THE NUMBER OF COLUMNS THAT CONTAIN THE ROWS

	ROW	TYPE	COUNT
1	employee-name	GROUP	3
2	social-security-number	ELEMENT	3
4	employee-identification-number	ELEMENT	2
6	personal-data	GROUP	2
3	termination-date	ELEMENT	1
5	employment-status	ELEMENT	1
7	hourly-job-data	GROUP	1
8	salaried-job-data	GROUP	1
9	address	GROUP	1
10	number-of-deductions	ELEMENT	1
11	current-date	ELEMENT	1
12	status-code	ELEMENT	1
13	pay-date	ELEMENT	1
14	regular-hours-worked	ELEMENT	1
15	overtime-hours-worked	ELEMENT	1
16	hours-per-day	ELEMENT	1

THE NUMBER OF ROWS CONTAINED IN THE COLUMNS

	COLUMN	TYPE	COUNT
8	time-card	INPUT	8
1	employment-termination-form	INPUT	5
7	tax-withholding-certificate	INPUT	5
2	hourly-employment-form	INPUT	2
6	salaried-employment-form	INPUT	2
3	name-six	INPUT	0
4	name-two	INPUT	0
5	paysystem-inputs	INPUT	0

FIGURE_22

Consists Matrix Report

PARAMETERS FOR: CM

FILE CONTAINED

URA311:CONROW : THE FOLLOWING ARE NOT CONTAINED IN ANYTHING:
check
department-update-data
emp-termination-data
error-listing-entry
h-derived-pay-data
h-emp-report-entry
hired-report-entry
hourly-emp-pay-data
pay-stub
s-derived-pay-data
s-emp-report-entry
salaried-emp-pay-data
term-report-entry
time-card-data

	ROW NAMES	
1	address	GROUP
2	birthdate	GROUP
3	check	GROUP
4	department-update-data	GROUP
5	emp-termination-data	GROUP
6	employee-name	GROUP
7	error-listing-entry	GROUP
8	h-derived-pay-data	GROUP
9	h-emp-report-entry	GROUP
10	hired-report-entry	GROUP
11	hourly-emp-pay-data	GROUP
12	hourly-job-data	GROUP
13	pay-stub	GROUP
14	personal-data	GROUP
15	s-derived-pay-data	GROUP
16	s-emp-report-entry	GROUP
17	salaried-emp-pay-data	GROUP

	COLUMN NAMES	
1	personal-data	GROUP
2	tax-withholding-certificate	INPUT
3	term-report-entry	GROUP
4	hourly-employee-information	ENTITY
5	salaried-employee-information	ENTITY
6	time-card	INPUT
7	employment-termination-form	INPUT
8	error-listing-entry	GROUP
9	h-emp-report-entry	GROUP
10	s-emp-report-entry	GROUP
11	check	GROUP
12	pay-stub	GROUP
13	hired-report-entry	GROUP
14	hourly-employment-form	INPUT
15	salaried-employment-form	INPUT
16	employee-name	GROUP

FIGURE_22

Consists Matrix Report

ROW NAMES	COLUMN NAMES
18 salaried-job-data	GROUP
19 surname	GROUP
20 term-report-entry	GROUP
21 time-card-data	GROUP

THE ROWS ARE CONTAINED IN THE COLUMNS WITH *S

FIGURE_22

Consists Matrix Report

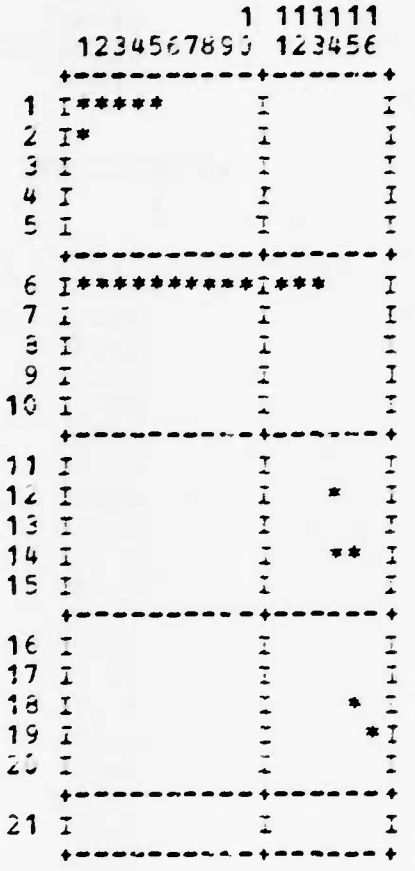


FIGURE_22

Consists Matrix Report

THE NUMBER OF COLUMNS THAT CONTAIN THE ROWS

	ROW	TYPE	COUNT
6	employee-name	GROUP	13
1	address	GROUP	5
14	personal-data	GROUP	2
2	birthdate	GROUP	1
12	hourly-job-data	GROUP	1
18	salaried-job-data	GROUP	1
19	surname	GROUP	1
3	check	GROUP	0
4	department-update-data	GROUP	0
5	emp-termination-data	GROUP	0
7	error-listing-entry	GROUP	0
8	h-derived-pay-data	GROUP	0
9	h-emp-report-entry	GROUP	0
10	hired-report-entry	GROUP	0
11	hourly-emp-pay-data	GROUP	0
13	pay-stub	GROUP	0
15	s-derived-pay-data	GROUP	0
16	s-emp-report-entry	GROUP	0
17	salaried-emp-pay-data	GROUP	0
20	term-report-entry	GROUP	0
21	time-card-data	GROUP	0

THE NUMBER OF ROWS CONTAINED IN THE COLUMNS

	COLUMN	TYPE	COUNT
1	personal-data	GROUP	3
2	tax-withholding-certificate	INPUT	2
3	term-report-entry	GROUP	2
4	hourly-employee-information	ENTITY	2
5	salaried-employee-information	ENTITY	2
14	hourly-employment-form	INPUT	2
15	salaried-employment-form	INPUT	2
6	time-card	INPUT	1
7	employment-termination-form	INPUT	1
8	error-listing-entry	GROUP	1

FIGURE_22

Consists Matrix Report

9	h-emp-report-entry	GROUP	1
10	s-emp-report-entry	GROUP	1
11	check	GROUP	1
12	pay-stub	GROUP	1
13	hired-report-entry	GROUP	1
16	employee-name	GROUP	1

CONTENTS REPORT

Purpose

To allow the user to view entire data structures (all levels) described in the Analyzer data base as implied by the use of the CONSISTS statement.

Information Presented

The CONTENTS REPORT presents all lower levels of data structures for SET, INPUT, OUTPUT, ENTITY and GROUP names used as input. (Since ELEMENTS may not have CONSISTS information they cannot be used as input to produce the report.) All names which the input names CONSIST of are designated as level 2 names; the names that the level 2 names CONSIST of are designated as level 3 names, etc.

The CONSISTS statement allows network structures to be constructed and so any given name may be CONTAINED in more than one structure, and at different levels in the different structures. The types of names presented in the structures will be INPUTS, OUTPUTS, ENTITIES, GROUPS and ELEMENTS.

Format

Each name given as input to the report is identified by a number 1*, 2*, etc., designating its position in the list of input names and also by the number 1 designating it as a level 1 name. All names that are part of its structure are numbered 1 though n according to its position in the structure when printed out and also numbered according to the name's relative level in the structure. Each level 2, 3 and so on is indented to further accent the idea of structure. A SYSTEM-PARAMETER or a numerical value may be used with the CONSISTS statement. In this case the VALUE of the SYSTEM-PARAMETER or the numerical value will be printed after the contained name. Each group of names of a given level number are CONTAINED in the preceeding name of the next highest level number. (Level 1 is the highest level number.) For example, the following URL description:

```
ENTITY   hourly-employee-record;
   CONSISTS   employee-name,
              employee-identification-number,
              social-security-number;

GROUP    employee-name;
   CONSISTS   surname,
              initial,
              first-name;
```

would appear as:

```
1*      1 hourly-employee-record
 1       2 employee-name
 2        3 surname
 3        3 initial
 4        3 first-name
 5       2 employee-identification-number
 6       2 social-security-number
```

in the CONTENTS REPORT if the report was generated for hourly-employee-record. If the report was generated for employee-name the following structure would appear:

```
1*      1 employee-name
 1       2 surname
 2       2 initial
 3       2 first-name
```

Options and Alternatives

The user may restrict the number of levels of the data structures presented when a numerical value is assigned to the LEVELS parameter. For example, when LEVELS=2 is given only the names at levels one and two of the data structure are presented in the report. The report normally prints out ALL levels of the data structures.

GROUPS in the structures which do not CONSIST of lower level information or those UNDEFINED names in the structure are flagged by the message:

NO CONSISTS FOR GROUP OR UNDEF

when the NCFLAG parameter is used. An index for the report is produced when the INDEX parameter is used.

Security information concerning the names printed, as specified by the CLASSIFICATION statement, can be printed on the report when the PRINT-SECURITY-INFORMATION parameter is used.

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input is searched for in the data base. If the name is not found, the message:

UBAJ65: MAINCONT: NAME NOT FOUND IN D.B.-

is printed and no structure information is printed for the name.

For each name given as an input, each name which is CONSISTS of is designated as a level 2 name as it is printed out. If this level 2 name CONSISTS of any information, then each name which it CONSISTS of is designated as a level 3 name as it is printed out. This process continues until no more CONSISTS relationships are found or the level specified by the LEVELS parameter is reached.

Names are printed out as they are encountered in the structure.

Usage

For the analyst, the report presents information structures as defined by the use of the CONSISTS statement in a format in which the entire structure can be seen. It is usually most beneficial to generate the CONTENTS REPORT for INPUT, OUTPUT and ENTITY names in the data base since all major information constructs are based around these types of names.

Completeness checks on the structure information in the data base can be performed by specifying the NCFIAG parameter when generating the report. Since all GROUPS should consist of other information (by definition of GROUP) and UNDEFINED names should be resolved, this parameter identifies these incomplete aspects of the structures.

For a complete set of final specifications for a particular target system, the report may be generated to present the logical information structures to be handled by the target. For this purpose it is recommended that the report be generated for all SET names with LEVELS=2 so that the relationships among INPUTS, OUTPUTS and ENTITIES with SETS can be presented, and generated for all INPUT, OUTPUT and ENTITY names so that structures below these names can be viewed. The commands to generate this information are:

```
NAME-GEN        S='SET'
CONTENTS        LEVELS=2

NAME-GEN        S='INPUT OR OUTPUT OR ENTITY' ORDER=BYTYPE
CONTENTS
```

the BYTYPE option is used so that all names of a particular name type are defined together.

When the volume of information which will be presented by the CONTENTS REPORT is unknown, it is a good practice to be conservative in specifying a value for LEVELS rather than allow LEVELS to have the value ALL and risk the possibility of generating dozens of pages of output.

Examples

Figure 23 presents the full data structure for the name hourly-employee-record. This example was produced by the following command:

```
CONTENTS  NAME=hourly-employee-report
```

Figure 24 presents the data structures down to level 2 for all ENTITIES defined in a particular Analyzer data base. The Analyzer commands used to generate this example were:

```
NAME-GEN  S='ENTITY'
CONTENTS  LEVELS=2
```

FIGURE_23

Contents Report

```
PARAMETERS FOR: CONT

   NAME=hourly-employee-report NONCFLAG PRINT-SECURITY-INFORMATION NOINDEX LEVELS=ALL


1*     1 hourly-employee-report (OUTPUT)
 1      2   h-emp-report-entry (GROUP)
 2       3     employee-name (GROUP)
 3        4       surname (ELEMENT)
 4        4       initial (ELEMENT)
 5        4       first-name (ELEMENT)
 6       3     employee-identification-number (ELEMENT)
                   classified )
 7       3     department (ELEMENT)
 8       3     gross-pay (ELEMENT)
 9       3     status-code (ELEMENT)
                   classified )
10       3     total-hours (ELEMENT)
```

FIGURE_24

Contents Report

```
PARAMETERS FOR: CONT

   FILE NONCFLAG PRINT-SECURITY-INFORMATION NOINDEX LEVELS=2


   1*    1 department-information (ENTITY)
    1      2   department (ELEMENT)
    2      2   supervisor (ELEMENT) (no-of-supervisors)
    3      2   number-of-employees (ELEMENT)
    4      2   total-budget (ELEMENT)
    5      2   remaining-funds (ELEMENT)

   2*    1 hourly-employee-information (ENTITY)
              classified 2
              secret 1
              top-secret 2
              limited-security 3
    1      2   employee-name (GROUP)
    2      2   employee-identification-number (ELEMENT)
                  classified 0
    3      2   social-security-number (ELEMENT)
                  classified 0
    4      2   pay-grade-code (ELEMENT)
                  classified 0
    5      2   address (GROUP)
    6      2   phone (ELEMENT)
    7      2   employment-date (ELEMENT)
    8      2   number-of-deductions (ELEMENT)
    9      2   department (ELEMENT)
   10      2   cumulative-gross-pay (ELEMENT)
   11      2   cumulative-federal-deductions (ELEMENT)
   12      2   cumulative-state-deductions (ELEMENT)
   13      2   cumulative-fica-deductions (ELEMENT)
   14      2   age (ELEMENT)
   15      2   sex (ELEMENT)
   16      2   status-code (ELEMENT)
                  classified 0
   17      2   employment-status (ELEMENT)
   18      2   cumulative-hours (ELEMENT)

   3*    1 salaried-employee-information (ENTITY)
```

FIGURE_24

Contents Report

```
 1     2   employee-name (GROUP)
 2     2   employee-identification-number (ELEMENT)
             classified 0
 3     2   social-security-number (ELEMENT)
             classified 0
 4     2   pay-grade-code (ELEMENT)
             classified 0
 5     2   address (GROUP)
 6     2   phone (ELEMENT)
 7     2   employment-date (ELEMENT)
 8     2   number-of-deductions (ELEMENT)
 9     2   department (ELEMENT)
10     2   cumulative-federal-deductions (ELEMENT)
11     2   cumulative-gross-pay (ELEMENT)
12     2   cumulative-state-deductions (ELEMENT)
13     2   cumulative-fica-deductions (ELEMENT)
14     2   age (ELEMENT)
15     2   sex (ELEMENT)
16     2   employment-status (ELEMENT)
17     2   status-code (ELEMENT)
             classified 0
```

DATA PROCESS REPORT

Purpose

This report shows the interaction between information (SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS and ELEMENTS) defined and the PROCESSES defined for the target system. It also shows the data dependencies among PROCESSES as implied by the Language descriptions of the PROCESSES and possible deficiencies in the descriptions of these PROCESSES.

Information Presented

The information presented in this report is slightly different depending on whether the DATA or PROCESS parameter was used in generating the report.

If the DATA parameter is used in generating the report, the names used as input must be SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS and/or ELEMENTS and the report presents all those PROCESSES which manipulate the input names via the RECEIVED, USED, UPDATED, DERIVED and GENERATED statements in a particular Analyzer data base.

If the PROCESS parameter is used in generating the report, the names used as input must be PROCESS names and the report presents all those SET, INPUT, OUTPUT, ENTITY, GROUP and ELEMENT names that each input PROCESS name manipulates via the RECEIVES, USES, UPDATES, DERIVES and GENERATES statements in a particular Analyzer data base.

The interactions among data and PROCESSES are shown as a matrix. An analysis on this matrix presents a summary describing the incomplete aspect of the Language description with respect to the information presented in the matrix. For example, a PROCESS producing information without using any information would be identified in this summary.

A second matrix presents the manner in which the PROCESSES (presented in the first matrix) interact, i.e., how they depend on data produced by other PROCESSES. Again, the information in this matrix is derived from the information in the first matrix.

Finally, an analysis is performed on this matrix and presented in the form of a summary. The summary identifies those PROCESSES with no predecessors (i.e., do not USE or RECEIVE data produced by other PROCESSES) and those with no successors (i.e., do not DERIVE, UPDATE or GENERATE any data used by other PROCESSES).

The two summaries and the second matrix are all produced based on the information presented in the first matrix. Therefore,

items which are designated incomplete in the report may actually be resolved elsewhere in the description in the data base. For example, if the following description was in the data base:

```
PROCESS:        payroll-processing;
 USES:            employee-information;
 DERIVES:             paysystem-outputs;
```

and the DATA PROCESS REPORT was produced for the name employee-information, the PROCESS payroll-processing would be presented since it USES it. The report would then identify payroll-processing as USING data but not UPDATING or DERIVING anything though elsewhere in the description it does. For this reason, it is important to recognize that the comments in the report are made with respect to the information in the first matrix rather than the entire description as it exists in the data base.

Format

Two lists of names are first presented, one labeled ROW NAMES and the other COLUMN NAMES. If the DATA parameter was used in generating the report, the names designated as ROW NAMES are those which were given as input. If the PROCESS parameter was used in generating the report the names designated as COLUMN NAMES are those which were given as input.

In any case, each name under COLUMN NAMES in some way (RECEIVES, USES, etc.) interacts with zero or more names given under ROW NAMES and each name under ROW NAMES is manipulated (USED, DERIVED, etc.) by zero or more, PROCESS names given under COLUMN NAMES.

The DATA PROCESS INTERACTION MATRIX is then printed out to show the relationships between the names designated as ROW NAMES (which are represented by the rows of the matrix) and the names designated as COLUMN NAMES (which are represented by the columns of the matrix). The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list of ROW NAMES and COLUMN NAMES, respectively.

An entry (F, U, D, A, F, 1 or 2) at the intersection of a particular row and column of the matrix designates that the name represented by the row is manipulated in some way (as defined by the meaning of the entry) by the name represented by the column. A legend is provided as part of the report that defines the meaning of each possible entry. This legend is shown below for purposes of clarification.

[i, j] value	meaning
R	Row i is received or used by column j (input)
U	Row i is updated by column j
D	Row i is derived or generated by column j (output)
A	Row i is input to, updated by, and output of column j (all)
F	Row i is input to and output of column j (flow)
1	Row i is input to and updated by column j
2	Row i is updated by and output of column j

A summary section called the DATA PROCESS INTERACTION MATRIX ANALYSIS is then presented specifying those inconsistencies found in analysis of the DATA PROCESS INTERACTION MATRIX. Inconsistencies for ROW NAMES and COLUMN NAMES are handled separately. Inconsistencies found for ROW NAMES are presented under the DATA heading and are of the following format:

row name (name-type) (row number) inconsistency message

Inconsistencies found for COLUMN NAMES are presented under the PROCESS heading and are of the following format:

column name (row number) inconsistency message

No name-type is necessary because all names under COLUMN NAMES are PROCESSES.

A second matrix, the PROCESS INTERACTION MATRIX, is printed to show relationships implied between PROCESSES in the DATA PROCESS INTERACTION MATRIX. In this matrix both the rows and columns represent those PROCESS names listed under COLUMN NAMES and the rows and columns are numbered to correspond to the appropriate name in COLUMN NAMES.

An asterisk (*) entry at the intersection of a particular row and column of the matrix designates that the PROCESS represented by the row DERIVES or UPDATES some information which is USED by the PROCESS represented by the column.

A summary section called the PROCESS INTERACTION MATRIX ANALYSIS then presents observations on the information in the PROCESS INTERACTION MATRIX. These observations are presented in the following format:

process name (row or column number) observation

An observation is given for each PROCESS which does not use information produced by any of the other PROCESSES, or does not produce information used by any of the other PROCESSES.

Options and Alternatives

The report must be generated using either the DATA or PROCESS parameter. If the DATA parameter is used, all names given as input must be SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names. If the PROCESS parameter is used, all names given as input must be PROCESS names.

Various sections of the report can be printed or left out depending on the parameters used when generating it. These parameters and their effects are presented below:

1)	DPMAT	-	the DATA PROCESS INTERACTION MATRIX is included in the report
	NODPMAT	-	the matrix is not printed
2)	DPANL	-	the DATA PROCESS INTERACTION MATRIX ANALYSIS included in the report
	NODPANL	-	the analysis is not printed
3)	PMAT	-	the PROCESS INTERACTION MATRIX is included in the report
	NOPMAT	-	the matrix is not printed
4)	PANL	-	the PROCESS INTERACTION ANALYSIS is included in the report
	NOPANL	-	the analysis is not printed

The report may be generated for a single input name (via the name parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input is searched for in the data base. If it is not found, the message:

URA143:MAINDP: NAME NOT IN D.B.-

is printed. If the name is found and the DATA parameter is used, the name is checked that it is a SET, INPUT, ENTITY, GROUP or ELEMENT name. If it is not, the message:

URA134:MAINDP: INVALID INPUT NAME TYPE

is printed and the name is not included in the matrix.

If the DATA parameter is used, all PROCESS names which RECEIVE, USE, UPDATE, DERIVE and/or GENERATE each input name are found.

The list of all input names and the list of all PROCESS names found are then printed on the report.

If the PROCESS parameter is used, all SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names which interact with each input name are found. The list of all input names and the list of all SET, INPUT, OUTPUT, ENTITY, GROUP and ELEMENT names found are then printed on the report.

The DATA PROCESS INTERACTION MATRIX is then printed with the appropriate value (R, U, D, A, F, 1 or 2) designating a relationship between a column name and row name.

The matrix is then analyzed and inconsistency messages are printed as data diagnostics (for row names representing SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names) and process diagnostics (for column names representing PROCESS names).

These diagnostics are presented below categorized by the name types to which they may apply.

I. <u>DATA DIAGNOSTICS (ROWS)</u>

1) INPUT names

- not RECEIVED by any PROCESS

If no PROCESS names RECEIVE the INPUT name of interest, this diagnostic is printed. If at least one PROCESS RECEIVES the INPUT name, the message is not printed.

- not USED by any PROCESS

If no PROCESS USES the INPUT name of interest, this diagnostic is printed.. If at least one PROCESSES USES the INPUT name, the message is not printed.

2) OUTPUT names

- not GENERATED by any PROCESS

If no PROCESS names GENERATE the OUTPUT name of interest, this diagnostic is printed. If at least one PROCESS GENERATES the OUTPUT name, the message is not printed.

- not DERIVED by any PROCESS

If no PROCESS names DERIVE the OUTPUT name of interest, this diagnostic is printed. If at least one PROCESS DERIVES the OUTPUT name, the message is not printed.

3) ENTITY or SET names

- not DERIVED by any PROCESS

If no PROCESS names DERIVE the ENTITY or SET name of interest, this diagnostic is printed. If at least one PROCESS DERIVES the name, the message is not printed.

- DERIVED but not USED by any PROCESS

If at least one PROCESS name DERIVES and no PROCESS names USE the ENTITY or SET name of interest, then this diagnostic is printed. There are 3 conditions that will cause this message not to be printed.

i) the name is not DERIVED by any PROCESS.

ii) the name is USED by at least one PROCESS.

iii) both i and ii.

- UPDATED but not USED by any PROCESS

If at least one PROCESS UPDATES and no PROCESS USES the ENTITY or SET name of interest, this diagnostic is printed. There are 3 conditions that will cause this message not to be printed:

i) the name is not UPDATED by any PROCESS.

ii) the name is USED by at least one PROCESS.

iii) both i and ii.

4) GROUP or ELEMENT

- not DERIVED, UPDATED, or USED by any PROCESS

If no PROCESS names DERIVE, UPDATE or USE the GROUP or ELEMENT name of interest, this diagnostic is printed. There are several conditions that will cause this message not to be printed:

i) at least one PROCESS DERIVES the name.

ii) at least one PROCESS UPDATES the name.

iii) at least one PROCESS USES the name.

iv) all 3 or any combination of the above.

NOTE: it is only necessary that one of the first 3 conditions is satisfied for the message not to be printed.

II. PROCESS DIAGNOSTICS (COLUMNS)

- does not interact with any data

If the PROCESS of interest does not interact with any SET, INPUT, OUTPUT, ENTITY, GROUP or ELEMENT names, this diagnostic is printed. If at least one name interacts with this PROCESS, this message is not printed.

- USES data, but does not DERIVE or UPDATE anything

If the PROCESS of interest USES at least one SET, INPUT, ENTITY, GROUP or ELEMENT name and does not DERIVE or UPDATE any, this diagnositc is printed. There are several conditions where this message will not be printed:

i) the PROCESS does not USE any SET, INPUT, ENTITY, GROUP or ELEMENT.

ii) the PROCESS DERIVES at least one SET, OUTPUT, ENTITY, GROUP or ELEMENT.

iii) the PROCESS UPDATES at least one SET, ENTITY, GROUP or ELEMENT.

iv) all 3 or any combination of the above.

- DERIVES something but does not USE anything

If the PROCESS of interest DERIVES at least one SET, ENTITY, GROUP or ELEMENT and does not USE any, this diagnostic is printed. There are 3 conditions where this message will not be printed:

i) the PROCESS does not DERIVE any SET, OUTPUT, ENTITY, GROUP or ELEMENT.

ii) the PROCESS USES at least one SET, INPUT, ENTITY, GROUP or ELEMENT.

iii) both i and ii.

- UPDATES something but does not USE anything

If the PROCESS of interest UPDATES at least one SET, ENTITY, GROUP or ELEMENT and does not USE any, this diagnostic is printed. There are 3 conditions where this message will not be printed:

i) the PROCESS does not UPDATE any SET, ENTITY, GROUP or ELEMENT.

ii) the PROCESS USES at least one SET, INPUT, ENTITY, GROUP or ELEMENT.

iii) both i and ii.

The PROCESS INTERACTION MATRIX is then produced using the data in the first matrix. The entries in a given column (representing a PROCESS name) of the DATA PROCESS INTERACTION MATRIX are compared with the entries for each other column. If an entry in the given column designates that the PROCESS USES information which is DERIVED or UPDATED by the column being compared with, an * entry is made in the PROCESS INTERACTION matrix at the column or row, respectively, representing these two PROCESS names. The matrix is then analyzed and observations are produced from this analysis. These observations are presented below.

- no interaction with other PROCESSES

If a PROCESS does not USE an object and also does not DERIVE or UPDATE an object, this diagnostic is printed. There are 3 conditions that will cause this message not to be printed:

i) the PROCESS USES at least one SET, INPUT, ENTITY, GROUP or ELEMENT.

ii) the PROCESS UPDATES or DERIVES a SET, OUTPUT, ENTITY, GROUP or ELEMENT.

iii) both i and ii.

- no predecessors for this PROCESS

If the PROCESS of interest does not USE any objects but DERIVES or UPDATES at least one object, this diagnostic is printed. The 3 conditions that will cause this message not to be printed are:

i) the PROCESS USES at least one SET, INPUT, ENTITY, GROUP or ELEMENT.

ii) the PROCESS does not DERIVE or UPDATE any SETS, OUTPUTS, ENTITIES, GROUPS or ELEMENTS.

iii) both i and ii.

- no successors for this PROCESS

If the PROCESS of interest USES at least one object but does not DERIVE or UPDATE any object, this diagnostic is printed. The 3 conditions that will cause this message not to be printed are:

i) the PROCESS does not USE any SETS, INPUTS, ENTITIES, GROUPS or ELEMENTS.

ii) the PROCESS DERIVES or UPDATES at least one SET, OUTPUT, ENTITY, GROUP or ELEMENT.

iii) both i and ii.

Usage

When the report is generated using the DATA parameter, it aids in presenting the utilization of SET, INPUT, OUTPUT, ENTITY, GROUP and ELEMENT names defined. This aids in identifying which names are not being utilized. For those names which are being utilized, it presents all the PROCESS names which utilize them.

When the report is generated using the PROCESS parameter, it presents all the data required for each particular PROCESS. It also aids in identifying PROCESS names which do not interact with data or are not consistently defined with respect to the manner in which they use data.

The PROCESS INTERACTION MATRIX may be used by designers to plan out the logic of the target system because it presents the data dependencies among the PROCESSES defined.

The following completeness checks can be made for a target system description based on information presented in the report:

- ALL INPUTS RECEIVED by some PROCESS
- ALL INPUTS USED by some PROCESS
- ALL OUTPUTS GENERATED by some PROCESS
- ALL OUTPUTS DERIVED by some PROCESS
- ALL ENTITIES and SETS DERIVED by some PROCESS
- ALL ENTITIES and SETS DERIVED and USED by some PROCESS
- ALL ENTITIES and SETS are UPDATED and USED by some PROCESS
- ALL GROUPS and ELEMENTS are DERIVED or UPDATED or USED by some PROCESS
- ALL PROCESSES USE data and DERIVE or UPDATE data
- ALL PROCESSES which DERIVE data also USE data
- ALL PROCESSES which UPDATE data also USE data
- ALL PROCESSES interact with data in some way

The report may also be used to aid in determining if the description of the target system was specified consistently with respect to the use of language statements. In particular, it determines:

- whether or not the use of RECEIVES and GENERATES statements in describing the system flow aspect of the system is consistent.

- whether or not the use of USES, UPDATES, and DERIVES statement in describing the data derivation aspect of the system is consistent.

Examples

Figure 25 presents the DATA PROCESS REPORT generated for all INPUT, OUTPUT and ENTITY names defined for a particular target system description. This example was produced using the Analyzer commands:

```
NAME-GEN S='INPUT OR OUTPUT OR ENTITY'
DATA-PROCESS DATA
```

Figure 26 presents the report generated for low level PROCESSES defined in the description. These PROCESSES were identified by the KEYWORD "terminal" and the report was produced by the following Analyzer commands:

```
NAME-GEN S='PROCESS AND KEY=terminal'
DATA-PROCESS PROCESS
```

Note that no reports of omissions appear in this figure under Data Process Interaction Matrix Analysis because at least one condition for the names listed is satisfied.

FIGURE_25

Data Process Report

PARAMETERS FOR: DP

FILE DATA DPMAT DPANL PMAT PANL

THE ROWS ARE DATA NAMES, THE COLUMNS ARE PROCESS NAMES.

	ROW NAMES	
1	department-information	ENTITY
2	hourly-employee-information	ENTITY
3	salaried-employee-information	ENTITY
4	employment-termination-form	INPUT
5	hourly-employment-form	INPUT
6	name-six	INPUT
7	name-two	INPUT
8	paysystem-inputs	INPUT
9	salaried-employment-form	INPUT
10	tax-withholding-certificate	INPUT
11	time-card	INPUT

	COLUMN NAMES	
1	hourly-information-creation	PROCESS
2	term-report-entry-generation	PROCESS
3	hourly-employee-processing	PROCESS
4	salaried-information-creation	PROCESS
5	salaried-employee-processing	PROCESS
6	terminating-emp-processing	PROCESS
7	hire-report-entry-generation	PROCESS
8	new-employee-processing	PROCESS
9	payroll-processing	PROCESS

FIGURE_25

Data Process Report

DATA PROCESS INTERACTION MATRIX

(i,j) value	meaning
F	Row i is received or used by column j (input)
U	Row i is updated by column j
D	Row i is derived or generated by column j (output)
A	Row i is input to, updated by, and output of column j (all)
P	Row i is input to and output of column j (flow)
1	Row i is input to and updated by column j
2	Row i is updated by and output of column j

	1	2	3	4	5	6	7	8	9
1	I				I				I
2	I	D	F	F	I				I
3	I		F		D F I				I
4	I				I	F			I
5	I	F			I		F	F	I
6	I				I				I
7	I				I				I
8	I				I				F I
9	I			F	I		F	F	I
10	I				I			F	I
11	I		F		I				I

FIGURE_25

Data Process Report

DATA PROCESS INTERACTION MATRIX ANALYSIS

DATA

department-information	(ENTITY)	(ROW 1)	NOT DERIVED BY ANY PROCESS
name-six	(INPUT)	(ROW 6)	NOT RECEIVED BY ANY PROCESS
name-six	(INPUT)	(ROW 6)	NOT USED BY ANY PROCESS
name-two	(INPUT)	(ROW 7)	NOT RECEIVED BY ANY PROCESS
name-two	(INPUT)	(ROW 7)	NOT USED BY ANY PROCESS

PROCESSES

term-report-entry-generation	(COLUMN 2)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
hourly-employee-processing	(COLUMN 3)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
salaried-employee-processing	(COLUMN 5)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
terminating-emp-processing	(COLUMN 6)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
hire-report-entry-generation	(COLUMN 7)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
new-employee-processing	(COLUMN 8)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI
payroll-processing	(COLUMN 9)	USES DATA, BUT DOES NOT DERIVE OR UPDATE ANYTHI

FIGURE_25

Data Process Report

PROCESS INTERACTION MATRIX (INCIDENCE)

The rows and columns are process names from above.
An asterisk in (i,j) means that something derived
or updated by process i is used by process j.

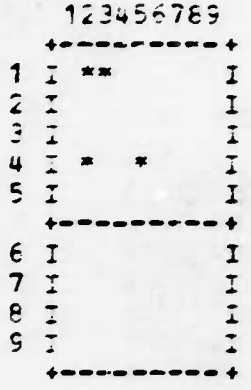


FIGURE_25

Data Process Report

PROCESS INTERACTION MATRIX ANALYSIS

hourly-information-creation	(ROW/COL	1)	NO PREDECESSORS FOR THIS PROCESS
term-report-entry-generation	(ROW/COL	2)	NO SUCCESSORS FOR THIS PROCESS
hourly-employee-processing	(ROW/COL	3)	NO SUCCESSORS FOR THIS PROCESS
salaried-information-creation	(ROW/COL	4)	NO PREDECESSORS FOR THIS PROCESS
salaried-employee-processing	(ROW/COL	5)	NO SUCCESSORS FOR THIS PROCESS
terminating-emp-processing	(ROW/COL	6)	NO INTERACTION, BUT HAS SUBPARTS AND IS PART OF
hire-report-entry-generation	(ROW/COL	7)	NO INTERACTION, BUT IS PART OF ANOTHER PROCESS
new-employee-processing	(ROW/COL	8)	NO INTERACTION, BUT HAS SUBPARTS AND IS PART OF
payroll-processing	(ROW/COL	9)	NO INTERACTION, BUT HAS SUBPARTS

FIGURE_26

Data Process Report

PARAMETERS FOR: DP

FILE PROCESS DPMAT DPALL PMAT PANI

THE ROWS ARE DATA NAMES, THE COLUMNS ARE PROCESS NAMES.

	ROW NAMES		COLUMN NAMES	
1	cumulative-federal-deductions	ELEMENT	federal-deductions-update	PROCESS
2	federal-tax	ELEMENT	fica-deductions-update	PROCESS
3	cumulative-fica-deductions	ELEMENT	funds-update	PROCESS
4	fica-tax	ELEMENT	gross-pay-update	PROCESS
5	remaining-funds	ELEMENT	h-gross-pay-computation	PROCESS
6	department	ELEMENT	hours-update	PROCESS
7	gross-pay	ELEMENT	net-pay-computation	PROCESS
8	cumulative-gross-pay	ELEMENT	pay-computation-validation	PROCESS
9	pay-grade-code	ELEMENT	s-gross-pay-computation	PROCESS
10	total-hours	ELEMENT	state-deductions-update	PROCESS
11	cumulative-hours	ELEMENT	tax-computation	PROCESS
12	net-pay	ELEMENT	time-card-validation	PROCESS
13	total-deductions	ELEMENT	total-deductions-computation	PROCESS
14	error-code	ELEMENT	total-hours-computation	PROCESS
15	employee-identification-number	ELEMENT		
16	social-security-number	ELEMENT		
17	status-code	ELEMENT		
18	cumulative-state-deductions	ELEMENT		
19	state-tax	ELEMENT		
20	number-of-deductions	ELEMENT		
21	pay-date	ELEMENT		
22	regular-hours-worked	ELEMENT		
23	overtime-hours-worked	ELEMENT		

FIGURE_26

Data Process Report

DATA PROCESS INTERACTION MATRIX

(i,j) value	meaning
R	Row i is received or used by column j (input)
U	Row i is updated by column j
D	Row i is derived or generated by column j (output)
A	Row i is input to, updated by, and output of column j (all)
F	Row i is input to and output of column j (flow)
1	Row i is input to and updated by column j
2	Row i is updated by and output of column j

FIGURE_26

Data Process Report

DATA PROCESS INTERACTION MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	I	U			I					I				I
2	I	F			I					I	D		F	I
3	I		U		I					I				I
4	I		F		I					I	D		F	I
5	I			U	I					I				I
6	I			F	I					I				I
7	I			F	F	DI		F		D I	F			I
8	I				U	I				I				I
9	I					RI			F	R I				RI
10	I					RI	R			I				DI
11	I					I	U			I				I
12	I					I		D		I				I
13	I					I		R		I			D	I
14	I					I			L	I		D		I
15	I					I			F	I		F		I
16	I					I			F	I		F		I
17	I					I			F	I		R		I
18	I					I				U I				I
19	I					I				R I	D		R	I
20	I					I				I	R			I
21	I					I				I		F		I
22	I					I				I				RI
23	I					I				I				RI

FIGURE_26

Data Process Report

DATA PROCESS INTERACTION MATRIX ANALYSIS

FIGURE_26

Data Process Report

PROCESS INTERACTION MATRIX (INCIDENCE)

The rows and columns are process names from above.
An asterisk in (i,j) means that something derived
or updated by process i is used by process j.

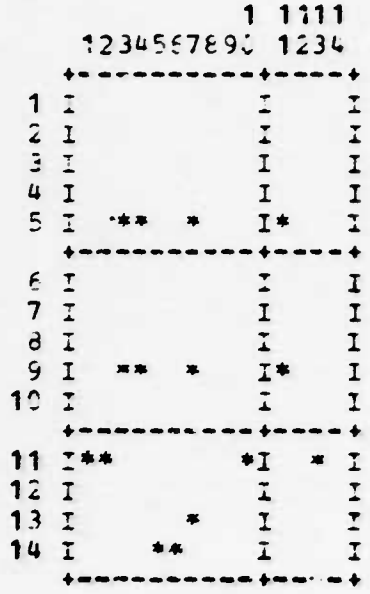


FIGURE_26

Data Process Report

PROCESS INTERACTION MATRIX ANALYSIS

federal-deductions-update	(ROW/COL 1)	NO SUCCESSORS FOR THIS PROCESS
fica-deductions-update	(ROW/COL 2)	NO SUCCESSORS FOR THIS PROCESS
funds-update	(ROW/COL 3)	NO SUCCESSORS FOR THIS PROCESS
gross-pay-update	(ROW/COL 4)	NO SUCCESSORS FOR THIS PROCESS
hours-update	(ROW/COL 6)	NO SUCCESSORS FOR THIS PROCESS
net-pay-computation	(ROW/COL 7)	NO SUCCESSORS FOR THIS PROCESS
pay-computation-validation	(ROW/COL 8)	NO INTERACTION, BUT IS PART OF ANOTHER PROCESS
s-gross-pay-computation	(ROW/COL 9)	NO PREDECESSORS FOR THIS PROCESS
state-deductions-update	(ROW/COL 10)	NO SUCCESSORS FOR THIS PROCESS
time-card-validation	(ROW/COL 12)	NO INTERACTION, BUT IS PART OF ANOTHER PROCESS
total-hours-computation	(ROW/COL 14)	NO PREDECESSORS FOR THIS PROCESS

DICTIONARY REPORT

Purpose

This report presents definitions attached to names used in a Language description and is intended as an aid in communication among persons interested in the description.

Information Presented

This report prints out the following information about each name used as input when generating the report and the appropriate parameters are used:

- Name type of the name
- DESCRIPTION comment entry for the name
- SYNONYMS associated with the name
- RESPONSIBLE PROBLEM DEFINER for the name's description
- KEYWORDS associated with the name

All of the above information is readily available from the contents of the data base.

Format

A dictionary entry is presented for each name given as input to the software producing the report. The first line of each entry consists of:

- A number designating the order the name was read from the input (and consequently presented in the report)
- The name the entry is for
- The name type of the name

The DESCRIPTION, SYNONYM, KEYWORDS and RESPONSIBLE-PROBLEM-DEFINER statements for each name are presented in the following format after the first line of the entry:

```
DESCRIPTION:

        [DESCRIPTION comment entry]

SYNONYMS:     [all SYNONYMS for the name listed two per line]
```

KEYWORDS: [all KEYWORDS for the name listed two per line]

RESP PD: [PROBLEM DEFINER name]

Spacing between dictionary entries may be modified by the NUM-SPACE PARAMETER.

Options and Alternatives

The number of lines skipped between dictionary entries is specified by the NUM-SPACE parameter. By default, 3 lines are skipped but NUM-SPACE may take any value 0 through 10.

The different types of information presented in a report entry can be included in or left out of the report depending on the parameters used when generating it. Each parameter and its effect is presented below:

1) DESCRIPTION	-	the DESCRIPTION comment entry for each name is printed
NODESCRIPTION	-	DESCRIPTION comment entries are not printed
2) KEYWORDS	-	all KEYWORDS associated to each name is printed out
NOKEYWORDS	-	KEYWORDS are not printed
3) RESPONSIBLE-PD	-	the RESPONSIBLE-PROBLEM-DEFINER for each name is printed
NORESPONSIBLE-PD	-	RESPONSIBLE-PROBLEM-DEFINERS are not printed
4) SYNONYMS	-	all SYNONYMS associated to each name are printed out
NOSYNONYMS	-	SYNONYMS are not printed

An INDEX for the report is provided when the INDEX parameter is used.

Analysis

For each name given as input, the software finds the name in the data base. If the name cannot be found, the message:

URA0064: MAINDICT: NAME NOT FOUND IN D.B.

is printed. If the name is found, the information specified by the parameters for the command is retrieved if available for the

AD-A060 517 MICHIGAN UNIV ANN ARBOR DEPT OF INDUSTRIAL AND OPERA--ETC F/G 9/2
USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
JUL 78 F19628-76-C-0197
UNCLASSIFIED ESD-TR-78-131 NL

3 OF 7
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3 OF 7

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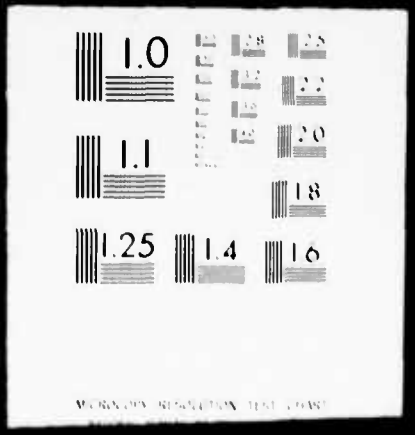

name.

Usage

The report is a valuable aid to analysts in maintaining definitions for names in the data base and as a tool for communicating with users of the target system. The DESCRIPTIONS for each name may be approved or disapproved by the users with respect to what the users require of the target system. As DESCRIPTIONS are modified, the analyst can add, delete or modify other statements to correspond to the DESCRIPTIONS.

If conventions are imposed on the language description required for particular types of names, an effective data dictionary can be formed. For example, by requiring certain KEYWORDS to be assigned to GROUP and ELEMENT names and that each GROUP and ELEMENT name have a DESCRIPTION, the DICTIONARY REPORT would be a good reference for anyone interested in the data described in the target system.

Examples

Figure 27 presents the DICTIONARY REPORT for a single PROCESS name. This example was produced by the command:

```
DICTIONARY NAME=payroll-processing
```

Figure 28 presents the report for several PROCESS names which have the KEYWORD 'independent'. This example was produced by the following Analyzer commands:

```
NAME-GEN S='PROCESS AND KEY=independent'
DICTIONARY
```

FIGURE_27

Dictionary Report

PARAMETERS FOR: DICT

NAME=payroll-processing NOINDEX DESCRIPTION SYNONYMS KEYWORDS RESPONSIBLE-PD NUM-SPACE=2

1 payroll-processing PROCESS

DESCRIPTION:
This process represents the highest level process in the target system. it accepts and processes all inputs and produces all outputs.

SYNONYMS: payproc p1

RESP PI: michel-j-bastarache

FIGURE_28

Dictionary Report

```
PARAMETERS FOR: DICT

  FILE NOINDEX DESCRIPTION SYNONYMS KEYWORDS RESPONSIBLE-PL RUN-SPACE=2


  1 hourly-employee-processing        PROCESS

                    SYNONYMS: h-emp-proc

                    KEYWORDS: independent

  2 new-employee-processing           PROCESS

                    DESCRIPTION:
                              This process produces the new hire section
                              in the h-t report.

                    KEYWORDS: independent

  3 salaried-employee-processing      PROCESS

                    SYNONYMS: s-emp-proc

                    KEYWORDS: independent

  4 terminating-emp-processing        PROCESS

                    DESCRIPTION:
                              This process deletes data, for those employees who
                              are no longer on the payroll, from the files. It also
                              prints a list of all employees no longer on the
                              payroll.

                    KEYWORDS: independent
```

DYNAMIC ANALYSIS REPORT

Purpose

This report shows the INPUTS, EVENTS, CONDITIONS and PROCESSES that influence what activities (PROCESSES) will be performed and the order in which they are performed in the target system. It also indicates the dependencies of the system dynamics on the condition of other system objects. The relationships depicted are TRIGGERS, INTERRUPTS, TERMINATES, CAUSES, MAKES, BECOMING-TRUE/FALSE, and optionally UTILIZES.

Information Presented

For each PROCESS, EVENT, CONDITION and INPUT name given as input or obtained internally from the relationships, the report presents, in the form of a matrix, all objects dynamically related to the given object. For each PROCESS given, the report shows those PROCESSES that the given object TRIGGERS, TERMINATES or INTERRUPTS, those EVENTS that INCEPTION-CAUSES or TERMINATION-CAUSES and those CONDITIONS that the given process MAKES TRUE or MAKES FALSE.

Similarly, for each INPUT and EVENT given, the report shows those PROCESSES that the given object TRIGGERS, TERMINATES or INTERRUPTS, and optionally UTILIZES those EVENTS that the given object CAUSES and the CONDITIONS that the given object MAKES TRUE or MAKES FALSE. For each CONDITION object given, the report indicates those PROCESSES for which the condition BECOMING TRUE or BECOMING FALSE TRIGGERS, TERMINATES or INTERRUPTS, and those events for which the condition BECOMING TRUE or BECOMING FALSE CAUSES.

This report is unlike some of the other Analyzer reports in that a single input name could add many names to both the rows and columns of the matrix. This is because the particular object could be dynamically related to many other objects, those in turn dynamically related to other objects, and so on. The dynamic analysis thus proceeds, in essence, down the "tree" or chain of events, processes and conditions for each name given as input. Therefore, there is not a one-to-one correspondence between the number of names provided in the input, and the number of names in the rows and columns of the matrix. There will likely be more names in the matrix than specified in the input.

An analysis is then performed on the matrix. Certain potential incompletenesses and inconsistencies of the target system description are determined by the analysis and signaled to the

user through appropriate diagnostic messages.

Format

Two lists of names are first presented, one labeled row names, the other labeled column names. The row names consist of those names that were given as input plus all other names found during the processing. The column names are in some way affected by the row names, e.g., TRIGGERED BY, CAUSED BY, etc. (See Table 1 below) The object type of each name appears beside it in the column.

The DYNAMICS ANALYSIS MATRIX is then printed to show the relationships between the names designated as ROW NAMES (which are represented by the rows of the matrix) and the names designated as column names (which are represented by the columns of the matrix). The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list of ROW NAMES and COLUMN NAMES, respectively. The order of the rows and columns will be by object type unless specifically directed otherwise using the ORDER parameter.

An entry at the intersection of a particular row and column of the matrix designates that the name represented by the column is affected in some way by the name represented by the row. A legend is provided as part of the report that defines the meaning of each possible entry. This legend is shown below in Table 1.

[i,_j]	Meaning
A	Row i TRIGGERS Column j
B	Row i INTERRUPTS Column j
C	Row i TERMINATES Column j
D	Row i CAUSES Column j
E	Row i MAKES TRUE Column j
F	Row i MAKES FALSE Column j
G	Row i BECOMING-TRUE-TRIGGERS Column j
H	Row i BECOMING-TRUE-INTERRUPTS Column j
I	Row i BECOMING-TRUE-TERMINATES Column J
J	Row i BECOMING-TRUE-CAUSES Column j
K	Row i BECOMING-FALSE-TRIGGERS Column j
L	Row i BECOMING-FALSE-INTERRUPTS Column j
M	Row i BECOMING-FALSE-TERMINATES Column j
N	Row i BECOMING-FALSE-CAUSES Column j
O	Row i INCEPTION-CAUSES Column j
P	Row i TERMINATION-CAUSES Column j
Q	Row i UTILIZES Column j
X	Row i is the same name as Column j

TABLE 1 - System Dynamics Relationships

In addition to the codes above, the presence of a numerical suffix indicates that the declared action is either conditional (may or may not happen DEPENDING ON some condition or element) or repetitive (happening FOR EACH named object instance) or both. The suffixes are:

Suffix Value	Meaning
1	Conditional (DEPENDING ON)
2	Repetitive (FOR EACH)
3	Both of the above

A maximum of twenty-five rows and thirty columns is printed per page for the Dynamic Analysis Matrix. Should more than thirty columns be necessary, the additional columns will appear on consecutive pages in groups of thirty. Row continuations will appear on succeeding pages, with all columns printing for each additional group of rows.

A summary section called the DYNAMICS ANALYSIS is then presented specifying possible incompletenesses and inconsistencies found in the analysis of the matrix.

The diagnostics are printed in three groups. First, the column incompleteness messages will be printed in the format:

object-name name-type column-number incompleteness-message

Then the row imcompleteness messages will be printed in the format:

object-name name-type row-number incompleteness-message

The possible incompleteness messages are described below under Analysis.

The inconsistency messages are the last to be printed. They have the format:

object-name-1 AND object-name-2 MAY BE DYNAMICALLY INCONSISTENT

Options and Alternatives

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved by NAME-GEN.

The matrix and analysis sections of the report can be printed or omitted depending on the parameter values specified. These parameters and their effects are presented below.

1) DYNAMIC-ANALYSIS-MATRIX(DAMAT)
   - the DYNAMICS ANALYSIS MATRIX is included in the report (this is the default)

   NODYNAMIC-ANALYSIS-MATRIX(NDAMAT)
   - the matrix is not printed

2) DYNAMICS-ANALYSIS(DANL)
   - the DYNAMICS ANALYSIS messages are included in the report (this is the default)

   NODYNAMICS-ANALYSIS(NDANL)
   - the messages are not printed

The names may appear in the rows and columns in the order in which they are encountered during the processing, alphabetically within object type, or in the order encountered within object type. The parameters for this option are:

3) ORDER= {BYTYPE-ALPHA}
          {BYTYPE   }
          {NOBYTYPE   }

The BYTYPE-ALPHA option specifies the names in the rows and the columns are sorted by object type and alphabetically within type. The BYTYPE option is similar but the names within each type appear in the order encountered during processing. The order of the object types are CONDITIONS, EVENTS, INPUTS, PROCESSES. The NOBYTYPE option specifies the names in the rows and the columns will be in the order encountered during processing.

The UTILIZES relationship between PROCESSES may appear in the report matrix. The parameters to effect this are:

4) UTILIZES - the UTILIZES relationship will be included in the matrix

   NOUTILIZES
   - the UTILIZES relationship will not be included in the matrix.

The number of dynamic connections to be traced, starting at the given name, may be set at any positive value via the LINKS parameter. For example, LINKS=2 indicates that the length of any dynamic relationship chains will be two relationships from the root name. The same LINKS value is used for all names input when the file parameter is used.

Analysis

Each name given as input is first checked to see that it is in the data base and that it is either a PROCESS, EVENT, CONDITION or INPUT name. If it is not in the data base the message

UBA370:MAINDA: NAME NOT IN DATA BASE -

is printed. If the object type is not valid, the message

UBA371:MAINDA: INVALID NAME TYPE-

is printed AND THE NAME IS NOT INCLUDED IN THE MATRIX.

For each valid input name, all objects related by the dynamic relationships listed in TABLE 1 are retrieved from the data base. Each name retrieved is placed in a column of the matrix and the appropriate code is placed at the intersection of the input name and the retrieved name to identify the relationship. If the relationship is conditional (DEPENDING ON) or repetitive (FOR EACH) then the proper suffix effecting this is also placed at the intersection. Each retrieved name will subsequently be placed in a row of the matrix and the analysis is repeated for each such name. No names are duplicated in the rows and columns of the matrix.

When the matrix is complete, it is analyzed for conditions which denote possible completeness and consistencies. Diagnostic messages are printed if those conditions exist. These diagnostic messages are presented below categorized by the name type to which they apply.

1) PROCESS

- not TRIGGERED OR UTILIZED BY another PROCESS, EVENT, INPUT, or CONDITION

- not TRIGGERED BY another PROCESS, EVENT, INPUT, or CONDITION

If no process, event, or condition names TRIGGERS or UTILIZES (if the UTILIZES parameter is in effect) the given process, this diagnostic is printed. If at least one name TRIGGERS OR UTILIZES the process then the message is not printed.

- does no further processing

If the given PROCESS does not initiate any further processing or sequence of events then this diagnostic is printed. If the given PROCESS TRIGGERS, TERMINATES or INTERRUPTS another PROCESS, or INCEPTION-CAUSES or TERMINATION-CAUSES an EVENT, or MAKES a CONDITION TRUE or FALSE, then this message is not printed.

2) EVENT

- does not initiate further action

If the given EVENT does not TRIGGER, INTERRUPT, or

TERMINATE another PROCESS, does not CAUSE another EVENT, and does not make a CONDITION TRUE or FALSE, then this diagnostic is printed.

3) CONDITION

- does not initiate any action on state change

If there are no BECOMING clauses for a CONDITION, this diagnostic is printed.

Two objects that directly participate in two different dynamic relationships with each other are highlighted because they are potentially inconsistent. An example of dynamically inconsistent USI statements follow:

```
PROCESS P1;
   INCEPTION-CAUSES E1;
   TRIGGERS P2;
EVENT E1;
   TRIGGERS P1;
PROCESS P2;
   TRIGGERS P1;
```

Usage

This report presents the behavior of the system over time, that is, the sequences of events and activities that comprise the system and its constituent parts. The analyst may use this report to verify the proper sequencing of events and activities (processes) of the system, and that the state of conditions is correct and that state changes occur at the desired time. The diagnostics on the report aid the analyst in determining the completeness of the dynamics aspect of the system description and correcting any inconsistencies discovered in the matrix. These messages do not necessarily indicate that something is wrong, but they highlight situations that could be potential problems. The analyst must determine whether these conditions are indeed errors for the particular system.

This report is related to the PROCESS CHAIN report. The PROCESS CHAIN report pictorially depicts the dynamics relationships between PROCESSES and EVENTS. The DYNAMICS ANALYSIS report displays the same relationships in the form of a matrix, and additionally includes CONDITION and INPUT objects and, optionally, the UTILIZES relationship. The sequences of EVENTS and PROCESSES are more apparent in the PROCESS CHAIN report, however, the DYNAMICS ANALYSIS MATRIX is more concise and presents an analysis of the relationships.

Examples

Figure 29 represents the DYNAMICS ANALYSIS REPORT generated for all PROCESS, EVENT, CONDITION, and INPUT names defined for a particular target system description. This example was produced using the analyzer commands:

```
NAME-GEN S="INPUT OR PROCESS OR EVENT OR CONDITION"
DYNAMIC-ANALYSIS
```

Figure 30 represents the DYNAMICS ANALYSIS REPORT produced for a single EVENT name supplied as input. This example resulted from the command:

```
DYNAMIC-ANALYSIS N=hourly-emp-processing-init
```

FIGURE_29

Dynamic Analysis Report

PARAMETERS FOR: DA

FILE DYNAMIC-ANALYSIS-MATRIX DYNAMICS-ANALYSIS UTILIZES LINKS=1000 ORDER=BYTYPE

The rows are the given input names plus all other names dynamically related to them.

The column names are all the objects related dynamically to the row names.

The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list below.

	ROW NAMES	
1	all-data-for-employee-found	CONDITION
2	employee-id-valid	CONDITION
3	time-cards-ready	CONDITION
4	hours-update-finished	CONDITION
5	no-error-found	CONDITION
6	no-time-card-for-employee	CONDITION
7	time-card-for-employee	CONDITION
8	passed-error-checks	EVENT
9	init-hourly-paycheck-procedure	EVENT
10	h-gross-pay-comp-init	EVENT
11	total-hours-comp-init	EVENT
12	validity-check	EVENT
13	new-employee-processing-init	EVENT
14	s-emp-form-verification-init	EVENT
15	h-emp-form-verification-init	EVENT
16	termination-processing-init	EVENT
17	time-card-listing-init	EVENT
18	hourly-emp-processing-init	EVENT
19	job-rating-init	EVENT
20	std-time-verification-init	EVENT
21	std-time-verification-term	EVENT
22	actual-time-verification-init	EVENT
23	actual-time-verification-term	EVENT

	COLUMN NAMES	
1	time-cards-ready	CONDITION
2	hours-update-finished	CONDITION
3	passed-error-checks	EVENT
4	init-hourly-paycheck-procedure	EVENT
5	h-gross-pay-comp-init	EVENT
6	total-hours-comp-init	EVENT
7	validity-check	EVENT
8	time-card-listing-init	EVENT
9	new-employee-processing-init	EVENT
10	h-emp-form-verification-init	EVENT
11	s-emp-form-verification-init	EVENT
12	termination-processing-init	EVENT
13	hourly-emp-processing-init	EVENT
14	job-rating-init	EVENT
15	actual-time-verification-init	EVENT
16	std-time-verification-init	EVENT
17	std-time-verification-term	EVENT
18	actual-time-verification-term	EVENT
19	job-rating-term	EVENT
20	wage-premium-processing-term	EVENT
21	time-card-missing	EVENT
22	time-card-found	EVENT
23	time-card-audit-init	EVENT

FIGURE_29

Dynamic Analysis Report

ROW NAMES		COLUMN NAMES	
24 job-rating-term	EVENT	24 init-request-for-time-study	EVENT
25 wage-premium-processing-term	EVENT	25 transaction-listing-init	EVENT
26 time-card-missing	EVENT	26 hourly-paycheck-production	PROCESS
27 time-card-found	EVENT	27 salaried-paycheck-production	PROCESS
28 actual-time-verif-error	EVENT	28 net-pay-computation	PROCESS
29 time-card-audit-init	EVENT	29 tax-computation	PROCESS
30 event-five	EVENT	30 total-deductions-computation	PROCESS
31 event-four	EVENT	31 h-gross-pay-computation	PROCESS
32 event-one	EVENT	32 total-hours-computation	PROCESS
33 event-seven	EVENT	33 pay-computation-validation	PROCESS
34 event-six	EVENT	34 hourly-employee-processing	PROCESS
35 event-three	EVENT	35 wage-premium-processing	PROCESS
36 event-two	EVENT	36 new-employee-processing	PROCESS
37 h-report-entry-complete	EVENT	37 terminating-emp-processing	PROCESS
38 init-request-for-time-study	EVENT	38 salaried-employee-processing	PROCESS
39 salaried-emp-processing-init	EVENT	39 std-time-verification	PROCESS
40 std-time-verif-error	EVENT	40 actual-time-verification	PROCESS
41 time-cards-collected	EVENT	41 job-rating	PROCESS
42 transaction-listing-init	EVENT	42 wage-premium-calculation	PROCESS
43 employment-termination-form	INPUT	43 hourly-emp-update	PROCESS
44 hourly-employment-form	INPUT	44 hours-update	PROCESS
45 name-six	INPUT	45 h-report-entry-generation	PROCESS
46 name-two	INPUT	46 hours-emp-update	PROCESS
47 paysystem-inputs	INPUT	47 gross-pay-update	PROCESS
48 salaried-employment-form	INPUT	48 federal-deductions-update	PROCESS
49 tax-withholding-certificate	INPUT	49 state-deductions-update	PROCESS
50 time-card	INPUT	50 fica-deductions-update	PROCESS
51 salaried-paycheck-production	PROCESS	51 funds-update	PROCESS
52 total-deductions-computation	PROCESS	52 time-card-validation	PROCESS
53 tax-computation	PROCESS	53 actual-time-error-proc	PROCESS
54 net-pay-computation	PROCESS	54 time-card-audit	PROCESS
55 hourly-paycheck-production	PROCESS	55 time-card-correction	PROCESS
56 h-gross-pay-computation	PROCESS	56 std-time-error-proc	PROCESS
57 total-hours-computation	PROCESS	57 transaction-listing	PROCESS
58 hourly-employee-processing	PROCESS		
59 new-employee-processing	PROCESS		
60 terminating-emp-processing	PROCESS		
61 salaried-employee-processing	PROCESS		

FIGURE_29

Dynamic Analysis Report

ROW	NAMES	COLUMN NAMES
62	wage-premium-processing	PROCESS
63	std-time-verification	PROCESS
64	actual-time-verification	PROCESS
65	job-rating	PROCESS
66	wage-premium-calculation	PROCESS
67	pay-computation-validation	PROCESS
68	h-report-entry-generation	PROCESS
69	hours-update	PROCESS
70	hours-emp-update	PROCESS
71	hourly-emp-update	PROCESS
72	funds-update	PROCESS
73	fica-deductions-update	PROCESS
74	state-deductions-update	PROCESS
75	federal-deductions-update	PROCESS
76	gross-pay-update	PROCESS
77	time-card-validation	PROCESS
78	actual-time-error-proc	PROCESS
79	time-card-audit	PROCESS
80	time-card-correction	PROCESS
81	std-time-error-proc	PROCESS
82	transaction-listing	PROCESS
83	department-file-addition	PROCESS
84	department-file-removal	PROCESS
85	hire-report-entry-generation	PROCESS
86	hourly-emp-processing	PROCESS
87	hourly-information-creation	PROCESS
88	hourly-information-deletion	PROCESS
89	hourly-paycheck-validation	PROCESS
90	name-one	PROCESS
91	payroll-processing	PROCESS
92	process-library	PROCESS
93	s-gross-pay-computation	PROCESS
94	s-report-entry-generation	PROCESS
95	salaried-emp-update	PROCESS
96	salaried-information-creation	PROCESS
97	salaried-information-deletion	PROCESS
98	salaried-paycheck-validation	PROCESS
99	term-report-entry-generation	PROCESS

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

An entry (i,j) at the intersection of a particular row i and column j of the matrix designates that the name represented by the column j is affected in some way by the name represented by the row i.

(i,j)	Meaning
A	Row i TRIGGERS Column j
B	Row i INTERRUPTS Column j
C	Row i TERMINATES Column j
D	Row i CAUSES Column j
E	Row i MAKES TRUE Column j
F	Row i MAKES FALSE Column j
G	Row i BECOMING-TRUE-TRIGGERS Column j
H	Row i BECOMING-TRUE-INTERRUPTS Column j
I	Row i BECOMING-TRUE-TERMINATES Column j
J	Row i BECOMING-TRUE-CAUSES Column j
K	Row i BECOMING-FALSE-TRIGGERS Column j
L	Row i BECOMING-FALSE-INTERRUPTS Column j
M	Row i BECOMING-FALSE-TERMINATES Column j
N	Row i BECOMING-FALSE-CAUSES Column j
O	Row i INCEPTION-CAUSES Column j
P	Row i TERMINATION-CAUSES Column j
Q	Row i UTILIZES Column j
X	Row i is the same as Column j

In addition to the codes above, the presence of a numerical suffix indicates that the declared action is either conditional (may or may not happen DEPENDING ON some CONDITION or ELEMENT) or repetitive (happening FOR-EACH named object instance) or both. The suffixes are:

Suffix Value	Meaning
1	Conditional (DEPENDING ON)
2	Repetitive (FOR EACH)
3	Both of the above

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

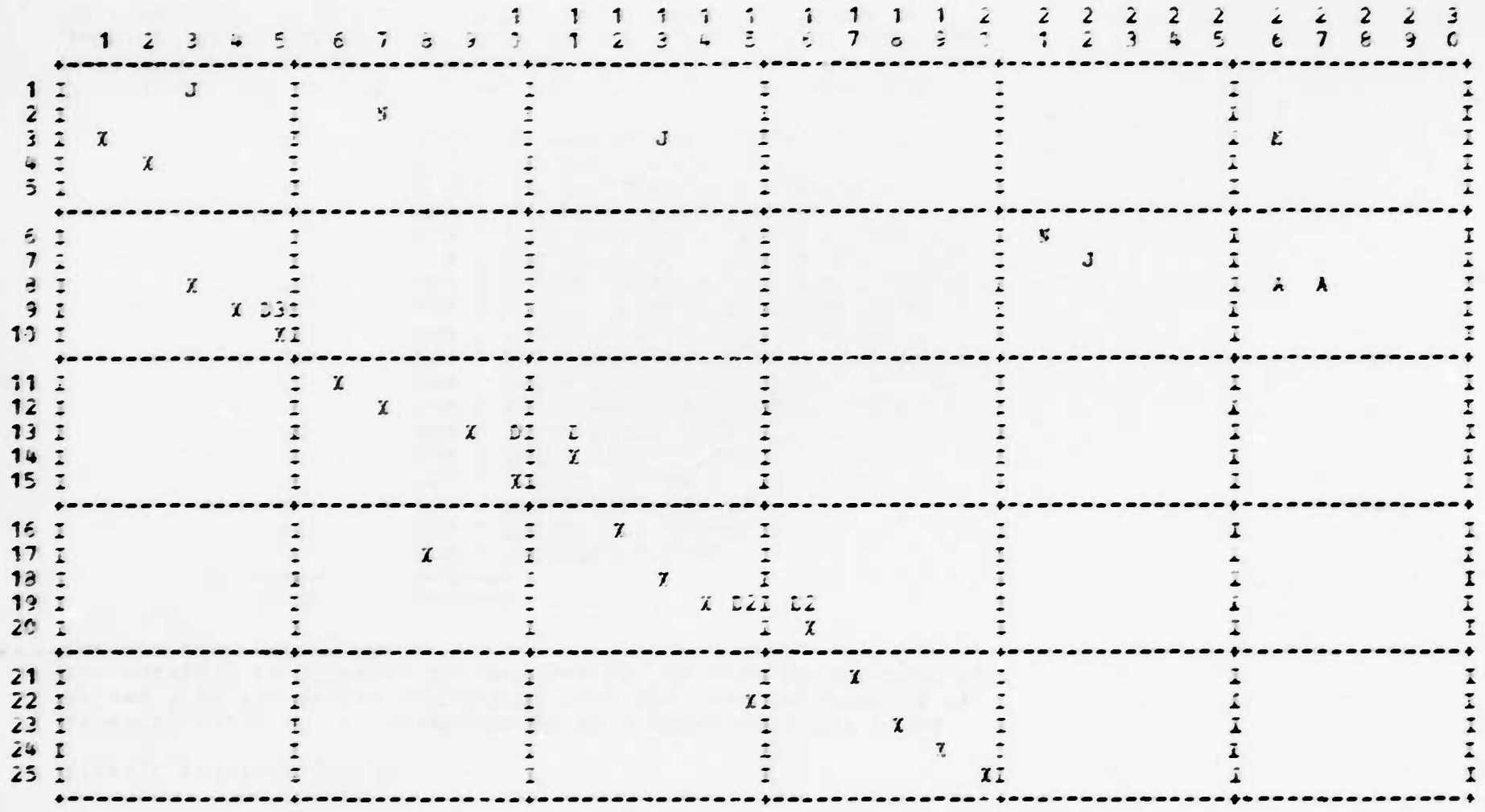

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
26																					X									
27																						X								
28																														
29																							X							
30																														
31																														
32																														
33																														
34																														
35																														
36																														
37																								A						
38																								X						
39																														
40																														
41		E																												
42																									X					
43																														
44																														
45																														
46																														
47																														
48																														
49																														
50		E											D																	

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

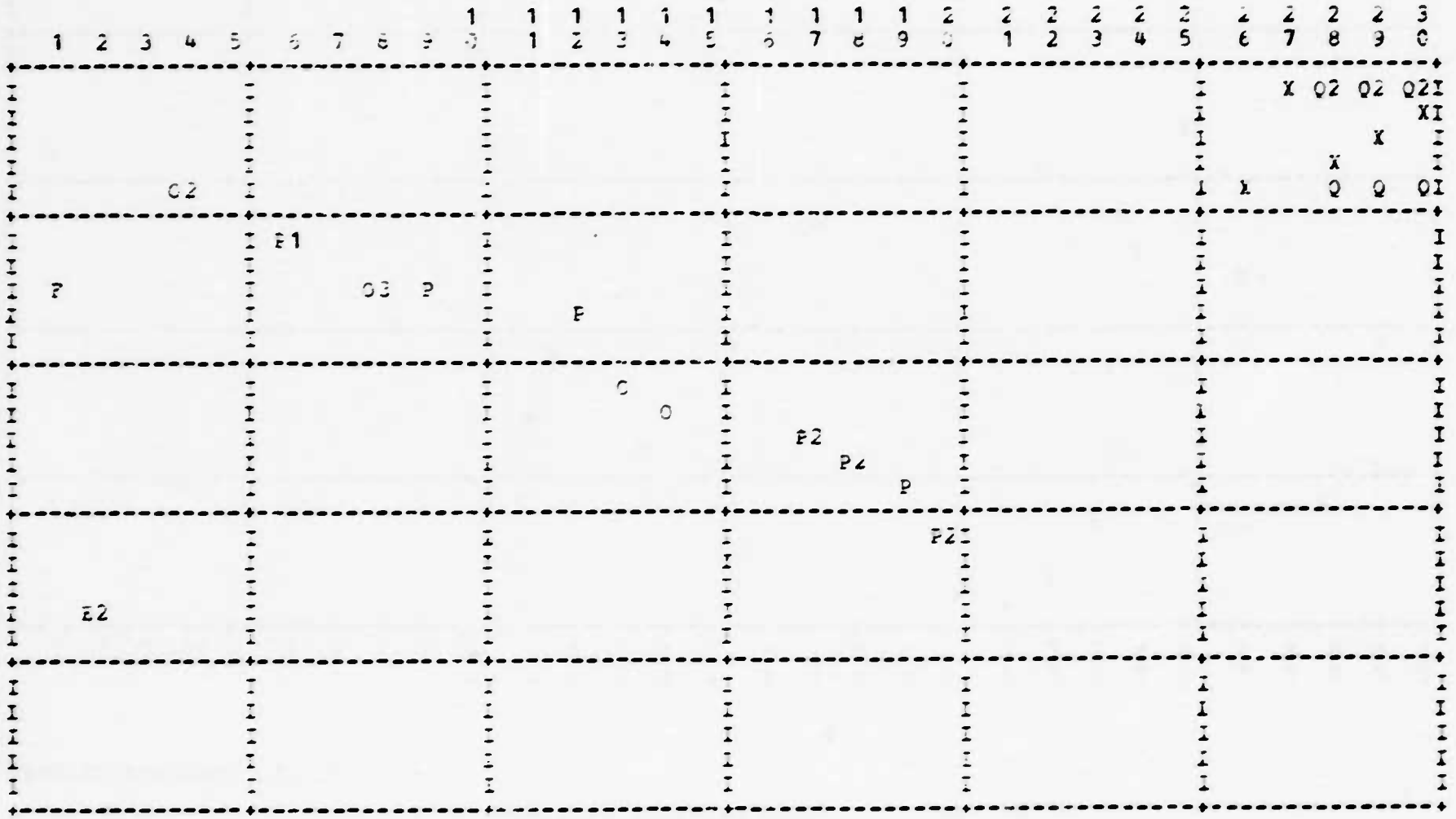

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
76	I				I					I					I					I					I					I
77	I				I					I					I					I					I					I
78	I				I					I					I					I			O		I					I
79	I				I					I					I					I					I					I
80	I				I					I					I					I					I					I
81	I				I					I					I					I				O1	I					I
82	I				I					I					I					I					I					I
83	I				I					I					I					I					I					I
84	I				I					I					I					I					I					I
85	I				I					I					I					I					I					I
86	I				I					I					I					I					I					I
87	I				I					I					I					I					I					I
88	I				I					I					I					I					I					I
89	I				I					I					I					I					I					I
90	I				I					I					I					I					I					I
91	I				I					I					I					I				P3	I					I
92	I				I					I					I					I					I					I
93	I				I					I					I					I					I					I
94	I				I					I					I					I					I					I
95	I				I					I					I					I					I					I
96	I				I					I					I					I					I					I
97	I				I					I					I					I					I					I
98	I				I					I					I					I					I					I
99	I				I					I					I					I					I					I

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
1																											
2																											
3				G				L																			
4													I	I	G												
5																											
6																											
7				L									G														
8																											
9																											
10	A																										
11		A																									
12			A	B3																							
13						A																					
14																											
15																											
16							A																				
17																											
18				A																							
19																											
20									A																		
21																											
22										A																	
23											A2																
24												A1															
25				C2																							

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
26			A	B1																		A					
27																											
28										B2													A				
29																								A			
30																											
31																											
32																											
33																											
34																											
35																											
36																											
37											C																
38																											
39									A																		
40										B																A	
41																											
42																											A2
43		C		B																							
44																											
45																											
46																											
47																											
48																											
49																											
50				A																							

FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

```
     31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
51   I                 I                 I                 I                 I          I
52   I                 I                 I                 I                 I          I
53   I                 I                 I                 I                 I          I
54   I                 I                 I                 I                 I          I
55   I                 I                 I                 I                 I          I
     +-----------------+-----------------+-----------------+-----------------+----------+
56   I  X              I                 I                 I                 I          I
57   I     X           I                 I                 I                 I          I
58   I           X  A3 I                 I                 I                 I          I
59   I              I  X                 I                 I                 I          I
60   I     C     B    I     X           I                 I                 I          I
     +-----------------+-----------------+-----------------+-----------------+----------+
61   I                 I        X        I                 I                 I          I
62   I        B2    X  I                 I                 I                 I          I
63   I                 I           X     I                 I                 I          I
64   I                 I              X  I                 I                 I          I
65   I                 I              I  X                 I                 I          I
     +-----------------+-----------------+-----------------+-----------------+----------+
66   I                 I              I     X              I                 I          I
67   I        X        I              I                    I                 I          I
68   I                 I              I                 X  I                 I          I
69   I                 I              I              X A3 I  C1               I          I
70   I                 I              I                 I  X                 I          I
     +-----------------+-----------------+-----------------+-----------------+----------+
71   I                 I              I        X A3     I     Q  Q  Q  Q  I  Q          I
72   I                 I              I                 I                 I  X          I
73   I                 I              I                 I                 I  X  I       I
74   I                 I              I                 I                 I     X  I    I
75   I                 I              I                 I                 I        X  I  I
     +-----------------+-----------------+-----------------+-----------------+----------+
```

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FIGURE_29

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

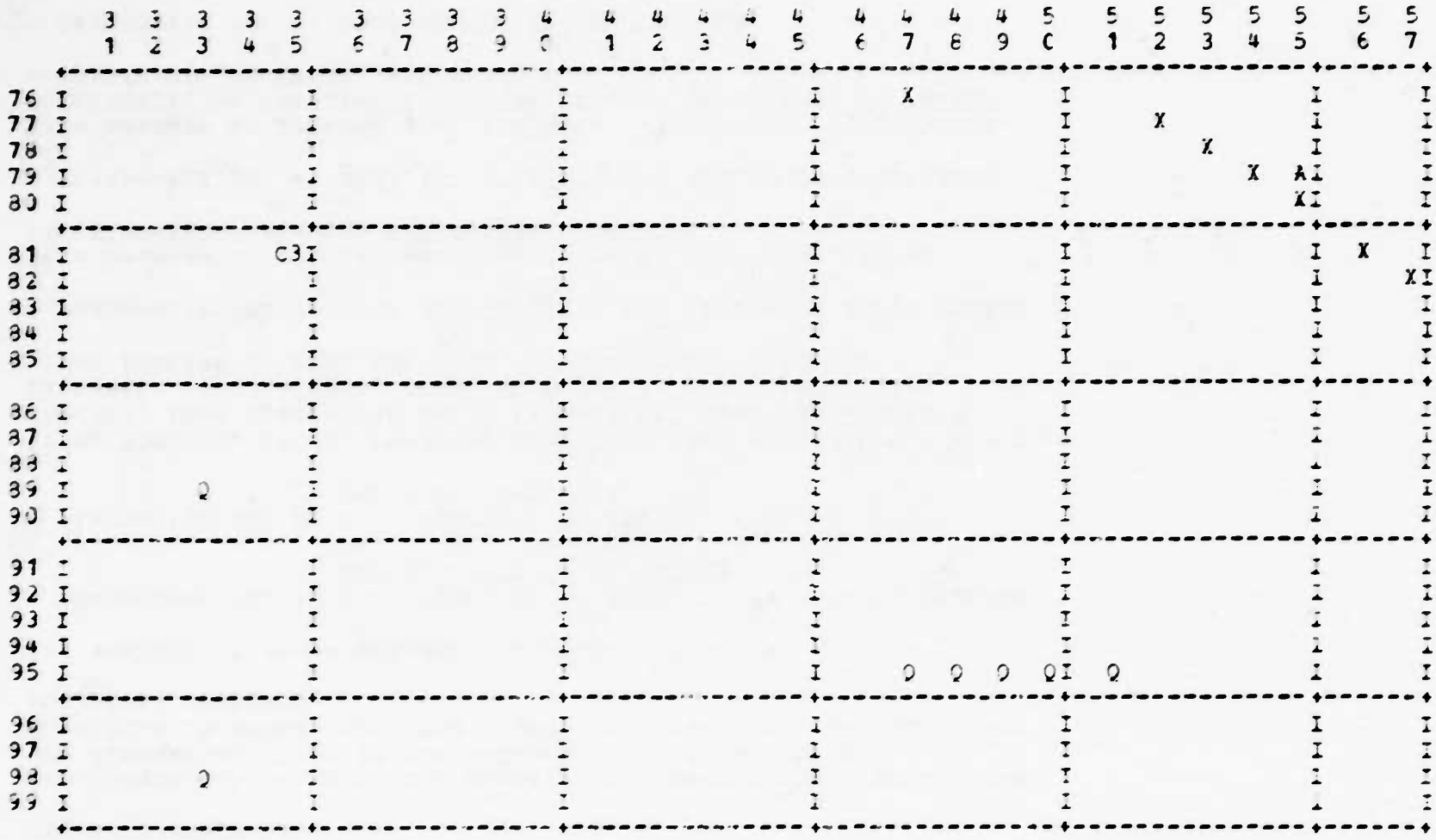


FIGURE_29

Dynamic Analysis Report

DYNAMICS ANALYSIS

The diagnostic messages are printed only when certain conditions are discovered. They do not necessarily indicate that something is wrong, but they highlight situations that could be potential problems.

The meaning of these messages is presented below.

- Diagnostic No. 1: NOT TRIGGERED OR UTILIZED BY ANOTHER PROCESS EVENT, INPUT OR CONDITION

- Diagnostic No. 2: NOT TRIGGERED BY ANOTHER PROCESS, EVENT, INPUT OR CONDITION

If no PROCESS, EVENT, INPUT or CONDITION name TRIGGERS the given PROCESS, then Diagnostic No. 2 is printed. When the UTILIZES parameter is in effect, Diagnostic No. 1 is printed if the given PROCESS is also not UTILIZED BY another PROCESS.

- Diagnostic No. 3: DOES NOT INITIATE ANY ACTION ON STATE CHANGE

This message is printed when there are no BECOMING-TRUE or BECOMING-FALSE clauses for a given CONDITION.

- Diagnostic No. 4: DOES NOT INITIATE ANY ACTION ON OCCURRENCE

This message is printed when the given EVENT does not TRIGGERS, INTERRUPTS, or TERMINATES any PROCESS, or MAKES TRUE or FALSE a CONDITION, or CAUSES any PROCESS.

- Diagnostic No. 5: DOES NO FURTHER PROCESSING

If the given PROCESS does not initiate any further processing or sequence of events, then this diagnostic is printed. If the given PROCESS TRIGGERS, INTERRUPTS, or TERMINATES another PROCESS or its INCEPTION-CAUSES or TERMINATION-CAUSES an EVENT, or MAKES TRUE or FALSE a CONDITION, then the message is not printed.

002

FIGURE_29

Dynamic Analysis Report

DYNAMICS ANALYSIS

- Diagnostic No. 6: MAY BE DYNAMICALLY INCONSISTENT

The two names given participate in two separate dynamic relationships with each other. This may be an inconsistency. For example, EVENT E1 TRIGGERS PROCESS P2 and PROCESS P2 INCEPTION-CAUSES EVENT E1.

FIGURE_20

Dynamic Analysis Report

DYNAMICS ANALYSIS

COLUMN INCOMPLETENESS MESSAGES

hours-emp-update	(PROCESS)	(COLUMN 46)	NOT TRGD OR UTLZD BY A PROCESS, EVENT, INPUT OR CONDITION

ROW INCOMPLETENESS MESSAGES

no-error-found	(CONDITION)	(ROW 5)	DOES NOT INITIATE ANY ACTION ON STATE CHANGE
s-emp-form-verification-init	(EVENT)	(ROW 14)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
h-emp-form-verification-init	(EVENT)	(ROW 15)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
time-card-listing-init	(EVENT)	(ROW 17)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
std-time-verification-term	(EVENT)	(ROW 21)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
time-card-found	(EVENT)	(ROW 27)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-five	(EVENT)	(ROW 30)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-four	(EVENT)	(ROW 31)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-one	(EVENT)	(ROW 32)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-seven	(EVENT)	(ROW 33)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-six	(EVENT)	(ROW 34)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-three	(EVENT)	(ROW 35)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
event-two	(EVENT)	(ROW 36)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
init-request-for-time-study	(EVENT)	(ROW 38)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
total-deductions-computation	(PROCESS)	(ROW 52)	DOES NO FURTHER PROCESSING
tax-computation	(PROCESS)	(ROW 53)	DOES NO FURTHER PROCESSING
net-pay-computation	(PROCESS)	(ROW 54)	DOES NO FURTHER PROCESSING
total-hours-computation	(PROCESS)	(ROW 57)	DOES NO FURTHER PROCESSING
pay-computation-validation	(PROCESS)	(ROW 67)	DOES NO FURTHER PROCESSING
h-report-entry-generation	(PROCESS)	(ROW 68)	DOES NO FURTHER PROCESSING
hours-emp-update	(PROCESS)	(ROW 70)	DOES NO FURTHER PROCESSING
funds-update	(PROCESS)	(ROW 72)	DOES NO FURTHER PROCESSING
fica-deductions-update	(PROCESS)	(ROW 73)	DOES NO FURTHER PROCESSING
state-deductions-update	(PROCESS)	(ROW 74)	DOES NO FURTHER PROCESSING
federal-deductions-update	(PROCESS)	(ROW 75)	DOES NO FURTHER PROCESSING
gross-pay-update	(PROCESS)	(ROW 76)	DOES NO FURTHER PROCESSING
time-card-validation	(PROCESS)	(ROW 77)	DOES NO FURTHER PROCESSING
time-card-correction	(PROCESS)	(ROW 80)	DOES NO FURTHER PROCESSING
transaction-listing	(PROCESS)	(ROW 82)	DOES NO FURTHER PROCESSING

FIGURE_29

Dynamic Analysis Report

DYNAMICS ANALYSIS

department-file-addition	(PROCESS)	(ROW 83)	DOES NO FURTHER PROCESSING
department-file-removal	(PROCESS)	(ROW 84)	DOES NO FURTHER PROCESSING
hire-report-entry-generation	(PROCESS)	(ROW 85)	DOES NO FURTHER PROCESSING
hourly-emp-processing	(PROCESS)	(ROW 86)	DOES NO FURTHER PROCESSING
hourly-information-creation	(PROCESS)	(ROW 87)	DOES NO FURTHER PROCESSING
hourly-information-deletion	(PROCESS)	(ROW 88)	DOES NO FURTHER PROCESSING
name-one	(PROCESS)	(ROW 90)	DOES NO FURTHER PROCESSING
process-library	(PROCESS)	(ROW 92)	DOES NO FURTHER PROCESSING
s-gross-pay-computation	(PROCESS)	(ROW 93)	DOES NO FURTHER PROCESSING
s-report-entry-generation	(PROCESS)	(ROW 94)	DOES NO FURTHER PROCESSING
salaried-information-creation	(PROCESS)	(ROW 96)	DOES NO FURTHER PROCESSING
salaried-information-deletion	(PROCESS)	(ROW 97)	DOES NO FURTHER PROCESSING
term-report-entry-generation	(PROCESS)	(ROW 99)	DOES NO FURTHER PROCESSING

INCONSISTENCY MESSAGES

time-cards-ready	AND	hourly-employee-processing	MAY BE DYNAMICALLY INCONSISTENT
hours-update-finished	AND	hours-update	MAY BE DYNAMICALLY INCONSISTENT
hourly-employee-processing	AND	wage-premium-processing	MAY BE DYNAMICALLY INCONSISTENT

FIGURE_3C

Dynamic Analysis Report

PARAMETERS FOR: DA

NAME=salaried-emp-processing-init DYNAMIC-ANALYSIS-MATRIX DYNAMICS-ANALYSIS UTILIZES
LINKS=1000 ORDER=BYTYPE

The rows are the given input names plus all other names dynamically related to them.

The column names are all the objects related dynamically to the row names.

The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list below.

	ROW NAMES	
1	time-cards-ready	CONDITION
2	salaried-emp-processing-init	EVENT
3	hourly-emp-processing-init	EVENT
4	new-employee-processing-init	EVENT
5	s-emp-form-verification-init	EVENT
6	h-emp-form-verification-init	EVENT
7	termination-processing-init	EVENT
8	time-card-listing-init	EVENT
9	init-hourly-paycheck-procedure	EVENT
10	h-gross-pay-comp-init	EVENT
11	total-hours-comp-init	EVENT
12	job-rating-init	EVENT
13	std-time-verification-init	EVENT
14	std-time-verification-term	EVENT
15	actual-time-verification-init	EVENT
16	actual-time-verification-term	EVENT
17	job-rating-term	EVENT
18	wage-premium-processing-term	EVENT
19	salaried-employee-processing	PROCESS
20	hourly-employee-processing	PROCESS
21	new-employee-processing	PROCESS
22	terminating-emp-processing	PROCESS

	COLUMN NAMES	
1	time-cards-ready	CONDITIO
2	hourly-emp-processing-init	EVENT
3	time-card-listing-init	EVENT
4	new-employee-processing-init	EVENT
5	h-emp-form-verification-init	EVENT
6	s-emp-form-verification-init	EVENT
7	termination-processing-init	EVENT
8	init-hourly-paycheck-procedure	EVENT
9	h-gross-pay-comp-init	EVENT
10	total-hours-comp-init	EVENT
11	job-rating-init	EVENT
12	actual-time-verification-init	EVENT
13	std-time-verification-init	EVENT
14	std-time-verification-term	EVENT
15	actual-time-verification-term	EVENT
16	job-rating-term	EVENT
17	wage-premium-processing-term	EVENT
18	salaried-employee-processing	PROCESS
19	hourly-employee-processing	PROCESS
20	wage-premium-processing	PROCESS
21	new-employee-processing	PROCESS
22	terminating-emp-processing	PROCESS

FIGURE_30

Dynamic Analysis Report

ROW NAMES		COLUMN NAMES	
23 total-hours-computation	PROCESS	23 total-hours-computation	PROCESS
24 hourly-paycheck-production	PROCESS	24 hourly-paycheck-production	PROCESS
25 total-deductions-computation	PROCESS	25 net-pay-computation	PROCESS
26 tax-computation	PROCESS	26 tax-computation	PROCESS
27 net-pay-computation	PROCESS	27 total-deductions-computation	PROCESS
28 h-gross-pay-computation	PROCESS	28 h-gross-pay-computation	PROCESS
29 wage-premium-processing	PROCESS	29 std-time-verification	PROCESS
30 std-time-verification	PROCESS	30 actual-time-verification	PROCESS
31 actual-time-verification	PROCESS	31 job-rating	PROCESS
32 job-rating	PROCESS	32 wage-premium-calculation	PROCESS
33 wage-premium-calculation	PROCESS		

FIGURE_3C

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

An entry (i,j) at the intersection of a particular row i and column j of the matrix designates that the name represented by the column j is affected in some way by the name represented by the row i.

(i,j)	Meaning
A	Row i TRIGGERS Column j
B	Row i INTERRUPTS Column j
C	Row i TERMINATES Column j
D	Row i CAUSES Column j
E	Row i MAKES TRUE Column j
F	Row i MAKES FALSE Column j
G	Row i BECOMING-TRUE-TRIGGERS Column j
H	Row i BECOMING-TRUE-INTERRUPTS Column j
I	Row i BECOMING-TRUE-TERMINATES Column j
J	Row i BECOMING-TRUE-CAUSES Column j
K	Row i BECOMING-FALSE-TRIGGERS Column j
L	Row i BECOMING-FALSE-INTERRUPTS Column j
M	Row i BECOMING-FALSE-TERMINATES Column j
N	Row i BECOMING-FALSE-CAUSES Column j
O	Row i INCEPTION-CAUSES Column j
P	Row i TERMINATION-CAUSES Column j
Q	Row i UTILIZES Column j
X	Row i is the same as Column j

In addition to the codes above, the presence of a numerical suffix indicates that the declared action is either conditional (may or may not happen DEPENDING ON some CONDITION or ELEMENT) or repetitive (happening FOR-EACH named object instance) or both. The suffixes are:

Suffix Value	Meaning
1	Conditional (DEPENDING ON)
2	Repetitive (FOR EACH)
3	Both of the above

FIGURE_30

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

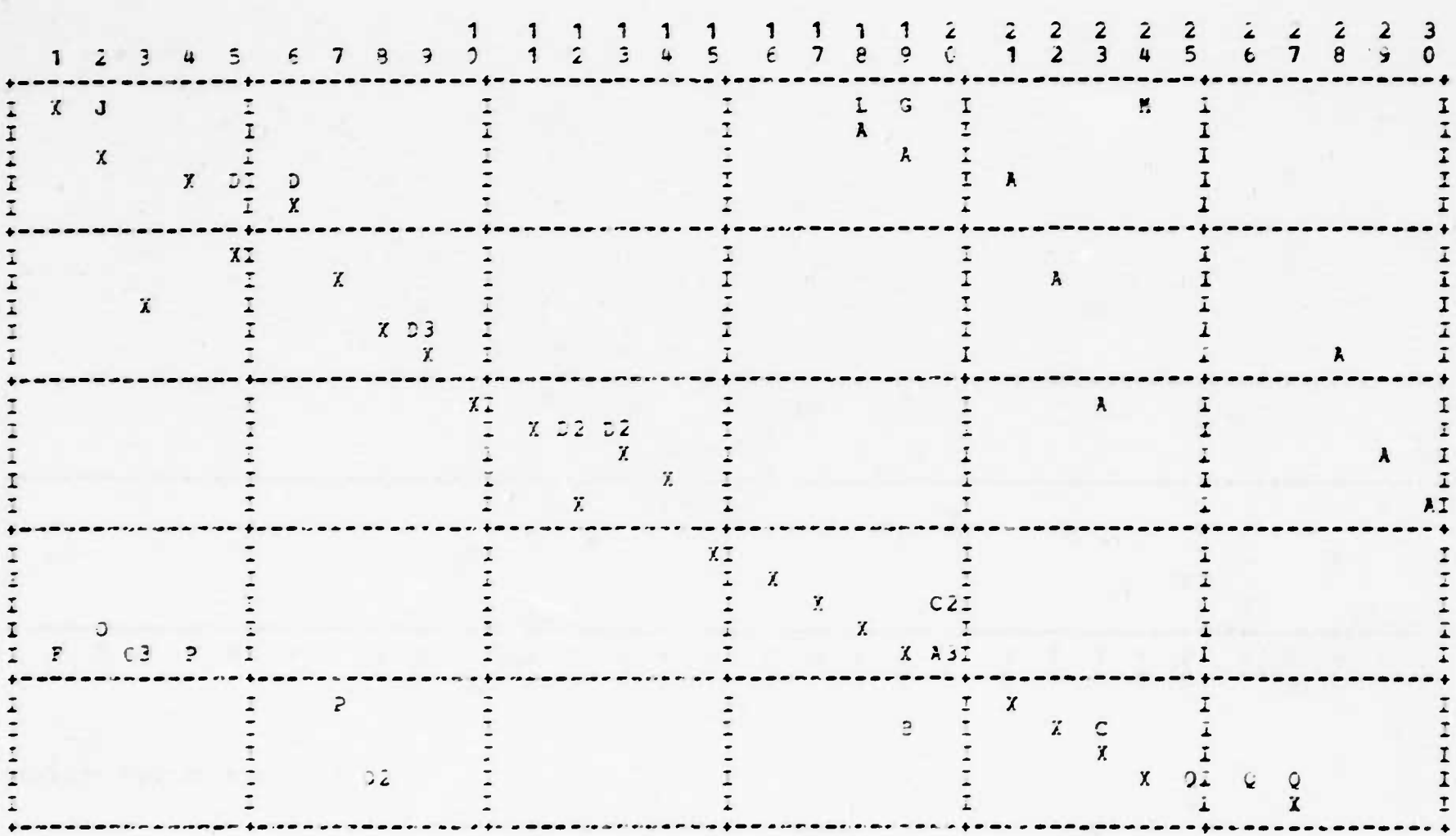


FIGURE_30

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
26	I				I					I					I					I					I	X			I
27	I				I					I					I					I					X1				I
28	I				I					B1I					I					I					I		X		I
29	I				I					I	C				I				B2	XI					I				I
30	I				I					I				P2	I					I					I			X		I
31	I				I					I					P2I					I					I					XI
32	I				I					I					I	P				I					I					I
33	I				I					I					I		P2			I					I					I

FIGURE_30

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

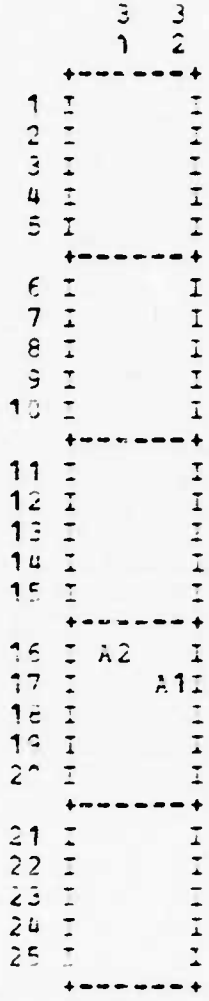


FIGURE_30

Dynamic Analysis Report

DYNAMIC ANALYSIS MATRIX

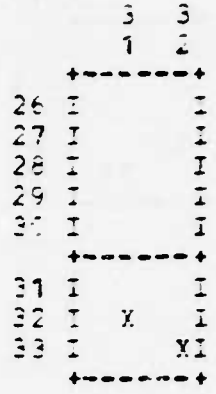


FIGURE_3C

Dynamic Analysis Report

DYNAMICS ANALYSIS

The diagnostic messages are printed only when certain conditions are discovered. They do not necessarily indicate that something is wrong, but they highlight situations that could be potential problems.

The meaning of these messages is presented below.

- Diagnostic No. 1: NOT TRIGGERED OR UTILIZED BY ANOTHER PROCESS EVENT, INPUT OR CONDITION

- Diagnostic No. 2: NOT TRIGGERED BY ANOTHER PROCESS, EVENT, INPUT OR CONDITION

If no PROCESS, EVENT, INPUT or CONDITION name TRIGGERS the given PROCESS, then Diagnostic No. 2 is printed. When the UTILIZES parameter is in effect, Diagnostic No. 1 is printed if the given PROCESS is also not UTILIZED BY another PROCESS.

- Diagnostic No. 3: DOES NOT INITIATE ANY ACTION OR STATE CHANGE

This message is printed when there are no BECOMING-TRUE or BECOMING-FALSE clauses for a given CONDITION.

- Diagnostic No. 4: DOES NOT INITIATE ANY ACTION OR OCCURRENCE

This message is printed when the given EVENT does not TRIGGERS, INTERRUPTS, or TERMINATES any PROCESS, or MAKES TRUE or FALSE a CONDITION, or CAUSES any PROCESS.

- Diagnostic No. 5: DOES NO FURTHER PROCESSING

If the given PROCESS does not initiate any further processing or sequence of events, then this diagnostic is printed. If the given PROCESS TRIGGERS, INTERRUPTS, or TERMINATES another PROCESS or its INCEPTION-CAUSES or TERMINATION-CAUSES an EVENT, or MAKES TRUE or FALSE a CONDITION, then the message is not printed.

FIGURE_36

Dynamic Analysis Report

DYNAMICS ANALYSIS

- Diagnostic No. 6: MAY BE DYNAMICALLY INCONSISTENT

The two names given participate in two separate dynamic relationships with each other. This may be an inconsistency. For example, EVENT E1 TRIGGERS PROCESS P2 and PROCESS P2 INCEPTION-CAUSES EVENT E1.

FIGURE_30

Dynamic Analysis Report

DYNAMICS ANALYSIS

COLUMN INCOMPLETENESS MESSAGES

hourly-paycheck-production	(PROCESS)	(COLUMN 24)	NOT TRGD OR UTLZD BY A PROCESS, EVENT, INPUT, OR CONDITION

ROW INCOMPLETENESS MESSAGES

s-emp-form-verification-init	(EVENT)	(ROW 5)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
h-emp-form-verification-init	(EVENT)	(ROW 6)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
time-card-listing-init	(EVENT)	(ROW 8)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
std-time-verification-term	(EVENT)	(ROW 14)	DOES NOT INITIATE ANY ACTION ON OCCURRENCE
total-hours-computation	(PROCESS)	(ROW 23)	DOES NO FURTHER PROCESSING
total-deductions-computation	(PROCESS)	(ROW 25)	DOES NO FURTHER PROCESSING
tax-computation	(PROCESS)	(ROW 26)	DOES NO FURTHER PROCESSING
net-pay-computation	(PROCESS)	(ROW 27)	DOES NO FURTHER PROCESSING

INCONSISTENCY MESSAGES

time-cards-ready	AND	hourly-employee-processing	MAY BE DYNAMICALLY INCONSISTENT
hourly-employee-processing	AND	wage-premium-processing	MAY BE DYNAMICALLY INCONSISTENT

EXTENDED PICTURE REPORT

Purpose

To present in graphical format, for each name input, a network of names related to it by structure or by data flow.

Information Presented

Names input to the report may have any of the following types:

ELEMENT
ENTITY
GROUP
INPUT
INTERFACE
OUTPUT
PROCESS
SET

Starting with each input name, one of four pictures will be obtained. These are referred to as structure downward, structure upward, data-flow forward, and data-flow backward.

For each name used as input, the report presents all successors to that name, where successors are found using the relationships listed in the appropriate column of either Table 3 or Table 4. For each of these new names, the report presents all of its successors, finding them in a similar manner. This network continues until the desired number of relationships has been traced, a loop is encountered, or no more relationships are found.

Name Type	Relationships Displayed Structure Downward	Relationships Displayed Structure Upward
ELEMENT		CONTAINED
ENTITY	CONSISTS	CONTAINED
GROUP	CONSISTS	CONTAINED
INPUT	SUBPARTS CONSISTS	PART CONTAINED
INTERFACE	SUBPARTS	PART
OUTPUT	SUBPARTS CONSISTS	PART CONTAINED
PROCESS	SUBPARTS UTILIZES	PART UTILIZED
SET	SUBSETS CONSISTS	SUBSET

Table 3
Structure Relationships Displayed in
Extended Picture Report

Name Type	Relationships Displayed Data-Flow Forward	Relationships Displayed Data-Flow Backward
ELEMENT	USED USED TO DERIVE USED TO UPDATE	DERIVED UPDATED
ENTITY	USED USED TO DERIVE USED TO UPDATE	DERIVED UPDATED
GROUP	USED USED TO DERIVE USED TO UPDATE	DERIVED UPDATED
INPUT	RECEIVED USED USED TO DERIVE USED TO UPDATE	GENERATED
INTERFACE	GENERATES	RECEIVES
OUTPUT	RECEIVED	GENERATED DERIVED
PROCESS	GENERATED DERIVES UPDATES	RECEIVES USES USES TO DERIVE USES TO UPDATE
SET	USED USED TO DERIVE USED TO UPDATE	DERIVED UPDATED

Table 4

Data Flow Relationships Displayed in
Extended Picture Report

Format

Each name which appears on the output is shown within a box. The top line of the box indicates the name type, while the bottom line shows the relationship with a name's predecessor. Boxes containing related names are linked by dotted lines.

If a name joins two or more chains (strings of related names) into a loop or loops, every appearance of that name after the first will be followed by the message, "NAME OCCURS ELSEWHERE. SEE INDEX.".

Output is continued across page boundaries. If the right edge of one page continues to the left edge of a second, the right most column of boxes on the first page will be repeated as the left most column of boxes on the second page, in order to facilitate matching of edges. Similarly, if the bottom edge of one page continues to the top edge of a second, the bottom row of boxes on the first page will be repeated as the top row of boxes on the second page.

Options and Alternatives

The report may be generated for a single name (via the NAME parameter) or for a collection of names, either input by the user or obtained by use of NAME-GEN.

The type of picture to be produced is selected by specifying one of the following parameter pairs:

```
STRUCTURE DOWNWARD
STRUCTURE UPWARD
DATA-FLOW FORWARD
DATA-FLOW BACKWARD
```

or by specifying the THREAD parameter, in which case the pair DATA-FLOW FORWARD will be implied but limited to the USED TO DERIVE relationship.

The number of columns and rows used on the page may be decreased from their default values of 119 and 39, respectively, via the COLUMNS and ROWS parameters. The minimum acceptable values for COLUMNS and ROWS are 39 and 14, respectively.

The number of boxes arranged horizontally or vertically on a page may be decreased from the defaults, which are the maximum numbers that will fit in each direction (depending on COLUMNS and ROWS), in order to make the output less cluttered. The parameters which can be used to do this are HORIZONTAL-BOXES and VERTICAL-BOXES. Their maximum values (for COLUMNS=119 and ROWS=39) are 6. Due to the scheme for continuing pages, their minimum values are 2.

The number of connections to be traced, starting at the given name, may be set at any positive value via the LINKS parameter. The same LINKS value is used for all names input when the FILE parameter is used.

An index, containing each name used on the report and the page(s) on which it appears, may be obtained by specifying the INDEX parameter.

Analysis

Each name given as input is first checked to see that it is in the data base and that it has one of the legal types (ELEMENT, ENTITY, GROUP, INPUT, INTERFACE, OUTPUT, PROCESS, or SET). If the name is not in the data base, the message:

UFA365: EPSUCC: NAME NOT IN DATA BASE

will be given. If the name has a type which is not in the list above, the user will receive the message:

UFA410: EPSUCC: NAME NOT ACCEPTABLE TYPE FOR EP REPORT

If the name passes these two tests, it is placed in a data structure which will later be used for output. The name is then used to generate a tree structure as follows. Using the relationships in the appropriate column of Table 3 or Table 4, or using the USED TO DERIVE relationship when THREAD is being used, all successors for the name are retrieved from the data base and placed on a stack. Then, the first name is removed from the stack, placed in its proper location in the data structure, and all successors for that name are retrieved and placed on the stack. This procedure continues, with names being removed from the top of the stack, placed in the data structure, and used to obtain further names, which are then placed on the stack. At any stage of this procedure, no names will be put on the stack if one of the following is true:

1) The current name has no successors.

2) The current name has been encountered earlier, and is therefore at the end of a chain or forms a loop with some portion of a chain traced earlier.

3) The number of links that has been traced on the current chain is equal to the limit set by the LINKS paramter. (For every input name for which this occurs, the message:

"USER LINK LIMIT OF no. of links REACHED"

will be printed.)

Thus, in any of these cases the size of the stack will decrease. The entire procedure is complete when, after any search, the stack is empty.

The data structure constructed from all names found as above is broken into page-sized units and is printed a page at a time.

The process described above is repeated until no more names remain in the input stream.

Usage

The EXTENDED PICTURE is very similar in content to the PICTURE report and therefore, most usages of the PICTURE report apply to the EXTENDED PICTURE report.

In addition, the EXTENDED PICTURE report provides a comprehensive view of the information flow and structure aspects of the target system for inclusion in the final specifications of the system, or as an aid in communicating this information to others.

Problem definers may use the EXTENDED PICTURE report to visually analyze the description of particular objects and the system as a whole, for completeness. Table 5 presents all completeness checks that can be made by visually scanning EXTENDED PICTURE reports.

Examples

Figure 31 presents an EXTENDED PICTURE of structure information for the PROCESS "hourly-employee-processing."

Figure 32 presents and EXTENDED PICTURE of data flow information for the INTERFACE "payroll-department." The amount of information presented was limited by setting LINKS=3.

FIGURE_31

EXTENDED PICTURE

PARAMETERS FOR: IP

NAME=hourly-employee-processing STRUCTURE FORWARD NOTHREAD LINKS=1000 NOINDEX COLUMNS=110
ROWS=33 HORIZONTAL-BOXES=6 VERTICAL-BOXES=6

FIGURE_31

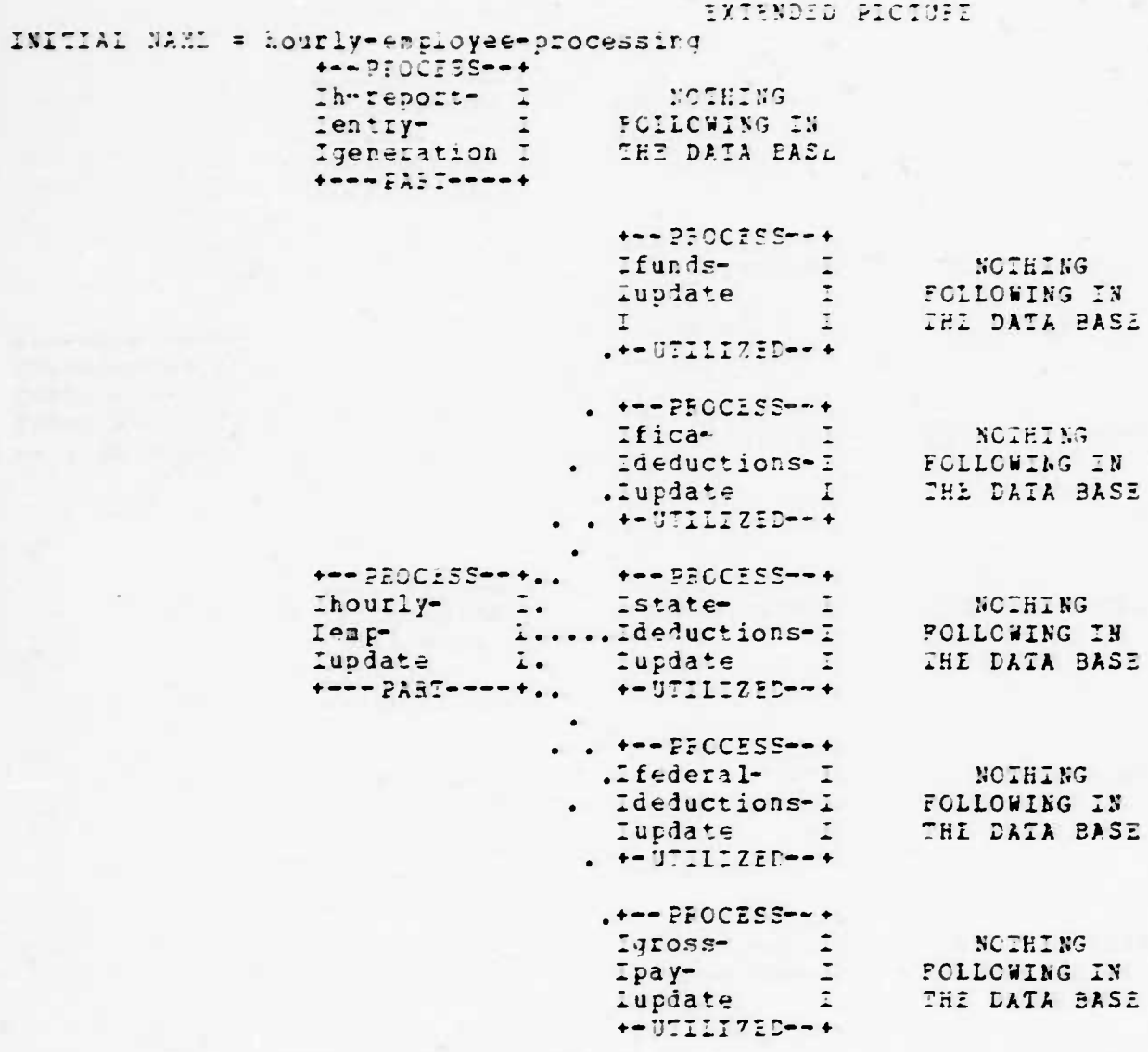
EXTENDED PICTURE

INITIAL NAME = hourly-employee-processing

CONTINUED ON PAGE 81

FIGURE_31

EXTENDED PICTURE



CONTINUED ON PAGE 82

FIGURE_31

EXTENDED PICTURE

INITIAL NAME = hourly-employee-processing

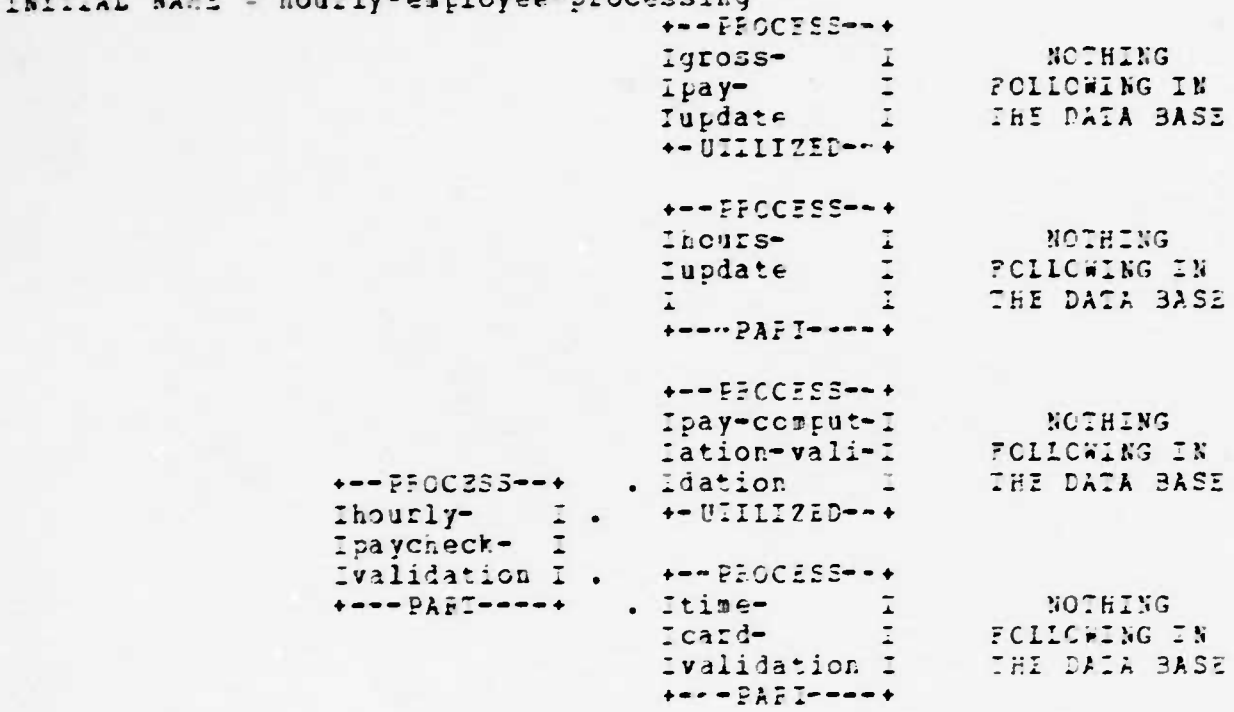


FIGURE_32

EXTENDED PICTURE

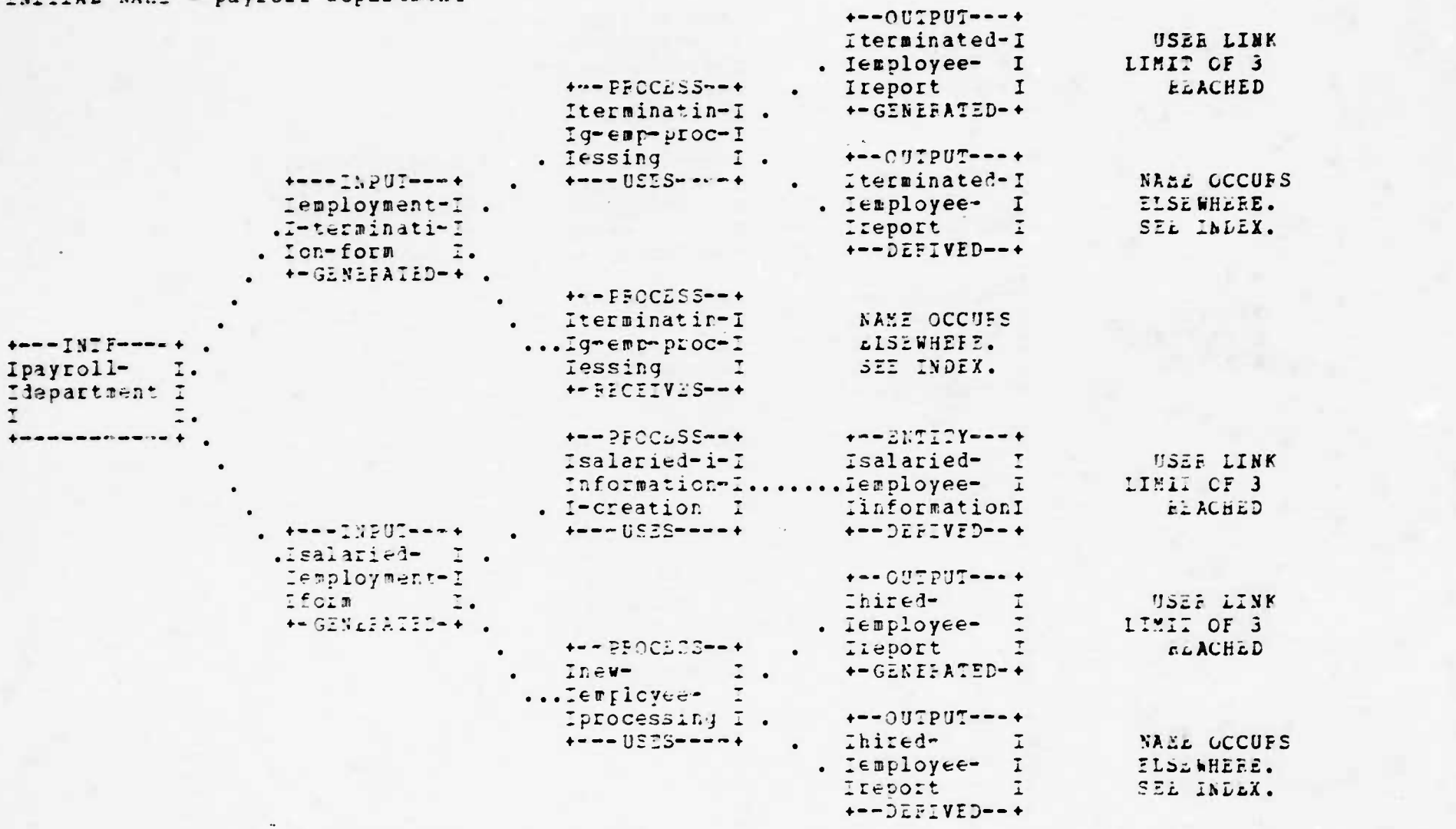
PARAMETERS FOR: EP

NAME=payroll-department DATA-FLOW FORWARD NOTHREAD LINKS=3 NOINDEX COLUMNS=119 ROWS=39
HORIZONTAL-BOXES=4 VERTICAL-BOXES=6

FIGURE_32

EXTENDED PICTURE

INITIAL NAME = payroll-department

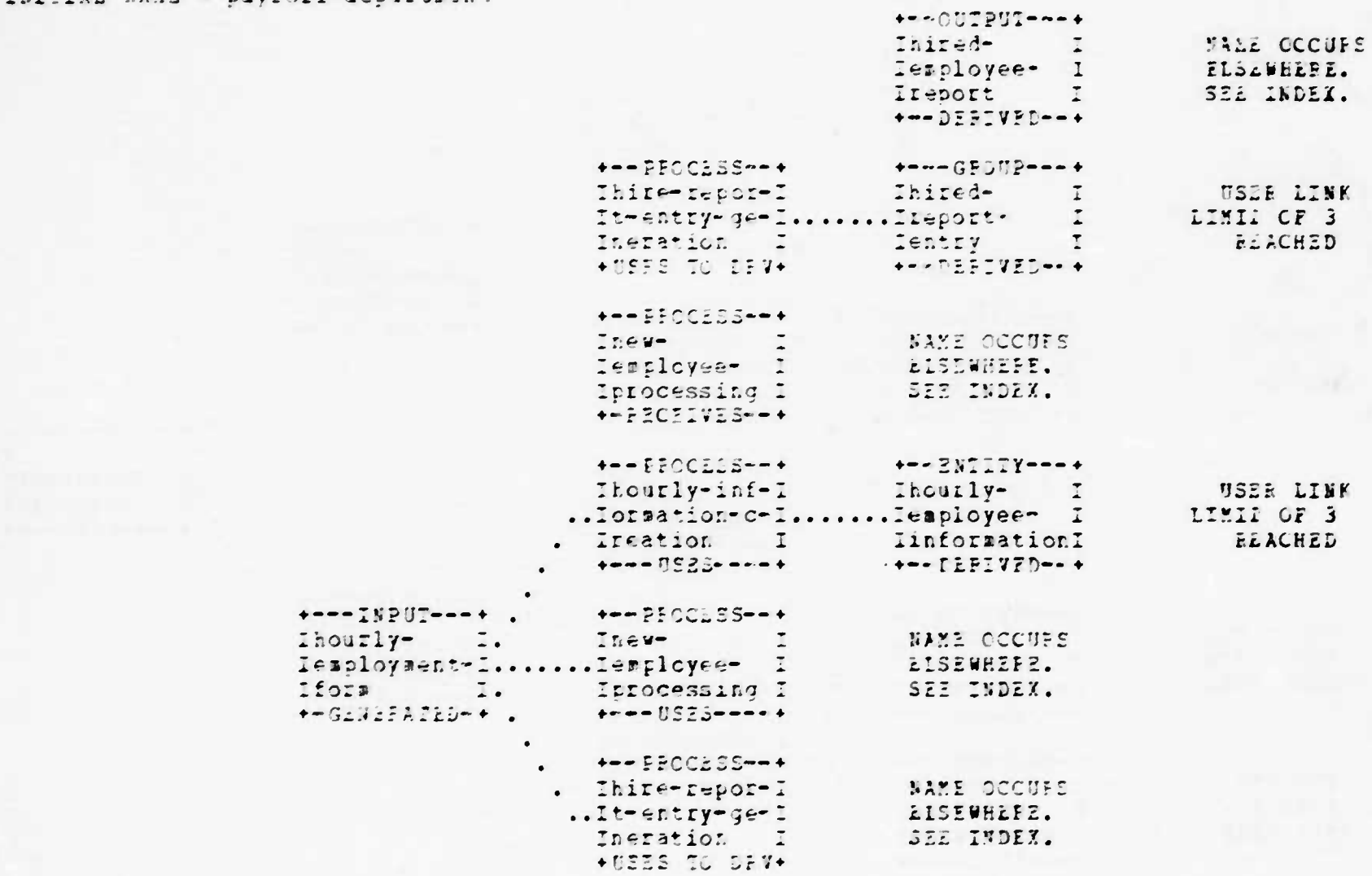


CONTINUED ON PAGE 85

FIGURE_32

EXTENDED PICTURE

INITIAL NAME = payroll-department



CONTINUED ON PAGE 86

FIGURE_32

EXTENDED PICTURE

INITIAL NAME = payroll-department

```
+--PROCESS--+
Ihire-repor-I          NAME OCCURS
It-entry-qe-I          ELSEWHERE.
Ineration   I          SEE INDEX.
+USES TO DEV+

+--PROCESS--+
Inew-       I          NAME OCCURS
Iemployee-  I          ELSEWHERE.
Iprocessing I          SEE INDEX.
+-RECEIVES--+
```

STRUCTURE:	
SET	- check that SET is broken down into ENTITIES, or INPUTS or SETS.
INPUT/OUTPUT/ GROUP/ENTITY	- check that these are eventually broken down into ELEMENTS.
GROUP/ELEMENT	- check that these are contained within some larger data structure.

FLOW:	
Process	- check that information produced is used in some manner. - check that information used has been made available (produced) in some manner. - check that all PROCESSES interact with data in some manner.
INTERFACE	- check that these all generate INPUTS to the system and/or receive OUTPUTS. - check that the OUTPUTS received have been generated in some manner. - check that the INPUTS generated are used in some manner.
SET	- check that all these are USED, UPDATED and/or DERIVED in some manner.
INPUT/OUTPUT/ ENTITY	- check that all these are produced in some manner and/or used in some manner.
GROUP/ELEMENT	- check that all these are produced in some manner and/or used in some manner.

Table 5

Completeness Checks that may be made by Visual Analysis of the EXTENDED PICTURE Report

FORMATTED PROBLEM STATEMENT

Purpose

To present in the Language format, all description given about one or more names in an Analyzer data base.

Information Presented

The report presents, for each name used as input when generating the report, all information directly available in the data base for that name and its relationships with other names in the data base. Since this report can be generated for any type of name and the report presents all Language relationships specified for each name type, it presents all the relationships that are specified in Part II of the UPL User's Manual.

Format

All information presented in this report is presented as legal Language statements and is formatted according to the values of the margin parameters. The margin parameters have the following effects on the format:

AMARG - indicates the column at which the first name of a name pair is to be outputted.

BMARG - indicates the column at which the second name of a name pair is to be outputted.

CMARG - specifies the number of columns between SMARG and where the text starts for a comment entry.

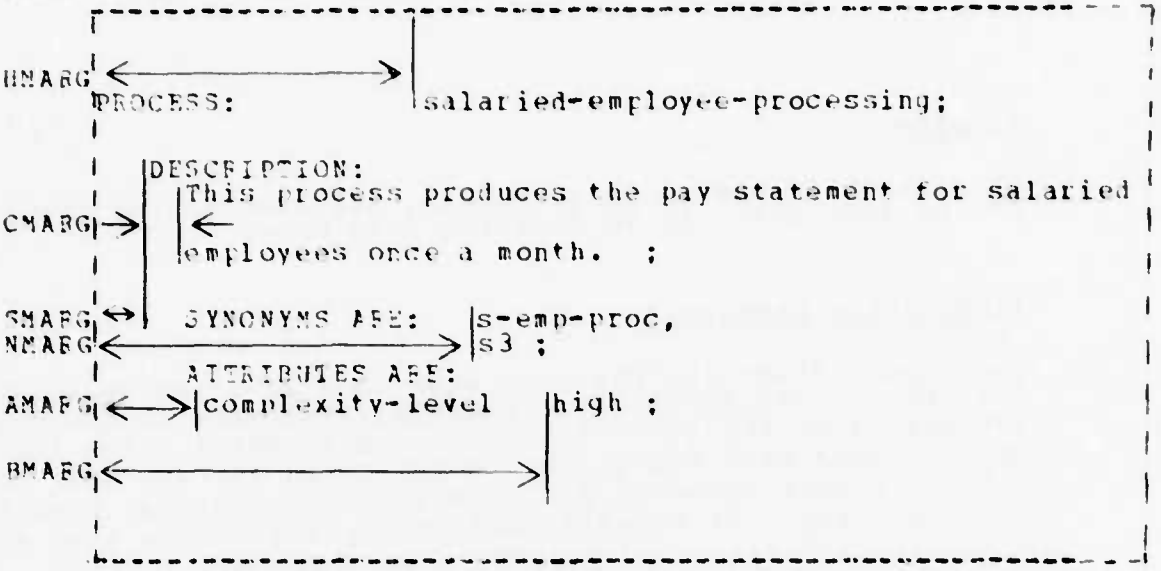
HMARG - indicates the column where the user defined name in a section header is to be outputted.

NMARG - indicates the column where the first name of a name list or name used in a language statement is outputted.

RNMARG - specifies the right-hand margin for names in a name list.

SMARG - indicates the column in which the language statement headers will be started.

Figure 33 illustrates the margin parameters with respect to a part of an actual FORMATTED PROBLEM STATEMENT.



All Language statements presented in the FPS Report are numbered sequentially along the left margin.

For each type of Language section, the statements within the section are ordered as given in Table 6. Sections in the FPS which describe undefined names or relationships not allowed by the syntax of the Language are presented as comment statements, i.e., preceded by the characters /* and succeeded by the characters */.

CONDITION section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES BECOMING TRUE CAUSES BECOMING FALSE CAUSES BECOMING TRUE INTERRUPTS BECOMING FALSE INTERRUPTS BECOMING TRUE TERMINATES BECOMING FALSE TERMINATES BECOMING TRUE TRIGGERS BECOMING FALSE TRIGGERS BECOMING TRUE IS CALLED BECOMING FALSE IS CALLED MADE TRUE BY MADE FALSE BY TRUE WHILE FALSE WHILE DEPENDS ON RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
DEFINE section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES APPLIES SUBSETTING-CRITERION MAINTAINED /* CONTAINED */ /* CONNECTIVITY */ /* CARDINALITY */ /* HAPPENS TIMES-PER */ /* HAPPENS EVERY */ /* HAPPENS WITHIN AFTER */ /* HAPPENS AFTER */ /* VALUE */ RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE

Table 6

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ELEMENT section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	CONTAINED
	SUBSETTING-CRITERION
	IDENTIFIES
	ASSOCIATED WITH
	VALUES
	USED
	UPDATED
	DERIVED
	CLASSIFICATION
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE
ENTITY section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	CONSISTS
	CONTAINED
	IDENTIFIES
	RELATED
	USED
	UPDATED
	DERIVED
	CLASSIFICATION
	OCCURRENCES
	VOLATILITY
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE

Table 6 (continued)

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EVENT section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES HAPPENS TIMES-PER HAPPENS EVERY HAPPENS WITHIN AFTER HAPPENS AFTER ON INCEPTION ON TERMINATION CAUSES CAUSED INTERRUPTS TRIGGERS MAKES RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
GROUP section	/* DATE OF LAST CHANGE*/ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES CONSISTS CONTAINED SUBSETTING-CRITERION IDENTIFIES ASSOCIATED-WITH USED UPDATED DERIVED CLASSIFICATION RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE

Table 6 (continued)

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INPUT section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES GENERATED RECEIVED SUBPARTS PART CONSISTS CONTAINED USED CLASSIFICATION HAPPENS TIMES-PER HAPPENS EVERY HAPPENS WITHIN AFTER HAPPENS AFTER CAUSES INTERRUPTS TERMINATES TRIGGERS MAKES RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
INTERFACE section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES GENERATES RECEIVES RESPONSIBLE SUBPARTS PART SECURITY-ACCESS-RIGHTS RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE

Table 6 (continued)

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INTERVAL section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES CONSISTS /* CONTAINED */ /* HAPPENS TIMES-PER */ /* HAPPENS EVERY */ /* HAPPENS WITHIN AFTER */ /* HAPPENS AFTER */ RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
MEMO section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION KEYWORDS TRACE-KEY ATTRIBUTES APPLIES RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
OUTPUT section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES GENERATED RECEIVED SUBPARTS PART CONSISTS CONTAINED DERIVED CLASSIFICATION HAPPENS TIMES-PER HAPPENS EVERY HAPPENS WITHIN AFTER HAPPENS AFTER RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE

Table 6 (continued)

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PROBLEM-DEFINER section	/* DATE OF LAST CHANGE */
	SYNONYM
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	MAILBOX
	RESPONSIBLE
	SECURITY
	SOURCE
PROCESS section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	GENERATES
	RECEIVES
	SUBPARTS
	PART
	UTILIZES
	UTILIZED
	PERFORMED BY
	RESOURCE-USAGE
	USES
	UPDATES
	DERIVES
	PROCEDURE
	MAINTAINS
	SECURITY-ACCESS-RIGHTS
	HAPPENS TIMES-PER
	HAPPENS EVERY
	HAPPENS WITHIN AFTER
	HAPPENS AFTER
	INCEPTION-CAUSES
	TERMINATION-CAUSES
	INTERRUPTS
	INTERRUPTED BY
	TERMINATED
	TRIGGERS
	TRIGGERED
	MAKES
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE

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Table 6 (continued)

PROCESSOR section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES GENERATES RECEIVES SUPPARTS PART CONSUMES PERFORMS UTILIZES UTILIZED PERFORMED BY RESOURCE-USAGE USES UPDATES DERIVES PROCEDURE MAINTAINS SECURITY-ACCESS-RIGHTS INCEPTION-CAUSES TERMINATION-CAUSES INTERRUPTS INTERRUPTED BY TERMINATED TRIGGERS TRIGGERED MAKES RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE
RELATION section	/* DATE OF LAST CHANGE */ SYNONYMS DESCRIPTION SEE-MEMO KEYWORDS TRACE-KEY ATTRIBUTES ASSOCIATED-DATA BETWEEN DERIVATION MAINTAINED CONNECTIVITY CARDINALITY RESPONSIBLE-PROBLEM-DEFINER SECURITY SOURCE

Table 6 (continued)

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RESOURCE section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	CONSUMED
	MEASURED
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE
RESOURCE-USAGE-PARAMETER section	
	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	RESOURCE-USAGE-PARAMETER-VALUE
	COMPUTER-PROCESSOR-CONSUMES
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE

Table 6 (continued)

SET section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	ASSERT
	RESPONSIBLE-INTERFACE
	SUBSETS
	SUBSET
	CONSISTS
	SUBSETTING-CRITERIA
	USED
	DERIVED
	UPDATED
	DERIVATION
	CLASSIFICATION
	OCCURRENCES
	VOLATILITY-MEMBER
	VOLATILITY-SET
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE
UNITS section	/* DATE OF LAST CHANGE */
	SYNONYMS
	DESCRIPTION
	SEE-MEMO
	KEYWORDS
	TRACE-KEY
	ATTRIBUTES
	ASSERT
	MEASURES
	RESPONSIBLE-PROBLEM-DEFINER
	SECURITY
	SOURCE

Table 6 (continued)

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Options and Alternatives

In addition to the margin parameters described above, a few other parameters which modify the format in some way are given below with the effect they have on the report format.

1) NEW-LINE - specifies that the first name in a list of names for Language statements is started on the line following the statement header.

NONEW-LINE - specifies that the names in the name list begin on the same line as the Language statement.

For example, with NEW-LINE in effect, a Language statement would be printed as follows:

```
SYNONYMS ARE:
                    s-emp-proc,
                    s3;
```

With NONEW-LINE in effect, the statement is printed as follows:

```
SYNONYMS ARE:    s-emp-proc,
                 s3;
```

2) NEW-PAGE - specifies that each section (description of single name) presented in the report would be printed beginning at the top of a new page.

NONEW-PAGE - specifies that sections are printed one after another without a new page being started.

3) ONE-PER-LINE - specifies that the names in a name list within a given statement be presented one per line.

SEVERAL-PER-LINE - specifies that the names in a name list be presented as many as possible on a line.

For example, with ONE-PER-LINE in effect a Language statement would be printed as

```
SYNONYMS:
                    s-emp-proc,
                    s3;
```

With SEVERAL-PER-LINE in effect the statement is printed as

SYNONYMS:
s-emp-proc, s3;

Some information in the FPS can be included or left out, depending on the parameters used when generating it. Each parameter and its effect is given below.

1) COMMENT - specifies that comment statements for descriptions of undefined names and complementary relationships not allowed by the Lanaguage syntax are to be included where applicable in the report.

NOCOMMENT - specifies that the comment statements are not to be printed.

2) DEFINE - specifies that descriptions for names which are described by a DEFINE section (ATTRIBUTE, ATTRIBUTE-VALUE, KEYWORD, MAILBOX, SECURITY, SOURCE, SUBSETTING-CRITERION, and SYSTEM-PARAMETER names) are included in the report when these names are given as input.

NODEFINE - specifies that the description of any name described by a DEFINE section is not presented in the report

3) DESG - specifies that the descriptions for names which are SYNONYMS for other names in the data base are presented in the report by the DESIGNATE section.

NODESG - specifies that the descriptions for names that are SYNONYMS are not to be presented in the report.

4) ALL-STATEMENTS(AS)
- specifies that all legal statements for each section will be printed whether information was supplied or not.

NOALL-STATEMENTS(NAS)
- specifies that only those statements for which there is information contained in the data base will be printed.

5) LINE-NUMBERS(LNS)
- specifies that line numbers are to be printed on the left side of the report.

NOLINE-NUMBERS(NLNS)
- specifies that line numbers should not appear on the report.

6) PRINTEOF(PEOF) - specifies that an extra line containing EOF is to be produced at the end of the output.

7) COMPLEMENTARY-STATEMENTS (COMP)
- specifies that complementary statements will be produced, if applicable, in each section of the report.

NOCOMPLEMENTARY-STATEMENTS(NCOMP)
- specifies that no complementary statements will be output. Only statements in the "present tense" are printed, e.g., RECEIVES and TRIGGERS as opposed to the complementary RECEIVED BY and TRIGGERED BY. Thus the number of statements is the minimum necessary to describe the information in the data base for this section.

8) DLC-COMMENT(DLCC)
- specifies that the Formatted Problem Statement for each name includes a comment which indicates the date and time of the last change made to that name.

NODLC-COMMENT(NDLCC)
- specifies that a date of last change comment will not be printed as part of the FPS report.

For each name given as input to the command producing the report, the report presents the appropriate section to describe the name. For example, when a PROCESS name is given, it is described in a PROCESS section. Therefore, when a SYNONYM name is given as input, the report describes the SYNONYM by a DESIGNATE section rather than presenting the description of the name the SYNONYM name applies to.

An index for the report is generated when the INDEX parameter is used.

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input is first checked to see that it is in the database. If it is not, the message:

```
/* NAME NOT FOUND IN D.B.-          */
```

is printed on the report.

If DLC-COMMENT parameter is specified, a date of last change comment will be printed as part of each section header statement. Each relationship the name has with other names is printed in the format of a legal lanaguage statement. If no statement exists, the relationship is presented as a comment entry. Since no Language section is available to describe an UNDEFINED name, the description of the name and relationships it has with other names are presented as a comment statement.

Usage

Since the FPS presents all the description given about each name in the data base, the report is beneficial in checking the accuracy of each description. It is usually recommended that an FPS for all names be maintained as a reference and updated when changes are made to the data base.

When maintaining an up-to-date copy of the FPS, it is often desirable to generate the FPS for all names in the data base with the NEW-PAGE option. Any modifications to the description in the data base can be recorded by generating an FPS (with the NEW-PAGE option again) for those names affected by the modification.

Examples

Figure 34 presents an FPS for a single name. This example was generated by the following command:

```
FORMATTED-PROBLEM-STATEMENT NAME=payroll-processing
```

Figure 35 presents the report for all ENTITY names defined in a particular data base. This example was generated by the following commands:

```
NAME-GEN S='ENTITY'
FPS
```

FIGURE_34

FORMATTED PROBLEM STATEMENT

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```
PARAMETERS FOR: PPS

   NAME=payroll-processing NOINDEX PRINT EMPTY NOPUNCH SMARG=5 NMARG=20 AMARG=10 BMARG=25
   RNMARG=70 CMARG=1 HMARG=40 NODESIGNATE ONE-PER-LINE DEFINE COMMENT NONEW-PAGE NONEW-LINE
   NOALL-STATEMENTS COMPLEMENTARY-STATEMENTS LINE-NUMBERS PRINTEOF DIC-COMMENT

   1 PROCESS                                   payroll-processing;
   2      /*   DATE OF LAST CHANGE - SEP 16, 1977, 02:06:14 */
   3     SYNONYMS ARE:  payproc,
   4                    p1;
   5     DESCRIPTION;
   6           This process represents the highest level process
   7           in the target system.  it accepts and processes
   8           all inputs and produces all outputs.;
   9     SEE-MEMO:      goals-memo,
  10                    process-memo;
  11     RECEIVES:      paysystem-inputs;
  12     SUBPARTS ARE:  new-employee-processing,
  13                    terminating-emp-processing,
  14                    hourly-employee-processing,
  15                    salaried-employee-processing,
  16                    process-library;
  17     PERFORMED BY:  payroll-processor;
  18     USES:          paysystem-inputs,
  19                    payroll-master-information;
  20     UPDATES:       payroll-master-information;
  21     HAPPENS:
  22          no-of-payroll-processing
  23           TIMES-PER      month;
  24     TERMINATION-CAUSES:
  25                    transaction-listing-init
  26       DEPENDING ON:
  27                    transaction-listing-option
  28       FOR EACH:    transaction;
  29     RESPONSIBLE-PROBLEM-DEFINER IS:
  30                    michel-j-bastarache;
  31
  32 EOP EOP EOP EOP EOP
```

FIGURE_35

FORMATTED PROBLEM STATEMENT

```
PARAMETERS FOR: FPS

   FILE NOINDEX PRINT EMPTY NOPUNCH SMARG=5 NMARG=20 AMARG=10 BMARG=25 BNMARG=70 CMARG=1 HMARG=40
   NODESIGNATE ONE-PER-LINE DEFINE COMMENT NONEW-PAGE NONEW-LINE NOALL-STATEMENTS
   COMPLEMENTARY-STATEMENTS LINE-NUMBERS PRINTEOF DLC-COMMENT

    1 ENTITY                                    department-information;
    2      /*   DATE OF LAST CHANGE - AUG 15, 1977, 23:13:23 */
    3      SYNONYMS ARE:  dept-info;
    4      DESCRIPTION;
    5            This information holds all current data relevent about each
    6            department;
    7      CONSISTS OF:
    8                          department,
    9           no-of-supervisors
   10                          supervisor,
   11                          number-of-employees,
   12                          total-budget,
   13                          remaining-funds;
   14      CONTAINED IN:  payroll-master-information,
   15                     department-file;
   16      IDENTIFIED BY: department;
   17      /* LEFT */ RELATED TO:
   18           hourly-employee-information
   19            VIA           dept-hourly-emp-relation;
   20      /* LEFT */ RELATED TO:
   21           salaried-employee-information
   22            VIA           dept-salaried-emp-relation;
   23      OCCURRENCES:   no-of-departments;
   24
   25 ENTITY                                    hourly-employee-information;
   26      /*   DATE OF LAST CHANGE - SEP 15, 1977, 14:12:58 */
   27      SYNONYMS ARE:  h-emp-info;
   28      DESCRIPTION;
   29            This information holds all current data about each hourly
   30            employee.;
   31      CONSISTS OF:
   32                          employee-name,
   33                          employee-identification-number,
   34                          social-security-number,
   35                          pay-grade-code,
```

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FIGURE_35

FORMATTED PROBLEM STATEMENT

```
36                          address,
37                          phone,
38                          employment-date,
39                          number-of-deductions,
40                          department,
41                          cumulative-gross-pay,
42                          cumulative-federal-deductions,
43                          cumulative-state-deductions,
44                          cumulative-fica-deductions,
45                          age,
46                          sex,
47                          status-code,
48                          employment-status,
49                          cumulative-hours;
50      CONTAINED IN:   payroll-master-information,
51                      hourly-employee-file;
52      IDENTIFIED BY: employee-identification-number;
53      /* RIGHT */ RELATED TO:
54           department-information
55            VIA           dept-hourly-emp-relation;
56      USED BY:        hourly-employee-processing;
57      USED BY:
58           term-report-entry-generation
59            TO DERIVE     term-report-entry
60           ;
61      DERIVED BY:     hourly-information-creation;
62      CLASSIFICATION IS:
63           classified      2,
64           secret          1,
65           top-secret      2,
66           limited-security
67                           3;
68      OCCURRENCES:    no-of-hourly-employees;
69      VOLATILITY:
70           This information is changed about once a week .;
71      SECURITY IS:    no-restrictions;
72
73  ENTITY                                  salaried-employee-information;
74       /*   DATA OF LAST CHANGE - SEP 16, 1977, 14:12:58 */
75      SYNONYMS ARE:   s-emp-info;
76      DESCRIPTION;
```

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FIGURE_35

FORMATTED PROBLEM STATEMENT

```
77          This information holds all current data about salaried
78          employees.;
79      CONSISTS OF:
80                          employee-name,
81                          employee-identification-number,
82                          social-security-number,
83                          pay-grade-code,
84                          address,
85                          phone,
86                          employment-date,
87                          number-of-deductions,
88                          department,
89                          cumulative-federal-deductions,
90                          cumulative-gross-pay,
91                          cumulative-state-deductions,
92                          cumulative-fica-deductions,
93                          age,
94                          sex,
95                          employment-status,
96                          status-code;
97      CONTAINED IN:   payroll-master-information,
98                      salaried-employee-file;
99      IDENTIFIED BY: employee-identification-number;
100     /* RIGHT */ RELATED TO:
101          department-information
102           VIA            dept-salaried-emp-relation;
103     USED BY:        salaried-employee-processing;
104     USED BY:
105          term-report-entry-generation
106           TO DERIVE     term-report-entry
107          ;
108     DERIVED BY:     salaried-information-creation;
109     OCCURRENCES:    no-of-salaried-employees;
110     VOLATILITY;
111          This information is changed about once a month.;
112     SECURITY IS:    no-restrictions;
113
114 EOF EOF EOF EOF EOF
```

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FREQUENCY REPORT

Purpose

To present all information based on the use of the HAPPENS statement in a particular Analyzer data base.

Information Presented

The report presents size and volume information about all INPUT, OUTPUT, PROCESS and EVENT names defined in the data base with respect to the HAPPENS statements connected to those types of names. An entry is made in the report for each INPUT, OUTPUT, PROCESS and EVENT with a HAPPENS statement and the entries are grouped by the INTERVAL over which the HAPPENS statement is effective.

SYSTEM-PARAMETERS are contained in each entry to define a number which relates the name to the entry and the INTERVAL.

Format

The report presents all HAPPENS statements relative to a specific INTERVAL name. For each INTERVAL, three headings are printed and the frequency information pertaining to the particular INTERVAL is listed below these headings. The headings are:

NAME - the names of the INPUTS, OUTPUTS, PROCESSES and EVENTS which HAPPEN within the designated INTERVAL are listed.

TYPE - the name type of each of the names given under NAME is listed.

HAPPENS - all of the HAPPENS relationships between each name and the given interval are listed.

The INTERVALS are presented alphabetically in the report. The names presented within each INTERVAL can appear alphabetically or by object type as specified with the ORDER parameter. When the NEW-PAGE parameter is in effect, each INTERVAL name will begin on a new page.

Options and Alternatives

There are two parameters that affect the format of the report as described above. The ORDER parameter specifies the sequence in which the names presented within each interval section of the report will appear. If the value BYTYPE, the default value, is

assigned to the ORDER parameter, the names within each interval section will be grouped by name type. If the value ALPHA is assigned, all names within each interval section will be arranged alphabetically.

The NEW-PAGE (NPG) parameter specifies that each interval section will begin on a new page. If not explicitly given, the default is the NONEW-PAGE (NNPG) parameter.

An index, containing each name used on the report and the page(s) on which it appears, may be obtained by specifying the INDEX parameter.

Analysis

The data base is first searched to determine whether there is any INTERVAL name that is connected to a HAPPENS relationship. If none is found, the message:

UPA 385: MAINFRQP: NO HAPPENS RELATION FOR user-name

is printed. Each INTERVAL name found is retrieved and for each name related to it via a HAPPENS statement, all of the HAPPENS relations existing between that name and the INTERVAL are retrieved.

Usage

The report is helpful to analysts in checking that all items in the description which are to be logically related via their frequency are grouped together.

The report is also beneficial to system designers when considering the relationships of various parts of system with respect to the frequency of occurrence, and the amount of input and output to be handled by the target system.

Examples

Figures 36 and 37 present the FREQUENCY REPORT for a language description of a target system. These were generated by the commands

```
FREQUENCY ORDER=ALPHA NEW-PAGE NOINDEX
FREQ
```

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FIGURE_36

FREQUENCY REPORT

PARAMETERS FOR: FREQ

NOINDEX NEW-PAGE ORDER=ALPHA

INTERVAL: days

NAME	TYPE	H A P P E N S
employment-termination-form	INPUT	WITHIN one days AFTER termination-processing-init
hourly-emp-processing	PROCESS	WITHIN one days AFTER hourly-emp-processing-init
hourly-employment-form	INPUT	WITHIN one days AFTER new-employee-processing-init
new-employee-processing	PROCESS	WITHIN one days AFTER new-employee-processing-init
new-employee-processing-init	EVENT	WITHIN two days AFTER hourly-emp-processing-init one days AFTER hourly-emp-processing-init
salaried-employee-processing	PROCESS	WITHIN one days AFTER salaried-emp-processing-init
salaried-employment-form	INPUT	WITHIN one days AFTER new-employee-processing-init
tax-withholding-certificate	INPUT	WITHIN one days AFTER new-employee-processing-init
terminating-emp-processing	PROCESS	WITHIN one days AFTER termination-processing-init
termination-processing-init	EVENT	WITHIN two days AFTER new-employee-processing-init one days AFTER new-employee-processing-init

FIGURE_36

FREQUENCY REPORT

INTERVAL: employment-termination-arrival

NAME	TYPE	H A P P E N S		
employment-termination-form	INPUT	EVERY	one	employment-termination-arrival
terminating-emp-processing	PROCESS	EVERY	one	employment-termination-arrival
termination-processing-init	EVENT	EVERY	one	employment-termination-arrival

FIGURE_36

FREQUENCY REPORT

INTERVAL: month

NAME	TYPE	H A P P E N S
employment-termination-form	INPUT	several TIMES PER month
event-four	EVENT	four month AFTER event-one
hourly-employment-form	INPUT	several TIMES PER month
name-six	INPUT	WITHIN one month AFTER event-two
payroll-processing	PROCESS	no-of-payroll-processing TIMES PER month
salaried-emp-processing-init	EVENT	no-salaried-emp-processing TIMES PER month
salaried-employee-processing	PROCESS	no-salaried-emp-processing TIMES PER month
salaried-employment-form	INPUT	several TIMES PER month
tax-withholding-certificate	INPUT	several TIMES PER month

FIGURE_36

FREQUENCY REPORT

INTERVAL: new-employment-arrival

NAME	TYPE	H A P P E N S
hourly-employment-form	INPUT	EVERY one new-employment-arrival
new-employee-processing	PROCESS	EVERY one new-employment-arrival
new-employee-processing-init	EVENT	EVERY one new-employment-arrival
salaried-employment-form	INPUT	EVERY one new-employment-arrival
tax-withholding-certificate	INPUT	EVERY one new-employment-arrival

FIGURE_36

FREQUENCY REPORT

INTERVAL: week

NAME	TYPE	H A P P E N S
event-four	EVENT	EVERY fifty-two week
federal-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
fica-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
funds-update	PROCESS	no-of-hourly-employees TIMES PER week
gross-pay-update	PROCESS	no-of-hourly-employees TIMES PER week
h-gross-pay-computation	PROCESS	no-of-hourly-employees TIMES PER week
h-report-entry-generation	PROCESS	no-of-hourly-employees TIMES PER week
hourly-emp-processing	PROCESS	no-hourly-emp-processing TIMES PER week
hourly-emp-processing-init	EVENT	no-hourly-emp-processing TIMES PER week
hourly-emp-update	PROCESS	no-of-hourly-employees TIMES PER week
hourly-employee-processing	PROCESS	1 TIMES PER week
hourly-paycheck-production	PROCESS	no-of-hourly-employees TIMES PER week
hourly-paycheck-validation	PROCESS	50 TIMES PER week
hours-update	PROCESS	no-of-hourly-employees TIMES PER week
name-one	PROCESS	two TIMES PER week EVERY one week WITHIN one week AFTER event-one three week AFTER event-two
name-six	INPUT	EVERY four week
name-two	INPUT	many TIMES PER week EVERY one week WITHIN one week AFTER event-three four week AFTER event-four
net-pay-computation	PROCESS	no-of-hourly-employees TIMES PER week
new-employee-processing	PROCESS	no-new-emp-processing TIMES PER week
new-employee-processing-init	EVENT	no-new-emp-processing TIMES PER week
pay-computation-validation	PROCESS	50 TIMES PER week
state-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
tax-computation	PROCESS	no-of-hourly-employees TIMES PER week
terminating-emp-processing	PROCESS	no-terminating-emp-processing TIMES PER week
termination-processing-init	EVENT	no-terminating-emp-processing TIMES PER week
time-card	INPUT	no-of-hourly-employees TIMES PER week
time-card-validation	PROCESS	50 TIMES PER week
total-deductions-computation	PROCESS	no-of-hourly-employees TIMES PER week
total-hours-computation	PROCESS	no-of-hourly-employees TIMES PER week

FIGURE_36

FREQUENCY REPORT

INTERVAL: year

NAME	TYPE	H A P P E N S
event-four	EVENT	one year AFTER event-six
name-six	INPUT	many TIMES PER year
		two year AFTER event-seven

FIGURE_37

FREQUENCY REPORT

PARAMETERS FOR: FREQ

NOINDEX NONEW-PAGE ORDER=BYTYPE

INTERVAL: days

NAME	TYPE	H A P P E N S
new-employee-processing-init	EVENT	WITHIN two days AFTER hourly-emp-processing-init one days AFTER hourly-emp-processing-init
termination-processing-init	EVENT	WITHIN two days AFTER new-employee-processing-init one days AFTER new-employee-processing-init
employment-termination-form	INPUT	WITHIN one days AFTER termination-processing-init
hourly-employment-form	INPUT	WITHIN one days AFTER new-employee-processing-init
salaried-employment-form	INPUT	WITHIN one days AFTER new-employee-processing-init
tax-withholding-certificate	INPUT	WITHIN one days AFTER new-employee-processing-init
hourly-emp-processing	PROCESS	WITHIN one days AFTER hourly-emp-processing-init
new-employee-processing	PROCESS	WITHIN one days AFTER new-employee-processing-init
salaried-employee-processing	PROCESS	WITHIN one days AFTER salaried-emp-processing-init
terminating-emp-processing	PROCESS	WITHIN one days AFTER termination-processing-init

INTERVAL: employment-termination-arrival

NAME	TYPE	H A P P E N S
termination-processing-init	EVENT	EVERY one employment-termination-arrival
employment-termination-form	INPUT	EVERY one employment-termination-arrival
terminating-emp-processing	PROCESS	EVERY one employment-termination-arrival

INTERVAL: month

NAME	TYPE	H A P P E N S
event-four	EVENT	four month AFTER event-one
salaried-emp-processing-init	EVENT	no-salaried-emp-processing TIMES PER month
employment-termination-form	INPUT	several TIMES PER month
hourly-employment-form	INPUT	several TIMES PER month

FIGURE_37

FREQUENCY REPORT

name-six	INPUT	WITHIN one month AFTER event-two
salaried-employment-form	INPUT	several TIMES PER month
tax-withholding-certificate	INPUT	several TIMES PER month
payroll-processing	PROCESS	no-of-payroll-processing TIMES PER month
salaried-employee-processing	PROCESS	no-salaried-emp-processing TIMES PER month

INTERVAL: new-employment-arrival

NAME	TYPE	H A P P E N S
new-employee-processing-init	EVENT	EVERY one new-employment-arrival
hourly-employment-form	INPUT	EVERY one new-employment-arrival
salaried-employment-form	INPUT	EVERY one new-employment-arrival
tax-withholding-certificate	INPUT	EVERY one new-employment-arrival
new-employee-processing	PROCESS	EVERY one new-employment-arrival

INTERVAL: week

NAME	TYPE	H A P P E N S
event-four	EVENT	EVERY fifty-two week
hourly-emp-processing-init	EVENT	no-hourly-emp-processing TIMES PER week
new-employee-processing-init	EVENT	no-new-emp-processing TIMES PER week
termination-processing-init	EVENT	no-terminating-emp-processing TIMES PER week
name-six	INPUT	EVERY four week
name-two	INPUT	many TIMES PER week EVERY one week WITHIN one week AFTER event-three four week AFTER event-four
time-card	INPUT	no-of-hourly-employees TIMES PER week
federal-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
fica-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
funds-update	PROCESS	no-of-hourly-employees TIMES PER week
gross-pay-update	PROCESS	no-of-hourly-employees TIMES PER week
h-gross-pay-computation	PROCESS	no-of-hourly-employees TIMES PER week
h-report-entry-generation	PROCESS	no-of-hourly-employees TIMES PER week
hourly-emp-processing	PROCESS	no-hourly-emp-processing TIMES PER week
hourly-emp-update	PROCESS	no-of-hourly-employees TIMES PER week
hourly-employee-processing	PROCESS	1 TIMES PER week

FIGURE_37

FREQUENCY REPORT

hourly-paycheck-production	PROCESS	no-of-hourly-employees TIMES PER week
hourly-paycheck-validation	PROCESS	50 TIMES PER week
hours-update	PROCESS	no-of-hourly-employees TIMES PER week
name-one	PROCESS	two TIMES PER week EVERY one week WITHIN one week AFTER event-one three week AFTER event-two
net-pay-computation	PROCESS	no-of-hourly-employees TIMES PER week
new-employee-processing	PROCESS	no-new-emp-processing TIMES PER week
pay-computation-validation	PROCESS	50 TIMES PER week
state-deductions-update	PROCESS	no-of-hourly-employees TIMES PER week
tax-computation	PROCESS	no-of-hourly-employees TIMES PER week
terminating-emp-processing	PROCESS	no-terminating-emp-processing TIMES PER week
time-card-validation	PROCESS	50 TIMES PER week
total-deductions-computation	PROCESS	no-of-hourly-employees TIMES PER week
total-hours-computation	PROCESS	no-of-hourly-employees TIMES PER week

INTERVAL: year

NAME	TYPE	H A P P E N S
event-four	EVENT	one year AFTER event-six
name-six	INPUT	many TIMES PER year two year AFTER event-seven

IDENTIFIER INFORMATION REPORT

Purpose

To present all information based on the use of IDENTIFIERS for ENTITIES in a particular Analyzer data base.

Information Presented

If IDENTIFIER names are used as input when generating this report (and the IDENTIFIER parameter is specified), those ENTITIES which the input names IDENTIFY are presented in the report.

If ENTITY names are used as input when generating the report (and the ENTITY parameter is specified), those IDENTIFIERS which the input names are IDENTIFIED by are presented in the report.

In either case, the information is presented as a matrix. An analysis of the information in the matrix produces some statistics showing the number of IDENTIFIERS each ENTITY in the matrix had and the number of ENTITIES each IDENTIFIER identifies in the matrix.

Format

If the IDENTIFIER parameter is used when generating the report, any names given as input which do not IDENTIFY any ENTITY in the data base are flagged at the beginning of the report. If the ENTITY parameter is used when generating the report, any names given as input which are not IDENTIFIED by any IDENTIFIER in the data base are flagged at the beginning of the report.

Two lists of names are then presented, one labeled ROW NAMES and the other COLUMN NAMES. If the IDENTIFIER parameter was used when generating the report, the names designated as ROW NAMES are those which were given as input. If the ENTITY parameter was used when generating the report, the names designated as COLUMN NAMES are those which were given as input.

In any case, each name under ROW NAMES IDENTIFIES one or more names under COLUMN NAMES and each name under COLUMN NAMES is IDENTIFIED by one or more names under ROW NAMES.

A matrix is then printed to show the relationships between the names designated as ROW NAMES (which are represented by the rows of the matrix) and the names designated as COLUMN NAMES (which are represented by the columns of the matrix). The rows and columns of the matrix are numbered to correspond to the number assigned to each name in the list of ROW NAMES and COLUMN NAMES, respectively.

An asterisk (*) entry at the intersection of a particular row and column of the matrix designates that the name represented by the row IDENTIFIES the ENTITY represented by the column.

Inspection of an entire row reveals all ENTITIES that a particular name (represented by the row) IDENTIFIES. Inspection of an entire column reveals all IDENTIFIERS for the particular name represented by the column.

A summary section is also included in the report presenting for each ROW NAME:

- The row it was represented by in the matrix (ROW).
- Its name type (TYPE).
- The number of * entries in its row (or the number of ENTITIES it IDENTIFIES) (COUNT).

The summary presents for each COLUMN NAME:

- The column it was represented by (COLUMN).
- Its name type (TYPE).
- The number of * entries in its column (or the number of IDENTIFIERS for it) (COUNT).

The summary section for ROW and COLUMN names is ordered in decreasing order of COUNT.

Options and Alternatives

The report must be generated using either the IDENTIFIER or ENTITY parameter. If the IDENTIFIER parameter is used, all names given as input must be IDENTIFIER names. If the ENTITY parameter is used, all names given as input must be ENTITY names.

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

For each name given as input, the software finds the name in the data base. If the name is not found, the message:

```
URA099:IDENTR: NAME NOT IN D.B. -                    or
URA052:IDENTC: NAME NOT IN D.B. -
```

is printed depending on whether the IDENTIFIER or ENTITY

parameter was specified for the command, respectively.

If the IDENTIFIERS parameter is used, each name given as input is checked that it IDENTIFIES one or more ENTITIES. If it does not, the name is listed under the message:

URA304:IDENTR: THE FOLLOWING NAMES DO NOT IDENTIFY ANYTHING

The ENTITIES that are IDENTIFIED by the input names are found. The list of all input names and the list of all ENTITIES retrieved is then printed.

If the ENTITY parameter is used, each name given as input is checked that it is IDENTIFIED by one or more IDENTIFIERS. If it does not, the name is listed under the message:

URA308:IDENTC: THE FOLLOWING NAMES ARE NOT IDENTIFIED BY ANYTHING

The IDENTIFIERS for the ENTITIES given as input are found. The list of all input names and the list of all IDENTIFIERS retrieved is then printed.

A matrix is printed out to illustrate the relationships between the names in the two lists and each relationship is designated by an asterisk.

A summary is then produced by counting the number of asterisks appearing in each row and column of the matrix.

Usage

The report presents information that aids the analyst in checking the completeness and consistency of the problem statement by:

1) - identifying those ENTITIES which do not have IDENTIFIERS. This can be accomplished by the following Analyzer commands:

```
NAME-GEN S='ENTITY'
ENTITY-IDENTIFIER ENTITY
```

2) - being in an easy-to-analyze format to check that the IDENTIFIERS defined for the problem statement are being used properly. For example, a typing error may result in an IDENTIFIER being used in the wrong context.

The report aids the system designer by presenting those ENTITIES with the same IDENTIFIERS and aids in determining a consistent and well-defined identifier coding structure.

Example

Figure 38 presents the report using the ENTITY parameter. The Analyzer commands used to generate this example were:

```
NAME-GEN S='ENTITY'
ENTITY-IDENTIFIER ENTITY
```

FIGURE_38

Identifier Information Report

PARAMETERS FOR: EI

FILE ENTITY

ROW NAMES		COLUMN NAMES	
1 department	ELEMENT	1 department-information	ENTITY
2 employee-identification-number	ELEMENT	2 hourly-employee-information	ENTITY
		3 salaried-employee-information	ENTITY

THE ROWS ARE IDENTIFIERS OF THE COLUMNS WITH *S

```
   123
  +---+
1 I*  I
2 I **I
  +---+
```

FIGURE_38

Identifier Information Report

THE NUMBER OF COLUMNS IDENTIFIED BY THE ROWS

	ROW	TYPE	COUNT
2	employee-identification-number	ELEMENT	2
1	department	ELEMENT	1

THE NUMBER OF ROWS THAT IDENTIFY THE COLUMNS

	COLUMN	TYPE	COUNT
1	department-information	ENTITY	1
2	hourly-employee-information	ENTITY	1
3	salaried-employee-information	ENTITY	1

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INTERVAL CONSISTENCY REPORT

Purpose

To show all levels of interval structures described in the Analyzer data base as specified by the use of the CONSISTS statement.

Information Presented

The INTERVAL CONSISTENCY REPORT presents all lower composition levels for INTERVAL names used as input. All of the names which the input names CONSIST of are designated as level 2 names; the names that the level 2 names CONSIST of are designated as level 3 names, etc.

The CONSISTS statement allows network structures to be constructed since any given INTERVAL may be CONTAINED in more than one structure, and at different levels in the different structures. The only type of name presented in the structure will be INTERVAL.

Format

Each name given as input to the report is identified by a number 1*, 2*, etc., designating its position in the list of input names and also by the number 1 designating it as a level 1 name. All names that are part of this structure are numbered one through n according to its position in the structure when printed out, and also numbered according to the names relative level in the structure. Each level 2,3 and so on is indented to further accent the idea of structure.

The VALUE of the SYSTEM-PARAMETER connected with each name is printed out within parentheses just after the name (except for names at level one). If there is no VALUE defined for the SYSTEM-PARAMETER, then the message (*UNKNOWN(system-parameter name)) will appear just after the INTERVAL name. For example, the following URL description:

```
INTERVAL year;
  CONSISTS     fifty-two week,
               twelve month,
               three-hundred-sixty day;
INTERVAL week;
  CONSISTS     seven day;
INTERVAL month;
  CONSISTS     four week,
               thirty day;
```

```
INTERVAL days;

DEFINE  fifty-two SYSTEM-PARAMETER;
        VALUES 52;
DEFINE  twelve SYSTEM-PARAMETER;
        VALUES 12;
DEFINE  thirty SYSTEM-PARAMETER;
        VALUES 30;
DEFINE  seven SYSTEM-PARAMETER;
        VALUES 7;
DEFINE  four SYSTEM-PARAMETER;
        VALUES 4;
DEFINE  three-hundred-sixty SYSTEM-PARAMETER
        VALUES 360;
```

would appear as:

```
1*  1 year
1       2 week (52)
2         3 day (7)
3       2 month (12)
4         3 week (4)
5           4 day (7)
6         3 day (30)
7       2 day (360)
```

in the INTERVAL-CONSISTENCY REPORT if the report was generated for the name year. If the report was generated for the name month, the following structure would appear:

```
1*  1 month
      2 week (4)
        3 day (7)
      2 day (30)
```

Options and Alternatives

The user may restrict the number of levels of the data structures presented when a numerical value is assigned to the LEVELS parameter. For example, when LEVELS=2 is given, only the names of levels one and two of the data structure are presented in the report. The default for the report is to present ALL levels of the data structures.

An index of names used in the report is produced when the INDEX parameter is used.

The report may be generated for a single input name (via the NAME parameter) or for a collection of input names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input is first checked to see if it is in the data base. If the name is not found, the message:

URA369: MAINIC: NAME NOT FOUND IN D.B.

is printed and no structure information is printed for that name.

Each name is then checked to see if it is an INTERVAL name. If it is not, the following message is generated and no structure information is printed for that name:

URA366:MAINIC:NAME NOT AN INTERVAL-

For each name given as input, each interval name that it CONSISTS of is designated as a level 2 name as it is printed.

If this level 2 name CONSISTS of any intervals, then each name which it CONSISTS of is designated as a level 3 name as it is printed. This process continues until no more CONSISTS relationships are found or the level specified by the LEVELS parameter is reached. Names are printed out as they are encountered in the structure.

A consistency check is performed whenever a name is connected with upper level names by two or more different paths in the network. When this is the case, all the different paths from the name until the top of the structure are followed and the consistency check between different paths is performed by multiplying the value of the SYSTEM-PARAMETERS connected with all the names encountered. An inconsistency will be recognized whenever the results of the mentioned multiplication are different for the different paths. Inconsistent structures will be flagged by the message:

```
***THE FOLLOWING PATHS FROM name-i TO name-n ARE INCONSISTENT:
    THE PATH name-i ---> name-j ---> name-k ...---> name-n
        HAS A VALUE OF system-parameter-value-1 name-n
    THE PATH name-i ---> name-x ---> name-y ...---> name-n
        HAS A VALUE OF system-parameter-value-2 name-n
```

When a SYSTEM-PARAMETER without a value connected to it is encountered, the consistency check could not be performed and a message will be printed out:

** CONSISTENCY CHECK CAN NOT BE PERFORMED **

In the example above, it can be noted that the structure for year is inconsistent. This name was defined as 52 weeks and every week as 7 days, so a year consists of 364 days. On the other hand, year was also defined as 360 days. Also year was defined in terms of 12 months, a month as 4 weeks and a week as

7 days. That means a year consists of 336 days also.

It should be noted that the consistency check is made for the units of the interval the user defined and not for real periods of time.

Usage

The report presents information for the analyst, about INTERVAL structures as defined by the use of the CONSISTS statement, using a format in which the entire structure can be seen. An automatic consistency check is performed for each structure. Incompletenesses with regard to system-parameter specifications are flagged for the user.

Examples

Figure 39 presents the report using the NAME parameter. Figure 40 illustrates the use of a file of names given as input and restricting the analysis to three levels. The commands used to generated these examples were:

```
INTERVAL-CONSISTENCY N=year

NG S="INTERVAL" NP
IC F LEVELS=3
```

FIGURE_39

Interval Consistency Report

```
PARAMETERS FOR: IC

   NAME=year NOINDEX LEVELS=ALL


   1*    1 year
    1     2   week  (52)
    2      3     days  (7)
    3     2   month  (12)
    4      3     week  (4)
    5       4       days  (7)
    6      3     days  (30(thirty))
    7     2   days  (360(three-hundred-sixty))
** THE FOLLOWING PATHS FROM  year   TO   days   ARE INCONSISTENT:
   THE PATH year   ->  week   ->  days   ->    HAS A VALUE OF  364  days
   THE PATH year   ->  days   ->    HAS A VALUE OF  360  days
   THE PATH year   ->  month   ->  week   ->  days   ->    HAS A VALUE OF  336  days
** THE FOLLOWING PATHS FROM  month   TO   days   ARE INCONSISTENT:
   THE PATH month   ->  week   ->  days   ->    HAS A VALUE OF  28  days
   THE PATH month   ->  days   ->    HAS A VALUE OF  30  days
```

FIGURE_40

Interval Consistency Report

```
PARAMETERS FOR: IC

   FILE NOINDEX LEVELS=3


   1*    1 century
    1     2   year  (100(hundred))
    2      3     week  (52)
    3      3     month  (12)
    4      3     days  (360(three-hundred-sixty))
    5     2   week  (520(five-hundred-twenty))
    6      3     days  (7)
    7     2   month  (120(hundred-twenty))
    8      3     week  (4)
    9      3     days  (30(thirty))
   10     2   days  (36000(thirty-six-thousands))
   11     2   decade  (10(ten))
   12      3     year  (10(ten))
   13      3     days  (3600(three-thousand-six-hundred))
*** THE FOLLOWING PATHS FROM  century   TO   days   ARE INCONSISTENT:
   THE PATH century   ->  year   ->  days   ->    HAS A VALUE OF  36000  days
   THE PATH century   ->  week   ->  days   ->    HAS A VALUE OF  3640  days
   THE PATH century   ->  month   ->  week   ->  days   ->    HAS A VALUE OF  3360  days
   THE PATH century   ->  days   ->    HAS A VALUE OF  36000  days
   THE PATH century   ->  decade   ->  year   ->  days   ->    HAS A VALUE OF  36000  days
*** THE FOLLOWING PATHS FROM  year   TO   days   ARE INCONSISTENT:
   THE PATH year   ->  week   ->  days   ->    HAS A VALUE OF  364  days
   THE PATH year   ->  month   ->  week   ->  days   ->    HAS A VALUE OF  336  days
   THE PATH year   ->  days   ->    HAS A VALUE OF  360  days
*** THE FOLLOWING PATHS FROM  month   TO   days   ARE INCONSISTENT:
   THE PATH month   ->  week   ->  days   ->    HAS A VALUE OF  28  days
   THE PATH month   ->  days   ->    HAS A VALUE OF  30  days

   2*    1 days

   3*    1 decade
    1     2   year  (10(ten))
    2      3     week  (52)
    3      3     month  (12)
    4      3     days  (360(three-hundred-sixty))
    5     2   days  (3600(three-thousand-six-hundred))
```

FIGURE_40

Interval Consistency Report

```
   4*    1 employment-termination-arrival

   5*    1 month
    1     2   week  (4)
    2      3     days  (7)
    3     2   days  (30(thirty))
** THE FOLLOWING PATHS FROM  month   TO   days   ARE INCONSISTENT:
   THE PATH month   -> week   -> days   ->    HAS A VALUE OF  28  days
   THE PATH month   -> days   ->    HAS A VALUE OF  30  days

   6*    1 new-employment-arrival

   7*    1 user-defined-unitofime-9

   8*    1 user-defined-unitoftime-0
    1     2   user-defined-unitoftime-1  (5(five))
    2      3     user-defined-unitoftime-2  (6(six))
    3     2   user-defined-unitoftime-6  (4(four))
    4      3     user-defined-unitoftime-7  (5(five))
    5     2   user-defined-unitcftime-11  (25(twenty-five))

   9*    1 user-defined-unitoftime-1
    1     2   user-defined-unitoftime-2  (6(six))
    2      3     user-defined-unitoftime-3  (*UNKNOWN( twenty-three )
    3      3     user-defined-unitoftime-4  (7(seven))
* CONSISTENCY CHECK CANNOT BE PERFORMED **

  10*    1 user-defined-unitoftime-10
    1     2   user-defined-unitoftime-11  (9(nine))

  11*    1 user-defined-unitoftime-11

  12*    1 user-defined-unitoftime-2
    1     2   user-defined-unitoftime-3  (*UNKNOWN( twenty-three )
    2      3     user-defined-unitoftime-4  (5(five))
    3     2   user-defined-unitoftime-4  (7(seven))
    4      3     user-defined-unitoftime-5  (20(twenty))
* CONSISTENCY CHECK CANNOT BE PERFORMED **

  13*    1 user-defined-unitoftime-3
```

FIGURE_40

Interval Consistency Report

```
    1      2   user-defined-unitoftime-4  (5(five))
    2        3     user-defined-unitoftime-5  (20(twenty))

   14*     1 user-defined-unitoftime-4
    1      2   user-defined-unitoftime-5  (20(twenty))

   15*     1 user-defined-unitoftime-5

   16*     1 user-defined-unitoftime-6
    1      2   user-defined-unitoftime-7  (5(five))
    2        3     user-defined-unitoftime-8  (6(six))

   17*     1 user-defined-unitoftime-7
    1      2   user-defined-unitoftime-8  (6(six))
    2        3     user-defined-unitoftime-9  (7(seven))

   18*     1 user-defined-unitoftime-8
    1      2   user-defined-unitoftime-9  (7(seven))

   19*     1 user-defined-unitoftime-9
    1      2   user-defined-unitoftime-10  (8(eight))
    2        3     user-defined-unitoftime-11  (9(nine))

   20*     1 week
    1      2   days  (7)

   21*     1 year
    1      2   week  (52)
    2        3     days  (7)
    3      2   month  (12)
    4        3     week  (4)
    5        3     days  (30(thirty))
    6      2   days  (360(three-hundred-sixty))
*** THE FOLLOWING PATHS FROM  year  TO  days  ARE INCONSISTENT:
    THE PATH year  ->  week  ->  days  ->  HAS A VALUE OF  364  days
    THE PATH year  ->  days  ->  HAS A VALUE OF  360  days
    THE PATH year  ->  month  ->  week  ->  days  ->  HAS A VALUE OF  336  days
*** THE FOLLOWING PATHS FROM  month  TO  days  ARE INCONSISTENT:
    THE PATH month  ->  week  ->  days  ->  HAS A VALUE OF  28  days
    THE PATH month  ->  days  ->  HAS A VALUE OF  30  days
```

KWIC INDEX

Purpose

To present, in an easy to inspect format, logical groupings of names defined in a particular Analyzer data base with respect to the spelling of the names.

Information Presented

The report presents, for all those names used as input, an alphabetical listing consisting of an entry for each name as it appears as input and entries for each permutation of the name (about the dashes). For example, if the name hourly-employment-form was supplied as input, there would be entries for:

employment-form
form
hourly-employment-form
hourly
hourly-employment

in the report. When there are several names used as input then all names with the word "employment" in them would have entries group together, all those with "form" would be grouped together, etc.

Format

The entries in the report are ordered alphabetically and numbered sequentially. There are two parts of each entry, the right hand side of the entry presents that part of the user defined name that has been stripped off for a permutation of the name and the left hand side of the entry presents the remaining part of the name. The distance (the number of columns) between the right and left sides of the entry can be varied by the value assigned to the DIF parameter.

Options and Alternatives

The DIF parameter may take on any value from 2 to 52.

Analysis

Each name given as input to the software generating the report is inspected, separated at the dashes in the name and a list is formed consisting of the original name and all permutations of the name.

After all names in the input list have been processed, the newly

AD-A060 517 MICHIGAN UNIV ANN ARBOR DEPT OF INDUSTRIAL AND OPERA--ETC F/G 9/2
USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
JUL 78 F19628-76-C-0197

UNCLASSIFIED ESD-TR-78-131 NL

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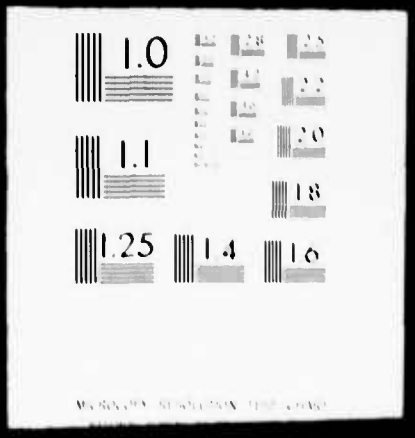


formed list is sorted and presented as the report.

Usage

The KWIC INDEX aids analysts in maintaining name conventions used in the target system description process and for finding names in the description based on the keywords within the names.

It is often desirable to use some conventions in assigning names to objects defined in a target system description and the KWIC INDEX aids in maintaining these. For example, by issuing the following Analyzer commands:

```
NAME-GEN S='ELEMENT'
KWIC
```

a KWIC INDEX is presented for all ELEMENT names so that consistency of naming can be checked.

Examples

Figure 41 presents a KWIC INDEX for INPUT names defined in a problem statement.

FIGURE_41

KWIC Index

PARAMETERS FOR: KWIC

DIF=2C FILE

SEQ	N A M E (PERMUTED)	
1	card	time
2	certificate	tax-withholding
3	employment-form	hourly
4	employment-form	salaried
5	employment-termination-form	
6	form	hourly-employment
7	form	salaried-employment
8	form	employment-termination
9	hourly-employment-form	
10	inputs	paysystem
11	name-six	
12	name-two	
13	paysystem-inputs	
14	salaried-employment-form	
15	six	name
16	tax-withholding-certificate	
17	termination-form	employment
18	time-card	
19	two	name
20	withholding-certificate	tax

LIST-CHANGES REPORT

Purpose

To present a list of all commands which have updated the data base and the corresponding date and time as they appeared on the printed output for each update command.

Information Presented

This report present a list of all the changes that have been made to the data base. The list contains the sequence number of the change, the command name, and the date and time when the change occurred in the data base.

Format

An entry in the report is printed for each change made to the data base. Each entry consists of:

- the change sequence number
- the command name
- the date and the time the change occurred.

This information is listed under the headings: CHANGE, COMMAND, DATE and TIME respectively.

Options and Alternatives

The PRINT and USER parameters allow the user to direct the list of data base changes to either the output file (PRINT), the user's terminal (USER), or both.

Analysis

All UPA modifier commands and utilities record the time and incremental sequence number of the data base modification. Specifically, the modifier commands RENAME, CHANGE-TYPE, DELETE-COMMENT-ENTRY, DELETE, DELETE-PSL, INPUT-PSL, and REPLACE-COMMENT-ENTRY add a Date-of-Last-Change record to the data base. The utilities PRES and PR23 also add a Date-of-Last-Change record.

When the LIST-CHANGES command is issued each one of these Date-of-Last-Change records is inspected, and the information that it contains is retrieved and printed on the report.

Usage

The report can be used to keep a record of the changes that were made to the data base, and when these changes were made. The report also gives an indication of how current the data base is.

The LIST-CHANGES Report can be used in conjunction with some other reports. The date and time of the last change can optionally be printed for each name in both the NAME-LIST Report and the FORMATTED-PROBLEM-STATEMENT Report. Names can also be extracted from the data base based on their date of last change by using the NAME-GENERATION command with the MIN-CHANGE-NUMBER and MAX-CHANGE-NUMBER parameters.

Examples

Figure 42 presents a LIST-CHANGES Report of a data base. Figure 43 presents a LIST-CHANGES Report with the parameters NOPRINT and USER in effect. Note, the report is printed at the user's terminal in the second example.

FIGURE_42

LIST OF CHANGES REPORT

PARAMETERS FOR: LC

PRINT NOUSER

CHANGE	COMMAND	DATE	TIME
1	IP	AUG 15, 1977	23:13:23
2	IP	SEP 15, 1977	14:12:56
3	CT	SEP 16, 1977	02:06:14
4	DEI	SEP 16, 1977	02:06:14
5	DCOM	SEP 16, 1977	02:06:14
6	DPSL	SEP 16, 1977	02:06:14
7	PEN	SEP 16, 1977	02:06:14
8	RCOM	SEP 16, 1977	02:06:14

FIGURE_43

LIST OF CHANGES REPORT

PARAMETERS FOR: LC

NOPRINT USER

NAME-GEN

Purpose

To select all names from the data base specified by parameters. The names retrieved will be placed into a file in a format suitable as input to various Analyzer report commands.

Information Presented

The report presents a list of names, their corresponding name types, their date and time of last change, and the name of the command that was used for the last change. The names may be ordered according to user specifications. The types of names in the list are specified by the selection criteria used with the SELECTION parameter described below.

Format

Any entry in the report is printed for each name retrieved and consists of:

- the name retrieved,
- the name type of the name,
- the date and time of last change, and
- the command.

The entries in the report are ordered in the following four ways:

1) alphabetically on the names within a name type (which are also ordered alphabetically) when the ORDER=BYTYPE parameter is in effect.

2) alphabetically on the names when the ORDER=ALPHA parameter is in effect.

3) on the attribute values associated with specified attribute names when user attribute names are specified. The output will be sorted on the value of the first attribute name, then on the second name, etc. Names which do not have the specified ATTRIBUTE are placed at the beginning of the list of names.

4) sorted on the date and time of last change when the ORDER=TIME-OF-LAST-CHANGE parameter is in effect.

All ORDER options except ALPHA may be used in any combination in

the list of parameters. The list of parameters may not exceed five options. The names are ordered first on the first option in the ordering list; within that ordering on the second option in the ordering list, etc.

Options and Alternatives

The Selection Criteria paramater permits the user to specify the types of names to be retrieved by giving a boolean expression. Either the SELECTION or INPUT parameter must be used to give the boolean expression. If SELECTION='boolean expression' is specified, the boolean expression appears inside quotes or apostrophies following the equal sign. If INPUT=fdname is used, the boolean expression must be in the file specified by the user.

The names retrieved in the NAME GEN report depend on the items or operands given in the boolean expression. Each of these operands represents some grouping of names which may be contained in the data base. An explanation of each of these operands is given below.

The following name types may be used as operands:

ATTRIBUTE	INTERFACE	RESOURCE
ATTRIBUTE-VALUE	INTERVAL	RESOURCE-USAGE-PARAMETER
CLASSIFICATION	KEYWORD	SECURITY
CONDITION	MAILBOX	SET
ELEMENT	MEMO	SOURCE
ENTITY	OUTPUT	SUBSETTING-CRITERION
EVENT	PROBLEM-DEFINER	SYSTEM-PARAMETER
GROUP	PROCESS	TRACE-KEY
INPUT	PROCESSOR	UNDEFINED
		UNIT

ALL

When the ALL operand is specified, the names of all name types except SYNONYM and UNDEFINED will be presented.

TOTAL

When the TOTAL operand is specified, every name in the data base will be presented.

BASIC

When the BASIC operand is specified, the basic names will be included in the output. The "Basic" names are those names which are not SYNONYMS.

UNDEFINED

When the UNDEFINED operand is specified, the undefined names will be presented.

ATTR=attr-name [,value]

When the ATTR operand is specifed, those names with the given user-name as an ATTRIBUTE are selected to be part of the output. The user-name must be a name defined as an ATTRIBUTE in the data base.

If an ATTRIBUTE-VALUE is specified as part of the user name then only those names with the given user-name as an ATTRIBUTE-VALUE, for the ATTRIBUTE designated by the ATTR parameter, are selected to be part of the output. The user-name must be an ATTRIBUTE-VALUE name in the data base.

SUBPARTS-OF(SO)=user-name[,level]

All names which belong to the SUBPARTS structure for a given name (as would be retrieved for the STRUCTURE report) can be retrieved by specifying:

SUBPARTS-OF=name

where the name is an INPUT, OUTPUT, PROCESS or INTERFACE name which has SUBPARTS information defined for it. The number of levels to go down and retrieve names to present in the report is specified by the SUBLEVEL parameter or by attaching a comma and a level number after the user-name with the SUBPARTS-OF parameter. If SUBLEVEL=ALL, then all levels of names are presented. If SUBLEVEL=1, then only those names which are PART OF the SUBPARTS OF name are presented. The following picture may clarify the association between the value of SUBLEVEL and the names presented.

```
                    S1                  SUBPARTS-OF name

              S2    S3    S4            SUBLEVEL=1

         S5   S6    S7                  SUBLEVEL=2

      S8   S9   S10  S11                 SUBLEVEL=3


                                        SUBLEVEL=ALL
```

Generation of the report with SUBPARTS-OF=S1 and SUBLEVEL=3 would present S2, S3, S4, S5, S6, S7, S8, S9, S10 and S11 in the

report. Generation of the report with SUBPARTS-OF=S1 AND SUBLEVEL=1 would present the names S2, S3 and S4. If neither the level nor SUBLEVEL parameter are specified, the default is ALL levels.

SYNONYMS

When the SYNONYMS operand is specified, all SYNONYMS are presented for each name retrieved in the report in addition to the basic form of the name. If only the SYNONYMS are desired, the basic names may be suppressed by specifying the NOBASIC and SYNONYM parameters. With standard defaults in effect, the BASIC and NOSYNONYM parameters are used.

MAX-CHANGE-NUMBER(MAXC)={integer|LAST|LAST-integer}

This parameter retrieves all names with a change number less than or equal to the specified integer. The sequential change-number is incremented every time the data base is modified. LAST-integer should not result in a negative value.

MIN-CHANGE-NUMBER(MINC)={integer|LAST|LAST-integer}

This parameter retrieves all names with a change-number greater than or equal to the specified integer. LAST-integer should not result in a negative value.

KEY=user-name

When the KEY operand is specified, those names with the given user-name as a KEYWORD are selected to be part of the output. The user-name must be a name defined as a KEYWORD in the data base.

PD=user-name

When the PD operand is specified, those names with the given user-name as a PROBLEM-DEFINER are selected to be part of the output. The user-name must be a name defined as a PROBLEM-DEFINER in the data base.

SOURCE=user-name

When the SOURCE operand is specified, those names with given user-name as a SOURCE will be included in the output. The user-name must be defined as a SOURCE in the data base.

SECURITY=user-name

When the SECURITY operand is specified, those names with given user-name as a SECURITY will be included. The user name must be defined as SECURITY name in the data base.

USAGE=(ID|IDENTIFIER)

When the usage operand is specified, those names which are used as IDENTIFIERS in the data base are selected to be part of the output. The syntax of the Language only allows ELEMENT, GROUP and UNDEFINED names to be IDENTIFIERS.

The names retrieved in the NAME GEN report also depend on the operators which are combined with the operands to form the boolean expression. These operators further define grouping of names when combined with operands. An explanation of each of these operators is given below.

NOT, ¬ ,/

The NOT operator placed before an operand specified that the names associated with that operand will not be retrieved. For example, a boolean expression of the form NOT PROCESS means that all names in the data base except for PROCESS names will be retrieved.

AND,&,*

The AND operator specifies that any name retrieved from the data base must meet the criterion designated before and after the AND operator. For example, a boolean expression of the form PROCESS AND KEY=level-1 means that any name retrieved must be a PROCESS name as well as have the KEYWORD "level-1" attached to it.

OR,|,+

The OR operator specifies that any name retrieved from the data base must either meet the criterion designated before the OR operator, or after the operator, or both. For example, a boolean expression of the form PROCESS OR KEY=level-1 means that any name retrieved must be either a PROCESS name, or have the KEYWORD "level-1", or be both a PROCESS and have the KEYWORD "level-1".

Analysis

Each name defined in the data base is checked against the parameters for the command. If it satisfies the requirements as specified by the parameters, it is placed in a list. After all names in the data base have been checked, the list is sorted as

the report.

If NAME-GEN is generated for an empty data base, the message:

URA049: ENUMRT: NO NAMES IN DATA BASE

will be printed.

If there are no names in the data base which satisfy the selection criteria, the message:

URA523: GETNML: NO NAMES WHICH MATCH CRITERION

will be printed.

If the selection string given as input is not a legal boolean expression, the message:

URA526: NGPRS: INVALID SELECTION STRING

will be printed.

If the selection string given as input contains an illegal operand or operator, the message:

URA527: NGPRS: INVALID ITEM IN SELECTION STRING

will be printed.

If more than five ORDER parameters have been given or the ORDER parameters have been given incorrectly, the message:

URA528: PREPAR: TOO MANY ORDER PARAMETERS

will be printed.

If the name given in the order list is not an ATTRIBUTE, the message:

URA529: PREPAR: NAME IN ORDER LIST NOT ATTRIBUTE

will be printed.

If too many levels have been specified via the SUBPARTS-OF or SUBLEVEL parameters (a fifty levels is maximum), the message:

URA535: NGPRS: TOO MANY LEVELS, MAX OF 50 ALLOWED

will be printed.

If LAST-integer results in a negative number the message:

URA227:NGPRS:NEGATIVE NUMBER ON RIGHT HAND SIDE OF MAXC OR MINC

will be printed.

Usage

It is an important aid to the analyst in obtaining other reports and outputs. For example, the analyst can ask for a list of all SET, ENTITY and GROUP names and with this list then ask for a CONTENTS REPORT for these names.

It is also used by the analyst as a reference to what names have been used and how they have been used (i.e., what their name types are).

The output can also be used effectively by project management to measure productivity of the project members. This can be done by retrieving a list of all names in the data base defined by a particular problem definer (analyst) and comparing it to previous lists.

Finally, the NAME GEN output can become an integral part of the final specifications as it acts as a directory in specifying name lists corresponding to certain selection criteria (a directory of all data elements may be desired before a section which deals with the definition of each element in detail).

Examples

Figure 44 presents a NAME GEN report produced for all PROCESS names which have "terminal" defined as one of their KEYWORDS. The command used to generate this example was:

```
NAME-GEN S='KEY=terminal AND PROCESS'
```

Figure 45 presents a NAME GEN report produced for all names which are PROCESSES and which do not have "terminal" defined as one of their KEYWORDS. The command used to generate this example was:

```
NAME-GEN S='PROCESS * NOT KEY=terminal'
```

Figure 46 presents a NAME GEN report produced for all names which have the ATTRIBUTE occurrence-type with the ATTRIBUTE-VALUE unscheduled. The command used to generate this example was:

```
NAME-GEN S='ATTR=occurrence-type,unscheduled'
```

Figure 47 presents a NAME GEN report produced for all INPUT and OUTPUT names which have the ATTRIBUTE copies or arrival-type with the ATTRIBUTE-VALUEs 3 or random. The command used to generate this example was:

FIGURE_44

Name Generation

'ARAMETERS FOR: NG

PRINT PUNCH EMPTY SELECTION='KEY=terminal AND PROCESS' ORDER=BYTYPE NOTIME-OF-LAST-CHANGE

1	federal-deductions-update	PROCESS
2	fica-deductions-update	PROCESS
3	funds-update	PROCESS
4	gross-pay-update	PROCESS
5	h-gross-pay-computation	PROCESS
6	hours-update	PROCESS
7	net-pay-computation	PROCESS
8	pay-computation-validation	PROCESS
9	s-gross-pay-computation	PROCESS
10	state-deductions-update	PROCESS
11	tax-computation	PROCESS
12	time-card-validation	PROCESS
13	total-deductions-computation	PROCESS
14	total-hours-computation	PROCESS

FIGURE_45

Name Generation

PARAMETERS FOR: NG

PRINT PUNCH EMPTY SELECTION='PROC * NOT KEY=terminal' ORDER=BYTYPE NOTIME-OF-LAST-CHANGE

1	actual-time-error-proc	PROCESS
2	actual-time-verification	PROCESS
3	department-file-addition	PROCESS
4	department-file-removal	PROCESS
5	h-report-entry-generation	PROCESS
6	hire-report-entry-generation	PROCESS
7	hourly-emp-processing	PROCESS
8	hourly-emp-update	PROCESS
9	hourly-employee-processing	PROCESS
10	hourly-information-creation	PROCESS
11	hourly-information-deletion	PROCESS
12	hourly-paycheck-production	PROCESS
13	hourly-paycheck-validation	PROCESS
14	hours-emp-update	PROCESS
15	job-rating	PROCESS
16	name-one	PROCESS
17	new-employee-processing	PROCESS
18	payroll-processing	PROCESS
19	process-library	PROCESS
20	s-report-entry-generation	PROCESS
21	salaried-emp-update	PROCESS
22	salaried-employee-processing	PROCESS
23	salaried-information-creation	PROCESS
24	salaried-information-deletion	PROCESS
25	salaried-paycheck-production	PROCESS
26	salaried-paycheck-validation	PROCESS
27	std-time-error-proc	PROCESS
28	std-time-verification	PROCESS
29	term-report-entry-generation	PROCESS
30	terminating-emp-processing	PROCESS
31	time-card-audit	PROCESS
32	time-card-correction	PROCESS
33	transaction-listing	PROCESS
34	wage-premium-calculation	PROCESS
35	wage-premium-processing	PROCESS

FIGURE_46

Name Generation

```
)PARAMETERS POP: SG

  PRINT PUNCH EMPTY SELECTION='ATTR=occurrence-type,unscheduled' ORDER=BYTYPE
  NOTIME-OF-LAST-CHANGE

  1    validation                          RESOURCE-USAGE-PARAMETER
```

FIGURE_47

Name Generation

```
PARAMETERS FOR: NG

   PRINT PUNCH EMPTY SELECTION='(INP|OUTPUT)&(ATTR=arrival-type,random | ATTR=copies,3)'
   ORDER=BYTYPE NOTIME-OF-LAST-CHANGE

   1     employment-termination-form          INPUT
   2     hourly-employment-form               INPUT
   3     salaried-employment-form             INPUT
   4     tax-withholding-certificate          INPUT
```

```
NAME-GEN S='{INPUT|OUTPUT}&{ATTR=copies,3 |
arrival-type,random}'
```

Figure 48 presents a NAME-GEN report for those names that have most recently been added or altered in some manner. The command used to generate this example was:

```
NAME-GEN S="MIN-CHANGE-NUMBER=LAST"
```

FIGURE_48

Name Generation

```
PARAMETERS FOR: NG

   PRINT PUNCH EMPTY SELECTION='MINC=LAST' ORDER=BYTYPE NOTIME-OF-LAST-CHANGE

   1    new-employee-processing              PROCESS
```

NAME LIST

Purpose

To present a list of all names defined in a particular Analyzer data base. The list may optionally contain the name type associated with the name, SYNONYMS defined for each name, and the date of last change of each name.

Information Presented

The report presents every name currently defined in the user's data base, and also may present the name type associated with each name, the SYNONYMS associated with each name, and the date of last change for each name.

Format

An entry in the report (all the options in effect) is printed for each name in the Analyzer data base and consists of:

- the name,
- the name type of the name,
- any SYNONYMS for the name, and
- the date of last change for that name.

The entries within the report are ordered in one of two ways: alphabetically on the names when the ORDER=ALPHA parameter is in effect and, alphabetically on the names within name type (which are also ordered alphabetically) when the ORDER=BYTYPE parameter is in effect.

If no SYNONYMS are available for a particular name a dash (-) is printed under the SYNONYM heading. If more than one SYNONYM exists for a name, they are listed beneath each other.

Options and Alternatives

The options ORDER=ALPHA and ORDER=BYTYPE are available for this report. If the option COLUMN=SYNONYM is specified, the SYNONYM column will be printed to the left of the TYPE column. If COLUMN=TYPE is in effect, the TYPE column will be printed to the left of the SYNONYM column. In addition, the parameters: NOTYPE, NOSYNONYM, NODATE-LAST-CHANGED suppress the printing of

the TYPE, SYNONYM, and DATE-LAST-CHANGE respectively, for each name in the list.

Analysis

Each name in the data base is inspected and its name type and any SYNONYMS for the name are retrieved. After this information has been collected according to the ORDER parameter for all names in the data, it is sorted and presented as the report.

Usage

The report is intended to be used as a directory facility by anyone needing a reference including all names defined in the data base.

Examples

Figure 49 presents the NAME LIST report generated with the ORDER=BYTYPE and NODATE-LAST-CHANGED options in effect. Figure 50 illustrates the NAME-LIST report with the ORDER=ALPHA, COLUMN and DATE-LAST-CHANGED parameters. The commands used to generated these examples were:

```
NAME-LIST ORDER=BYTYPE NODATE-LAST-CHANGED
NAME-LIST ORDER=ALPHA COL=SYN DLC
```

FIGURE_49

Name List

PARAMETERS FOR: NL

ORDER=BYTYPE COLUMN-ORDER=TYPE TYPE SYNONYM NODATE-LAST-CHANGE

	NAME	TYPE	SYNONYM
1	invalid-job	*** UNDEFINED ***	-
2	job-validity-check	*** UNDEFINED ***	-
3	outstanding-performance	*** UNDEFINED ***	-
4	time-card-listing-optin	*** UNDEFINED ***	-
5	transaction	*** UNDEFINED ***	-
6	transaction-listing-option	*** UNDEFINED ***	-
7	wage-premium-eligibility	*** UNDEFINED ***	-
8	arrival-type	ATTRIBUTE	-
9	color	ATTRIBUTE	-
10	complexity-level	ATTRIBUTE	-
11	copies	ATTRIBUTE	-
12	data-standard	ATTRIBUTE	-
13	number-of-lines	ATTRIBUTE	-
14	occurrence-type	ATTRIBUTE	-
15	processor-type	ATTRIBUTE	-
16	type	ATTRIBUTE	-
17	character	ATTRIBUTE-VALUE	-
18	date	ATTRIBUTE-VALUE	-
19	high	ATTRIBUTE-VALUE	-
20	human	ATTRIBUTE-VALUE	-
21	low	ATTRIBUTE-VALUE	-
22	medium	ATTRIBUTE-VALUE	-
23	numeric	ATTRIBUTE-VALUE	-
24	random	ATTRIBUTE-VALUE	-
25	scheduled	ATTRIBUTE-VALUE	-
26	unscheduled	ATTRIBUTE-VALUE	-
27	white	ATTRIBUTE-VALUE	-
28	classified	CLASSIFICATION	-
29	limited-security	CLASSIFICATION	-
30	secret	CLASSIFICATION	-
31	top-secret	CLASSIFICATION	-
32	all-data-for-employee-found	CONDITION	-
33	employee-id-valid	CONDITION	-
34	hours-update-finished	CONDITION	-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM
35	no-error-found	CONDITION	-
36	no-time-card-for-employee	CONDITION	-
37	time-card-for-employee	CONDITION	-
38	time-cards-ready	CONDITION	-
39	age	ELEMENT	-
40	apartment-number	ELEMENT	-
41	check-number	ELEMENT	-
42	city	ELEMENT	-
43	count-of-hourly-employees	ELEMENT	-
44	count-of-salaried-employees	ELEMENT	-
45	cumulative-federal-deductions	ELEMENT	-
46	cumulative-fica-deductions	ELEMENT	-
47	cumulative-gross-pay	ELEMENT	-
48	cumulative-hours	ELEMENT	-
49	cumulative-state-deductions	ELEMENT	-
50	cumulative-tax-deductions	ELEMENT	-
51	current-date	ELEMENT	-
52	department	ELEMENT	-
53	employee-identification-number	ELEMENT	-
54	employment-date	ELEMENT	-
55	employment-status	ELEMENT	-
56	error-code	ELEMENT	-
57	federal-tax	ELEMENT	-
58	fica-tax	ELEMENT	-
59	first-name	ELEMENT	-
60	gross-pay	ELEMENT	-
61	hours-per-day	ELEMENT	-
62	house-number	ELEMENT	-
63	initial	ELEMENT	-
64	job-number	ELEMENT	-
65	job-title	ELEMENT	-
66	net-pay	ELEMENT	-
67	number-of-deductions	ELEMENT	-
68	number-of-employees	ELEMENT	-
69	overtime-hours-worked	ELEMENT	-
70	pay-date	ELEMENT	-
71	pay-grade-code	ELEMENT	-
72	pay-rate	ELEMENT	-
73	phone	ELEMENT	-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM	
74	regular-hours-worked	ELEMENT		-
75	remaining-funds	ELEMENT		-
76	salary	ELEMENT		-
77	sex	ELEMENT		-
78	social-security-number	ELEMENT		-
79	state	ELEMENT		-
80	state-tax	ELEMENT		-
81	status-code	ELEMENT		-
82	street	ELEMENT		-
83	supervisor	ELEMENT		-
84	termination-date	ELEMENT		-
85	total-budget	ELEMENT		-
86	total-deductions	ELEMENT		-
87	total-hours	ELEMENT		-
88	zip-code	ELEMENT		-
89	department-information	ENTITY	dept-info	
90	hourly-employee-information	ENTITY	h-emp-info	
91	salaried-employee-information	ENTITY	s-emp-info	
92	actual-time-verif-error	EVENT		-
93	actual-time-verification-init	EVENT		-
94	actual-time-verification-term	EVENT		-
95	event-five	EVENT		-
96	event-four	EVENT		-
97	event-one	EVENT		-
98	event-seven	EVENT		-
99	event-six	EVENT		-
100	event-three	EVENT		-
101	event-two	EVENT		-
102	h-emp-form-verification-init	EVENT		-
103	h-gross-pay-comp-init	EVENT		-
104	h-report-entry-complete	EVENT		-
105	hourly-emp-processing-init	EVENT		-
106	init-hourly-paycheck-procedure	EVENT		-
107	init-request-for-time-study	EVENT		-
108	job-rating-init	EVENT		-
109	job-rating-term	EVENT		-
110	new-employee-processing-init	EVENT		-
111	passed-error-checks	EVENT		-
112	s-emp-form-verification-init	EVENT		-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM	
113	salaried-emp-processing-init	EVENT		-
114	std-time-verif-error	EVENT		-
115	std-time-verification-init	EVENT		-
116	std-time-verification-term	EVENT		-
117	termination-processing-init	EVENT		-
118	time-card-audit-init	EVENT		-
119	time-card-found	EVENT		-
120	time-card-listing-init	EVENT		-
121	time-card-missing	EVENT		-
122	time-cards-collected	EVENT		-
123	total-hours-comp-init	EVENT		-
124	transaction-listing-init	EVENT		-
125	validity-check	EVENT		-
126	wage-premium-processing-term	EVENT		-
127	address	GROUP		-
128	birthdate	GROUP		-
129	check	GROUP		-
130	department-update-data	GROUP		-
131	emp-termination-data	GROUP		-
132	employee-name	GROUP		-
133	error-listing-entry	GROUP		-
134	h-derived-pay-data	GROUP		-
135	h-emp-report-entry	GROUP		-
136	hired-report-entry	GROUP		-
137	hourly-emp-pay-data	GROUP		-
138	hourly-job-data	GROUP		-
139	pay-stub	GROUP		-
140	personal-data	GROUP		-
141	s-derived-pay-data	GROUP		-
142	s-emp-report-entry	GROUP		-
143	salaried-emp-pay-data	GROUP		-
144	salaried-job-data	GROUP		-
145	surname	GROUP		-
146	term-report-entry	GROUP		-
147	time-card-data	GROUP		-
148	employment-termination-form	INPUT	term-form	
149	hourly-employment-form	INPUT	h-emp-form	
150	name-six	INPUT		-
151	name-two	INPUT		-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM
2	paysystem-inputs	INPUT	emp-info i1
3	salaried-employment-form	INPUT	s-emp-form
4	tax-withholding-certificate	INPUT	tax-cert
5	time-card	INPUT	t-card
6	departments-and-employees	INTERFACE	dept-emp r1
7	payroll-department	INTERFACE	pay-dept
8	personnel	INTERFACE	emp
9	century	INTERVAL	-
0	days	INTERVAL	day
1	decade	INTERVAL	-
2	employment-termination-arrival	INTERVAL	-
3	month	INTERVAL	-
4	new-employment-arrival	INTERVAL	-
5	user-defined-unitoftime-9	INTERVAL	-
6	user-defined-unitoftime-0	INTERVAL	-
7	user-defined-unitoftime-1	INTERVAL	-
8	user-defined-unitoftime-10	INTERVAL	-
9	user-defined-unitoftime-11	INTERVAL	-
0	user-defined-unitoftime-2	INTERVAL	-
1	user-defined-unitoftime-3	INTERVAL	-
2	user-defined-unitoftime-4	INTERVAL	-
3	user-defined-unitoftime-5	INTERVAL	-
4	user-defined-unitoftime-6	INTERVAL	-
5	user-defined-unitoftime-7	INTERVAL	-
6	user-defined-unitoftime-8	INTERVAL	-
7	user-defined-unitoftime-9	INTERVAL	-
8	week	INTERVAL	-
9	year	INTERVAL	-
0	electronic	KEYWORD	-
1	independent	KEYWORD	-
2	manual	KEYWORD	-
3	terminal	KEYWORD	-
4	test-object	KEYWORD	-
5	isdos-project-ann-arbor	MAILBOX	-
6	goals-memo	MEMO	-
7	i-o-constraints-memo	MEMO	-
8	process-memo	MEMO	-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM	
189	processor-memo	MEMO		-
190	resource-memo	MEMO		-
191	rup-memo	MEMO		-
192	unit-memo	MEMO		-
193	(	PROBLEM-DEFINER		-
194	(_><(/.-+)	PROBLEM-DEFINER		-
195	!	PROBLEM-DEFINER		-
196	$	PROBLEM-DEFINER		-
197	)	PROBLEM-DEFINER		-
198	%	PROBLEM-DEFINER		-
199	#	PROBLEM-DEFINER		-
200	@	PROBLEM-DEFINER		-
201	james-m-amster	PROBLEM-DEFINER		-
202	michel-j-bastarache	PROBLEM-DEFINER		-
203		PROBLEM-DEFINER		-
204		PROBLEM-DEFINER		-
205		PROBLEM-DEFINER		-
206	actual-time-error-proc	PROCESS		-
207	actual-time-verification	PROCESS		-
208	department-file-addition	PROCESS		-
209	department-file-removal	PROCESS		-
210	federal-deductions-update	PROCESS		-
211	fica-deductions-update	PROCESS		-
212	funds-update	PROCESS		-
213	gross-pay-update	PROCESS		-
214	h-gross-pay-computation	PROCESS		-
215	h-report-entry-generation	PROCESS		-
216	hire-report-entry-generation	PROCESS		-
217	hourly-emp-processing	PROCESS		-
218	hourly-emp-update	PROCESS		-
219	hourly-employee-processing	PROCESS	h-emp-proc	
220	hourly-information-creation	PROCESS		-
221	hourly-information-deletion	PROCESS		-
222	hourly-paycheck-production	PROCESS		-
223	hourly-paycheck-validation	PROCESS		-
224	hours-emp-update	PROCESS		-
225	hours-update	PROCESS		-
226	job-rating	PROCESS		-
227	name-one	PROCESS		-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM
28	net-pay-computation	PROCESS	-
29	new-employee-processing	PROCESS	-
30	pay-computation-validation	PROCESS	-
31	payroll-processing	PROCESS	payproc p1
32	process-library	PROCESS	-
33	s-gross-pay-computation	PROCESS	-
34	s-report-entry-generation	PROCESS	-
35	salaried-emp-update	PROCESS	-
36	salaried-employee-processing	PROCESS	s-emp-proc
37	salaried-information-creation	PROCESS	-
38	salaried-information-deletion	PROCESS	-
39	salaried-paycheck-production	PROCESS	-
40	salaried-paycheck-validation	PROCESS	-
41	state-deductions-update	PROCESS	-
42	std-time-error-proc	PROCESS	-
43	std-time-verification	PROCESS	-
44	tax-computation	PROCESS	-
45	term-report-entry-generation	PROCESS	-
46	terminating-emp-processing	PROCESS	-
47	time-card-audit	PROCESS	-
48	time-card-correction	PROCESS	-
49	time-card-validation	PROCESS	-
50	total-deductions-computation	PROCESS	-
51	total-hours-computation	PROCESS	-
52	transaction-listing	PROCESS	-
53	wage-premium-calculation	PROCESS	-
54	wage-premium-processing	PROCESS	-
55	computer-processor	PROCESSOR	-
56	payroll-processor	PROCESSOR	-
57	validation-clerk	PROCESSOR	valid-clerk
58	dept-hourly-emp-relation	RELATION	-
59	dept-salaried-emp-relation	RELATION	-
60	cpu-time	RESOURCE	-
61	paper	RESOURCE	pr
62	job	RESOURCE-USAGE-PARAM	-
63	payroll	RESOURCE-USAGE-PARAM	-
64	validation	RESOURCE-USAGE-PARAM	valid
65	company-only	SECURITY	-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM	
266	no-restrictions	SECURITY		-
267	unclassified	SECURITY		-
268	department-file	SET	dept-file	
269	hourly-employee-file	SET	h-emp-file	
270	payroll-master-information	SET	master-file pay-mast s1	
271	salaried-employee-file	SET	s-emp-file	
272	constantine	SOURCE		-
273	processor-specification	SOURCE		-
274	resource-specification	SOURCE		-
275	rup-specification	SOURCE		-
276	unit-specification	SOURCE		-
277	eight	SYSTEM-PARAMETER		-
278	fifty-two	SYSTEM-PARAMETER		-
279	five	SYSTEM-PARAMETER		-
280	five-hundred-twenty	SYSTEM-PARAMETER		-
281	four	SYSTEM-PARAMETER		-
282	hundred	SYSTEM-PARAMETER		-
283	hundred-twenty	SYSTEM-PARAMETER		-
284	many	SYSTEM-PARAMETER		-
285	nine	SYSTEM-PARAMETER		-
286	no-hourly-emp-processing	SYSTEM-PARAMETER		-
287	no-new-emp-processing	SYSTEM-PARAMETER		-
288	no-of-departments	SYSTEM-PARAMETER		-
289	no-of-employees	SYSTEM-PARAMETER		-
290	no-of-hourly-employees	SYSTEM-PARAMETER		-
291	no-of-payroll-processing	SYSTEM-PARAMETER		-
292	no-of-salaried-employees	SYSTEM-PARAMETER		-
293	no-of-supervisors	SYSTEM-PARAMETER		-
294	no-salaried-emp-processing	SYSTEM-PARAMETER		-
295	no-terminating-emp-processing	SYSTEM-PARAMETER		-
296	one	SYSTEM-PARAMETER		-
297	seven	SYSTEM-PARAMETER		-
298	several	SYSTEM-PARAMETER		-
299	six	SYSTEM-PARAMETER		-
300	ten	SYSTEM-PARAMETER		-
301	thirty	SYSTEM-PARAMETER		-
302	thirty-six-thousands	SYSTEM-PARAMETER		-

FIGURE_49

Name List

	NAME	TYPE	SYNONYM	
13	three	SYSTEM-PARAMETER		-
14	three-hundred-sixty	SYSTEM-PARAMETER		-
15	three-thousand-six-hundred	SYSTEM-PARAMETER		-
16	twelve	SYSTEM-PARAMETER		-
17	twenty	SYSTEM-PARAMETER		-
18	twenty-five	SYSTEM-PARAMETER		-
19	twenty-three	SYSTEM-PARAMETER		-
10	two	SYSTEM-PARAMETER		-
11	page	UNIT	pg	
12	seconds	UNIT		-

FIGURE_5(

Name List

PARAMETERS FOR: NL

ORDER=ALPHA COLUMN-ORDER=SYN TYPE SYNONYM DATE-LAST-CHANGE

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHA
1	(		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
2	(_><(/.-+)		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
3	!		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
4	$		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
5	)		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
6	*		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
7	#		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
8	@		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
9	actual-time-error-proc		-	PROCESS	SEP 15, 1977 14:12
10	actual-time-verif-error		-	EVENT	SEP 15, 1977 14:12
11	actual-time-verification		-	PROCESS	SEP 15, 1977 14:12
12	actual-time-verification-init		-	EVENT	SEP 15, 1977 14:12
13	actual-time-verification-term		-	EVENT	SEP 15, 1977 14:12
14	address		-	GROUP	AUG 15, 1977 23:13
15	age		-	ELEMENT	AUG 15, 1977 23:13
16	all-data-for-employee-found		-	CONDITION	SEP 15, 1977 14:12
17	apartment-number		-	ELEMENT	AUG 15, 1977 23:13
18	arrival-type		-	ATTRIBUTE	AUG 15, 1977 23:13
19	birthdate		-	GROUP	SEP 16, 1977 02:06
20	century		-	INTERVAL	SEP 15, 1977 14:12
21	character		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13
22	check		-	GROUP	SEP 16, 1977 02:06
23	check-number		-	ELEMENT	AUG 15, 1977 23:13
24	city		-	ELEMENT	AUG 15, 1977 23:13
25	classified		-	CLASSIFICATION	SEP 16, 1977 02:06
26	color		-	ATTRIBUTE	AUG 15, 1977 23:13
27	company-only		-	SECURITY	AUG 15, 1977 23:13
28	complexity-level		-	ATTRIBUTE	AUG 15, 1977 23:13
29	computer-processor		-	PROCESSOR	AUG 15, 1977 23:13
30	constantine		-	SOURCE	AUG 15, 1977 23:13
31	copies		-	ATTRIBUTE	SEP 16, 1977 02:06
32	count-of-hourly-employees		-	ELEMENT	AUG 15, 1977 23:13
33	count-of-salaried-employees		-	ELEMENT	AUG 15, 1977 23:13
34	cpu-time		-	RESOURCE	AUG 15, 1977 23:13

FIGURE_5C

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHANGE
35	cumulative-federal-deductions		-	ELEMENT	AUG 15, 1977 23:13:23
36	cumulative-fica-deductions		-	ELEMENT	AUG 15, 1977 23:13:23
37	cumulative-gross-pay		-	ELEMENT	AUG 15, 1977 23:13:23
38	cumulative-hours		-	ELEMENT	AUG 15, 1977 23:13:23
39	cumulative-state-deductions		-	ELEMENT	AUG 15, 1977 23:13:23
40	cumulative-tax-deductions		-	ELEMENT	AUG 15, 1977 23:13:23
41	current-date		-	ELEMENT	AUG 15, 1977 23:13:23
42	data-standard		-	ATTRIBUTE	AUG 15, 1977 23:13:23
43	date		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
44	days	day		INTERVAL	SEP 16, 1977 02:06:14
45	decade		-	INTERVAL	SEP 15, 1977 14:12:58
46	department		-	ELEMENT	AUG 15, 1977 23:13:23
47	department-file	dept-file		SET	AUG 15, 1977 23:13:23
48	department-file-addition		-	PROCESS	AUG 15, 1977 23:13:23
49	department-file-removal		-	PROCESS	AUG 15, 1977 23:13:23
50	department-information	dept-info		ENTITY	AUG 15, 1977 23:13:23
51	department-update-data		-	GROUP	AUG 15, 1977 23:13:23
52	departments-and-employees	dept-emp r1		INTERFACE	SEP 16, 1977 02:06:14
53	dept-hourly-emp-relation		-	RELATION	AUG 15, 1977 23:13:23
54	dept-salaried-emp-relation		-	RELATION	AUG 15, 1977 23:13:23
55	eight		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:58
56	electronic		-	KEYWORD	AUG 15, 1977 23:13:23
57	emp-termination-data		-	GROUP	AUG 15, 1977 23:13:23
58	employee-id-valid		-	CONDITION	SEP 15, 1977 14:12:58
59	employee-identification-number		-	ELEMENT	SEP 15, 1977 14:12:58
0	employee-name		-	GROUP	AUG 15, 1977 23:13:23
1	employment-date		-	ELEMENT	AUG 15, 1977 23:13:23
2	employment-status		-	ELEMENT	AUG 15, 1977 23:13:23
3	employment-termination-arrival		-	INTERVAL	SEP 16, 1977 02:06:14
4	employment-termination-form	term-form		INPUT	SEP 15, 1977 14:12:58
5	error-code		-	ELEMENT	SEP 16, 1977 02:06:14
6	error-listing-entry		-	GROUP	SEP 16, 1977 02:06:14
7	event-five		-	EVENT	SEP 16, 1977 02:06:14
8	event-four		-	EVENT	SEP 16, 1977 02:06:14
9	event-one		-	EVENT	SEP 15, 1977 14:12:58
0	event-seven		-	EVENT	SEP 15, 1977 14:12:58
1	event-six		-	EVENT	SEP 16, 1977 02:06:14
2	event-three		-	EVENT	SEP 15, 1977 14:12:58

FIGURE_50

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHA
73	event-two		-	EVENT	SEP 15, 1977 14:12
74	federal-deductions-update		-	PROCESS	AUG 15, 1977 23:13
75	federal-tax		-	ELEMENT	AUG 15, 1977 23:13
76	fica-deductions-update		-	PROCESS	AUG 15, 1977 23:13
77	fica-tax		-	ELEMENT	AUG 15, 1977 23:13
78	fifty-two		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
79	first-name		-	ELEMENT	AUG 15, 1977 23:13
80	five		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
81	five-hundred-twenty		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
82	four		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
83	funds-update		-	PROCESS	AUG 15, 1977 23:13
84	goals-memo		-	MEMO	AUG 15, 1977 23:13
85	gross-pay		-	ELEMENT	SEP 16, 1977 02:06
86	gross-pay-update		-	PROCESS	AUG 15, 1977 23:13
87	h-derived-pay-data		-	GROUP	AUG 15, 1977 23:13
88	h-emp-form-verification-init		-	EVENT	SEP 15, 1977 14:12
89	h-emp-report-entry		-	GROUP	SEP 16, 1977 02:06
90	h-gross-pay-comp-init		-	EVENT	AUG 15, 1977 23:13
91	h-gross-pay-computation		-	PROCESS	AUG 15, 1977 23:13
92	h-report-entry-complete		-	EVENT	AUG 15, 1977 23:13
93	h-report-entry-generation		-	PROCESS	SEP 15, 1977 14:12
94	high		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13
95	hire-report-entry-generation		-	PROCESS	AUG 15, 1977 23:13
96	hired-report-entry		-	GROUP	SEP 16, 1977 02:06
97	hourly-emp-pay-data		-	GROUP	SEP 15, 1977 14:12
98	hourly-emp-processing		-	PROCESS	SEP 15, 1977 14:12
99	hourly-emp-processing-init		-	EVENT	SEP 15, 1977 14:12
100	hourly-emp-update		-	PROCESS	AUG 15, 1977 23:13
101	hourly-employee-file	h-emp-file		SET	SEP 15, 1977 14:12
102	hourly-employee-information	h-emp-info		ENTITY	SEP 15, 1977 14:12
103	hourly-employee-processing	h-emp-proc		PROCESS	SEP 16, 1977 02:06
104	hourly-employment-form	h-emp-form		INPUT	SEP 15, 1977 14:12
105	hourly-information-creation		-	PROCESS	AUG 15, 1977 23:13
106	hourly-information-deletion		-	PROCESS	AUG 15, 1977 23:13
107	hourly-job-data		-	GROUP	AUG 15, 1977 23:13
108	hourly-paycheck-production		-	PROCESS	AUG 15, 1977 23:13
109	hourly-paycheck-validation		-	PROCESS	AUG 15, 1977 23:13
110	hours-emp-update		-	PROCESS	SEP 15, 1977 14:12
111	hours-per-day		-	ELEMENT	AUG 15, 1977 23:13

FIGURE_50

Name List

	NAME	SYNONYM	TYPE	DATE/TIME LAST CHANGE
12	hours-update	-	PROCESS	SEP 15, 1977 14:12:58
13	hours-update-finished	-	CONDITION	SEP 15, 1977 14:12:58
14	house-number	-	ELEMENT	AUG 15, 1977 23:13:23
15	human	-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
16	hundred	-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:58
17	hundred-twenty	-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:58
18	i-o-constraints-memo	-	MEMO	SEP 16, 1977 02:06:14
19	independent	-	KEYWORD	AUG 15, 1977 23:13:23
20	init-hourly-paycheck-procedure	-	EVENT	AUG 15, 1977 23:13:23
21	init-request-for-time-study	-	EVENT	SEP 15, 1977 14:12:58
22	initial	-	ELEMENT	AUG 15, 1977 23:13:23
23	invalid-job	-	*** UNDEFINED ***	SEP 15, 1977 14:12:58
24	isdos-project-ann-arbor	-	MAILBOX	AUG 15, 1977 23:13:23
25	james-m-master	-	PROBLEM-DEFINER	AUG 15, 1977 23:13:23
26	job	-	RESOURCE-USAGE-PARAM	AUG 15, 1977 23:13:23
27	job-number	-	ELEMENT	SEP 16, 1977 02:06:14
28	job-rating	-	PROCESS	SEP 15, 1977 14:12:58
29	job-rating-init	-	EVENT	SEP 15, 1977 14:12:58
30	job-rating-term	-	EVENT	SEP 15, 1977 14:12:58
31	job-title	-	ELEMENT	SEP 16, 1977 02:06:14
32	job-validity-check	-	*** UNDEFINED ***	SEP 15, 1977 14:12:58
33	limited-security	-	CLASSIFICATION	AUG 15, 1977 23:13:23
34	low	-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
35	manual	-	KEYWORD	AUG 15, 1977 23:13:23
36	many	-	SYSTEM-PARAMETER	SEP 16, 1977 02:06:14
37	medium	-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
38	michel-j-basterache	-	PROBLEM-DEFINER	SEP 16, 1977 02:06:14
39	month	-	INTERVAL	SEP 16, 1977 02:06:14
40	name-one	-	PROCESS	SEP 15, 1977 14:12:58
41	name-six	-	INPUT	SEP 15, 1977 14:12:58
42	name-two	-	INPUT	SEP 15, 1977 14:12:58
43	net-pay	-	ELEMENT	AUG 15, 1977 23:13:23
44	net-pay-computation	-	PROCESS	AUG 15, 1977 23:13:23
45	new-employee-processing	-	PROCESS	SEP 16, 1977 02:06:14
46	new-employee-processing-init	-	EVENT	SEP 16, 1977 02:06:14
47	new-employment-arrival	-	INTERVAL	SEP 16, 1977 02:06:14
48	nine	-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:58
49	no-error-found	-	CONDITION	SEP 15, 1977 14:12:58
50	no-hourly-emp-processing	-	SYSTEM-PARAMETER	SEP 16, 1977 02:06:14

FIGURE_50

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHA
151	no-new-emp-processing		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
152	no-of-departments		-	SYSTEM-PARAMETER	AUG 15, 1977 23:13
153	no-of-employees		-	SYSTEM-PARAMETER	AUG 15, 1977 23:13
154	no-of-hourly-employees		-	SYSTEM-PARAMETER	AUG 15, 1977 23:13
155	no-of-payroll-processing		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
156	no-of-salaried-employees		-	SYSTEM-PARAMETER	AUG 15, 1977 23:13
157	no-of-supervisors		-	SYSTEM-PARAMETER	AUG 15, 1977 23:13
158	no-restrictions		-	SECURITY	AUG 15, 1977 23:13
159	no-salaried-emp-processing		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
160	no-terminating-emp-processing		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
161	no-time-card-for-employee		-	CONDITION	SEP 15, 1977 14:12
162	number-of-deductions		-	ELEMENT	SEP 16, 1977 02:06
163	number-of-employees		-	ELEMENT	AUG 15, 1977 23:13
164	number-of-lines		-	ATTRIBUTE	AUG 15, 1977 23:13
165	numeric		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13
166	occurrence-type		-	ATTRIBUTE	AUG 15, 1977 23:13
167	one		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
168	outstanding-performance		-	*** UNDEFINED ***	SEP 15, 1977 14:12
169	overtime-hours-worked		-	ELEMENT	AUG 15, 1977 23:13
170	page	pg		UNIT	AUG 15, 1977 23:13
171	paper	pr		RESOURCE	AUG 15, 1977 23:13
172	passed-error-checks		-	EVENT	AUG 15, 1977 23:13
173	pay-computation-validation		-	PROCESS	AUG 15, 1977 23:13
174	pay-date		-	ELEMENT	AUG 15, 1977 23:13
175	pay-grade-code		-	ELEMENT	SEP 16, 1977 02:06
176	pay-rate		-	ELEMENT	AUG 15, 1977 23:13
177	pay-stub		-	GROUP	SEP 16, 1977 02:06
178	payroll		-	RESOURCE-USAGE-PARAM	AUG 15, 1977 23:13
179	payroll-department	pay-dept		INTERFACE	SEP 16, 1977 02:06
180	payroll-master-information	master-file pay-mast s1		SET	AUG 15, 1977 23:13
181	payroll-processing	payproc p1		PROCESS	SEP 16, 1977 02:06
182	payroll-processor		-	PROCESSOR	AUG 15, 1977 23:13
183	paysystem-inputs	emp-info i1		INPUT	SEP 16, 1977 02:06
184	personal-data		-	GROUP	AUG 15, 1977 23:13
185	personnel	emp		INTERFACE	SEP 16, 1977 02:06

FIGURE_5C

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHANGE
86	phone		-	ELEMENT	AUG 15, 1977 23:13:23
87	process-library		-	PROCESS	SEP 16, 1977 02:06:14
88	process-memo		-	MEMO	AUG 15, 1977 23:13:23
89	processor-memo		-	MEMO	AUG 15, 1977 23:13:23
90	processor-specification		-	SOURCE	AUG 15, 1977 23:13:23
91	processor-type		-	ATTRIBUTE	AUG 15, 1977 23:13:23
92	random		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
93	regular-hours-worked		-	ELEMENT	AUG 15, 1977 23:13:23
94	remaining-funds		-	ELEMENT	AUG 15, 1977 23:13:23
95	resource-memo		-	MEMO	AUG 15, 1977 23:13:23
96	resource-specification		-	SOURCE	AUG 15, 1977 23:13:23
97	rup-memo		-	MEMO	AUG 15, 1977 23:13:23
98	rup-specification		-	SOURCE	AUG 15, 1977 23:13:23
99			-	PROBLEM-DEFINER	AUG 15, 1977 23:13:23
00	s-derived-pay-data		-	GROUP	AUG 15, 1977 23:13:23
01	s-emp-form-verification-init		-	EVENT	SEP 15, 1977 14:12:58
02	s-emp-report-entry		-	GROUP	SEP 16, 1977 02:06:14
03	s-gross-pay-computation		-	PROCESS	AUG 15, 1977 23:13:23
04	s-report-entry-generation		-	PROCESS	AUG 15, 1977 23:13:23
05	salaried-emp-pay-data		-	GROUP	SEP 15, 1977 14:12:58
06	salaried-emp-processing-init		-	EVENT	SEP 15, 1977 14:12:58
07	salaried-emp-update		-	PROCESS	AUG 15, 1977 23:13:23
08	salaried-employee-file	s-emp-file		SET	AUG 15, 1977 23:13:23
09	salaried-employee-information	s-emp-info		ENTITY	SEP 15, 1977 14:12:58
10	salaried-employee-processing	s-emp-proc		PROCESS	SEP 16, 1977 02:06:14
11	salaried-employment-form	s-emp-form		INPUT	SEP 15, 1977 14:12:58
12	salaried-information-creation		-	PROCESS	AUG 15, 1977 23:13:23
13	salaried-information-deletion		-	PROCESS	AUG 15, 1977 23:13:23
14	salaried-job-data		-	GROUP	AUG 15, 1977 23:13:23
15	salaried-paycheck-production		-	PROCESS	AUG 15, 1977 23:13:23
16	salaried-paycheck-validation		-	PROCESS	AUG 15, 1977 23:13:23
17	salary		-	ELEMENT	AUG 15, 1977 23:13:23
18	scheduled		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:23
19	seconds		-	UNIT	AUG 15, 1977 23:13:23
20	secret		-	CLASSIFICATION	AUG 15, 1977 23:13:23
21	seven		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06:14
22	several		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06:14
23	sex		-	ELEMENT	AUG 15, 1977 23:13:23
24	six		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:58

FIGURE_5C

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHA
225	social-security-number		-	ELEMENT	SEP 15, 1977 14:12
226	state		-	ELEMENT	AUG 15, 1977 23:13
227	state-deductions-update		-	PROCESS	AUG 15, 1977 23:13
228	state-tax		-	ELEMENT	AUG 15, 1977 23:13
229	status-code		-	ELEMENT	AUG 15, 1977 23:13
230	std-time-error-proc		-	PROCESS	SEP 15, 1977 14:12
231	std-time-verif-error		-	EVENT	SEP 15, 1977 14:12
232	std-time-verification		-	PROCESS	SEP 15, 1977 14:12
233	std-time-verification-init		-	EVENT	SEP 15, 1977 14:12
234	std-time-verification-term		-	EVENT	SEP 15, 1977 14:12
235	street		-	ELEMENT	AUG 15, 1977 23:13
236	supervisor		-	ELEMENT	AUG 15, 1977 23:13
237	surname		-	GROUP	SEP 16, 1977 02:06
238	tax-computation		-	PROCESS	AUG 15, 1977 23:13
239	tax-withholding-certificate	tax-cert		INPUT	SEP 15, 1977 14:12
240	ten		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
241	term-report-entry		-	GROUP	SEP 16, 1977 02:06
242	term-report-entry-generation		-	PROCESS	AUG 15, 1977 23:13
243	terminal		-	KEYWORD	AUG 15, 1977 23:13
244	terminating-emp-processing		-	PROCESS	SEP 16, 1977 02:06
245	termination-date		-	ELEMENT	AUG 15, 1977 23:13
246	termination-processing-init		-	EVENT	SEP 16, 1977 02:06
247	test-object		-	KEYWORD	AUG 15, 1977 23:13
248	thirty		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
249	thirty-six-thousands		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
250	three		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
251	three-hundred-sixty		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06
252	three-thousand-six-hundred		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12
253	time-card	t-card		INPUT	SEP 16, 1977 02:06
254	time-card-audit		-	PROCESS	SEP 15, 1977 14:12
255	time-card-audit-init		-	EVENT	SEP 15, 1977 14:12
256	time-card-correction		-	PROCESS	SEP 15, 1977 14:12
257	time-card-data		-	GROUP	AUG 15, 1977 23:13
258	time-card-for-employee		-	CONDITION	SEP 16, 1977 02:06
259	time-card-found		-	EVENT	AUG 15, 1977 23:13
260	time-card-listing-init		-	EVENT	SEP 15, 1977 14:12
261	time-card-listing-optin		-	*** UNDEFINED ***	SEP 15, 1977 14:12
262	time-card-missing		-	EVENT	SEP 16, 1977 02:06
263	time-card-validation		-	PROCESS	AUG 15, 1977 23:13

FIGURE_5C

Name List

	NAME	SYNONYM		TYPE	DATE/TIME LAST CHANG
4	time-cards-collected		-	EVENT	AUG 15, 1977 23:13:2
5	time-cards-ready		-	CONDITION	AUG 15, 1977 23:13:2
6	top-secret		-	CLASSIFICATION	SEP 16, 1977 02:06:1
7	total-budget		-	ELEMENT	AUG 15, 1977 23:13:2
8	total-deductions		-	ELEMENT	AUG 15, 1977 23:13:2
9	total-deductions-computation		-	PROCESS	AUG 15, 1977 23:13:2
0	total-hours		-	ELEMENT	AUG 15, 1977 23:13:2
1	total-hours-comp-init		-	EVENT	AUG 15, 1977 23:13:2
2	total-hours-computation		-	PROCESS	AUG 15, 1977 23:13:2
3	transaction		-	*** UNDEFINED ***	SEP 15, 1977 14:12:5
4	transaction-listing		-	PROCESS	SEP 15, 1977 14:12:5
5	transaction-listing-init		-	EVENT	SEP 15, 1977 14:12:5
6	transaction-listing-option		-	*** UNDEFINED ***	SEP 15, 1977 14:12:5
7	twelve		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:5
8	twenty		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:5
9	twenty-five		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:5
0	twenty-three		-	SYSTEM-PARAMETER	SEP 15, 1977 14:12:5
1	two		-	SYSTEM-PARAMETER	SEP 16, 1977 02:06:1
2	type		-	ATTRIBUTE	AUG 15, 1977 23:13:2
3	unclassified		-	SECURITY	AUG 15, 1977 23:13:2
4	unit-memo		-	MEMO	AUG 15, 1977 23:13:2
5	unit-specification		-	SOURCE	AUG 15, 1977 23:13:2
6	unscheduled		-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13:2
7	user-defined-unitoftime-9		-	INTERVAL	SEP 15, 1977 14:12:5
8	user-defined-unitoftime-0		-	INTERVAL	SEP 15, 1977 14:12:5
9	user-defined-unitoftime-1		-	INTERVAL	SEP 15, 1977 14:12:5
0	user-defined-unitoftime-10		-	INTERVAL	SEP 15, 1977 14:12:5
1	user-defined-unitoftime-11		-	INTERVAL	SEP 15, 1977 14:12:5
2	user-defined-unitoftime-2		-	INTERVAL	SEP 15, 1977 14:12:5
3	user-defined-unitoftime-3		-	INTERVAL	SEP 15, 1977 14:12:5
4	user-defined-unitoftime-4		-	INTERVAL	SEP 15, 1977 14:12:5
5	user-defined-unitoftime-5		-	INTERVAL	SEP 15, 1977 14:12:5
6	user-defined-unitoftime-6		-	INTERVAL	SEP 15, 1977 14:12:5
7	user-defined-unitoftime-7		-	INTERVAL	SEP 15, 1977 14:12:5
8	user-defined-unitoftime-8		-	INTERVAL	SEP 15, 1977 14:12:5
9	user-defined-unitoftime-9		-	INTERVAL	SEP 15, 1977 14:12:5
0	validation	valid		RESOURCE-USAGE-PARAM	AUG 15, 1977 23:13:2
1	validation-clerk	valid-clerk		PROCESSOR	AUG 15, 1977 23:13:2
2	validity-check		-	EVENT	AUG 15, 1977 23:13:2

FIGURE_5C

Name List

	NAME	SYNONYM	TYPE	DATE/TIME LAST CHA
303	wage-premium-calculation	-	PROCESS	SEP 15, 1977 14:12
304	wage-premium-eligibility	-	*** UNDEFINED ***	SEP 15, 1977 14:12
305	wage-premium-processing	-	PROCESS	SEP 15, 1977 14:12
306	wage-premium-processing-term	-	EVENT	SEP 15, 1977 14:12
307	week	-	INTERVAL	SEP 16, 1977 02:06
308	white	-	ATTRIBUTE-VALUE	AUG 15, 1977 23:13
309	year	-	INTERVAL	SEP 16, 1977 02:06
310	zip-code	-	ELEMENT	AUG 15, 1977 23:13
311		-	PROBLEM-DEFINER	AUG 15, 1977 23:13
312		-	PROBLEM-DEFINER	AUG 15, 1977 23:13

PICTURE

Purpose

The PICTURE report presents flow and structure information about the problem statement in a graphical format. The PICTURE report provides the user with a detailed view of one part of the target system description (i.e., it presents all flow and structure relationships a particular name has with other names).

Information Presented

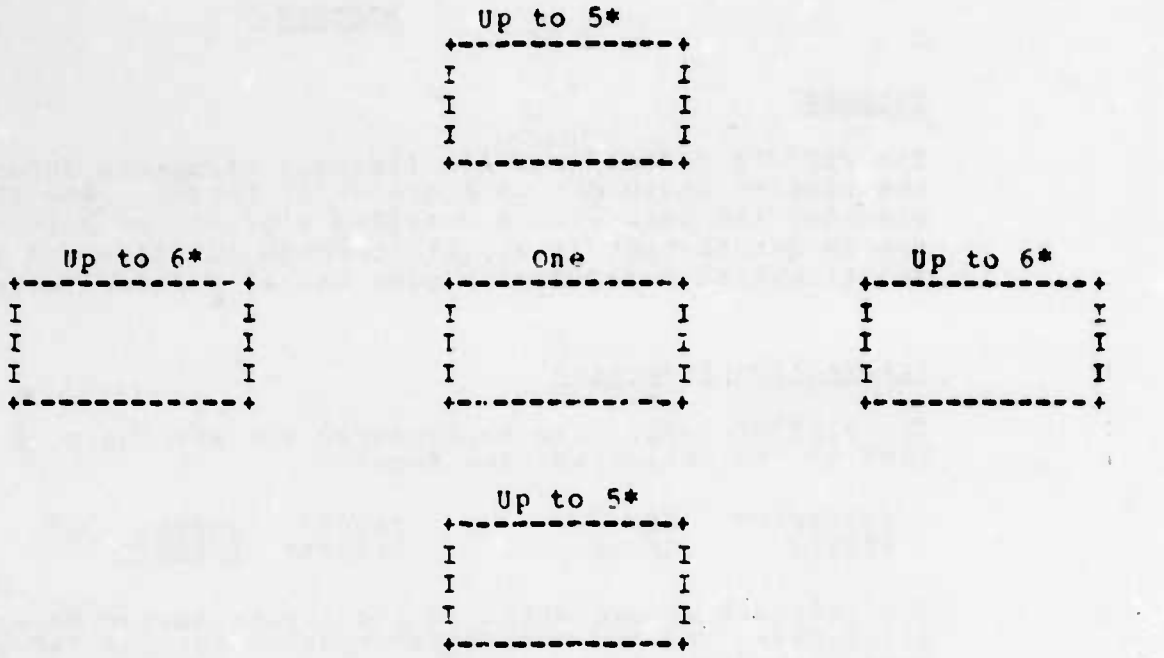
The PICTURE report can be produced for any names in the data base of the following name types:

INTERFACE	SET	INPUT	OUTPUT
ENTITY	GROUP	ELEMENT	PROCESS

The information presented in the report varies depending on which name type the report is produced for and the parameters used when generating the report. For each name type the FLOW, STRUCTURE and DATA parameters present different types of UPL relationships as retrieved from the data base. Table 7 shows the relationships presented for each name type.

Format

The PICTURE report is generated in a graphical format. The basic template for the format is shown in Figure 51. A given PICTURE report describes a single named object.

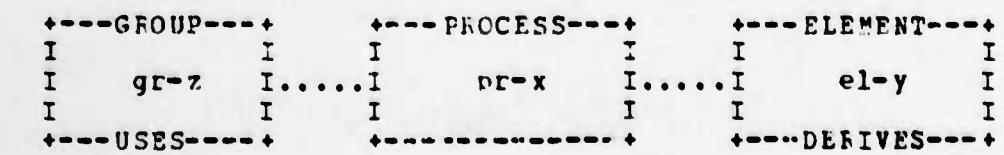


* if more, report is continued on next page (except for PART OF relationship which only one per PICTURE).

Figure 51

General PICTURE Format and Limits per Page

The object being described is represented by a retangular box printed in the center of the report page. All named objects related to the center object are also represented by rectangular boxes but are arranged around the perimeter of the page. The name type (PROCESS, ELEMENT, etc.) of the represented object is printed along the top line of each box. The relationship of an object (represented by one of the perimeter boxes) with the center object is printed along the bottom line of the box. For illustrative purposes, lines extend from each box to the center box.



The preceding example is to be interpreted as follows:

PROCESS pr-x USES GROUP gr-z and,
PROCESS pr-x DERIVES ELEMENT el-y.

Should a PICTURE of particular name exceed the page limitation as given in Figure 51 the PICTURE will be continued on succeeding pages.

The format of the relationships presented varies depending on the name type of the object being described (just as the types of relationships vary). The remaining figures in this section show how relationships are formatted.

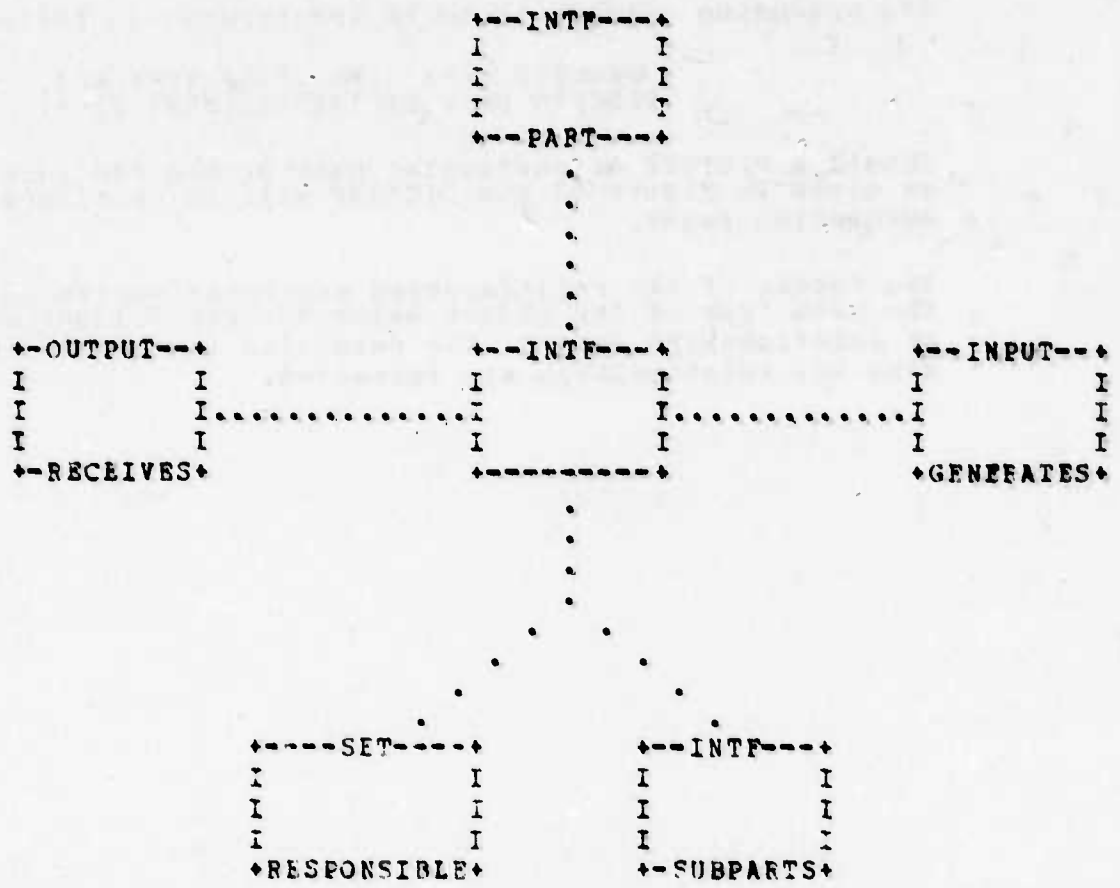


Figure 52

INTERFACE PICTURE

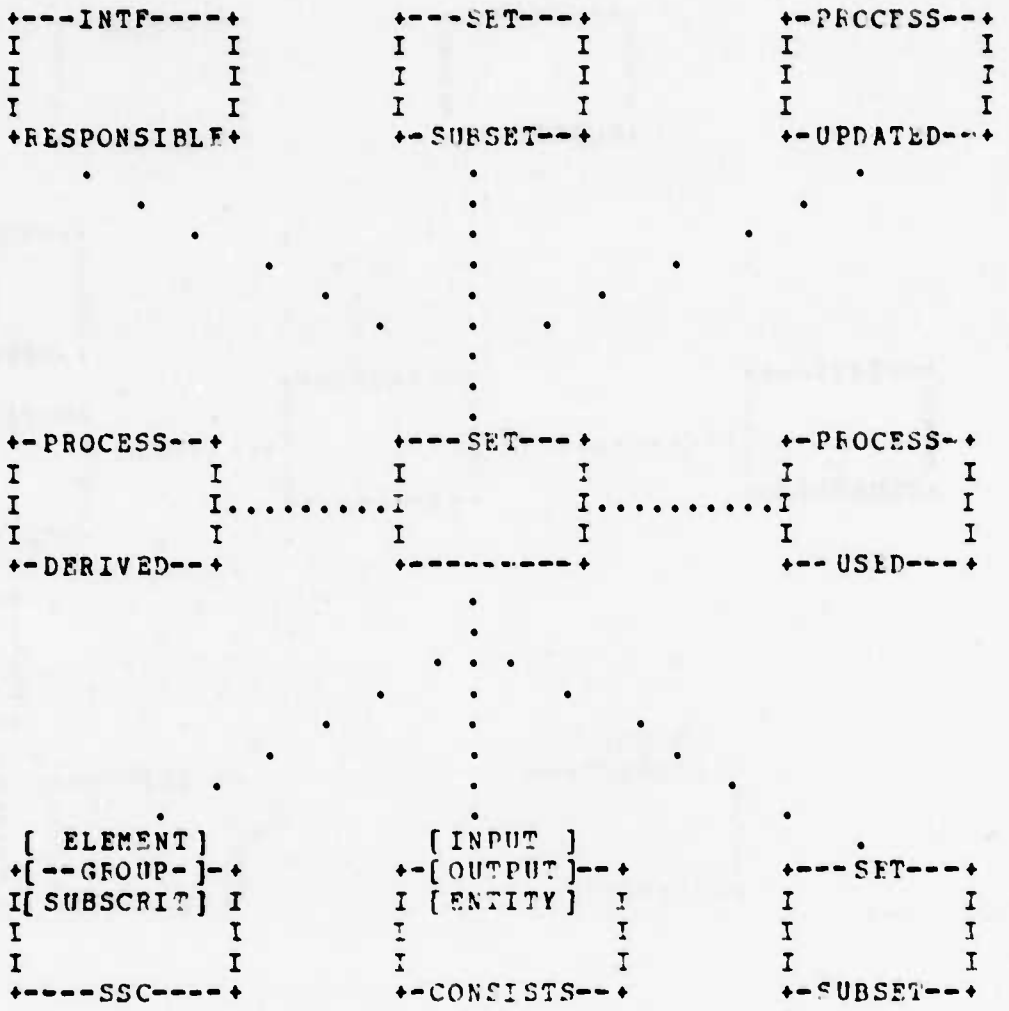


Figure 53

SET PICTURE

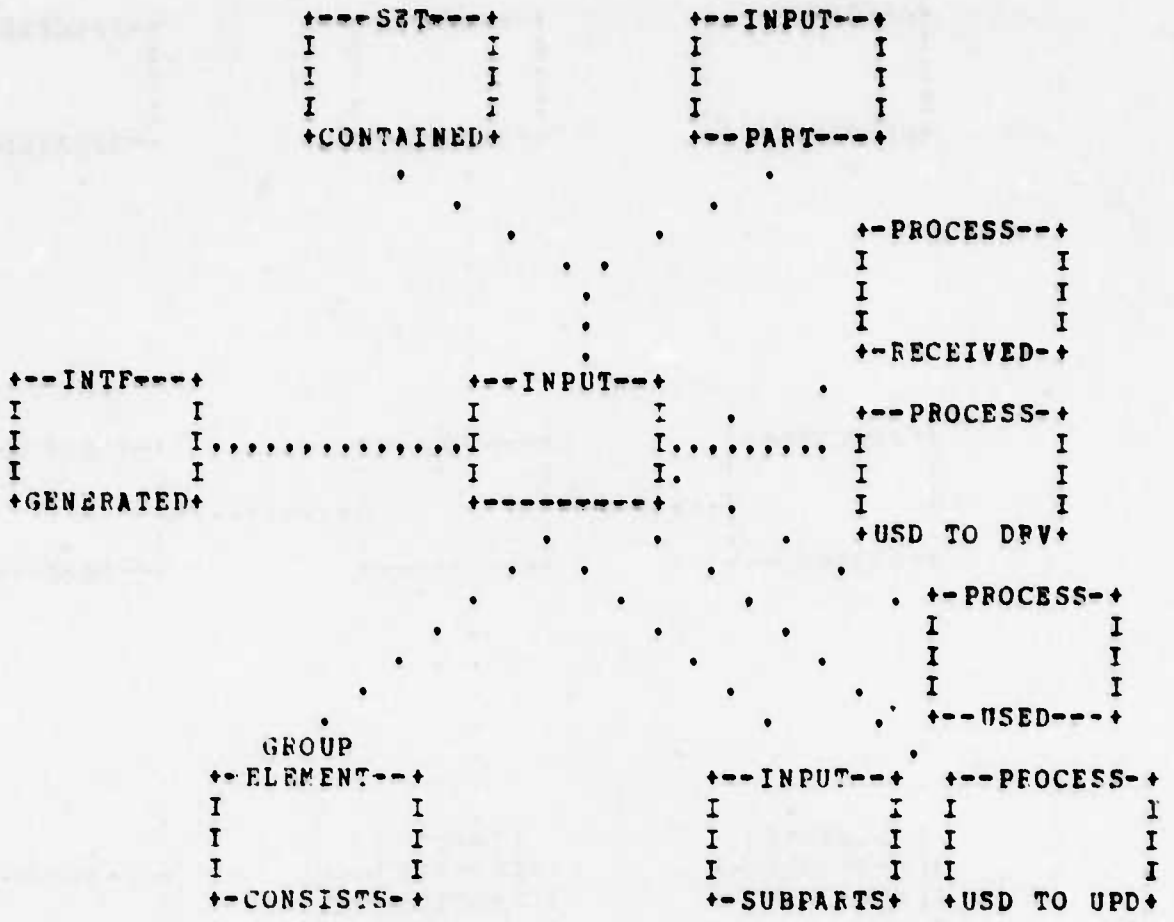


Figure 54

INPUT PICTURE

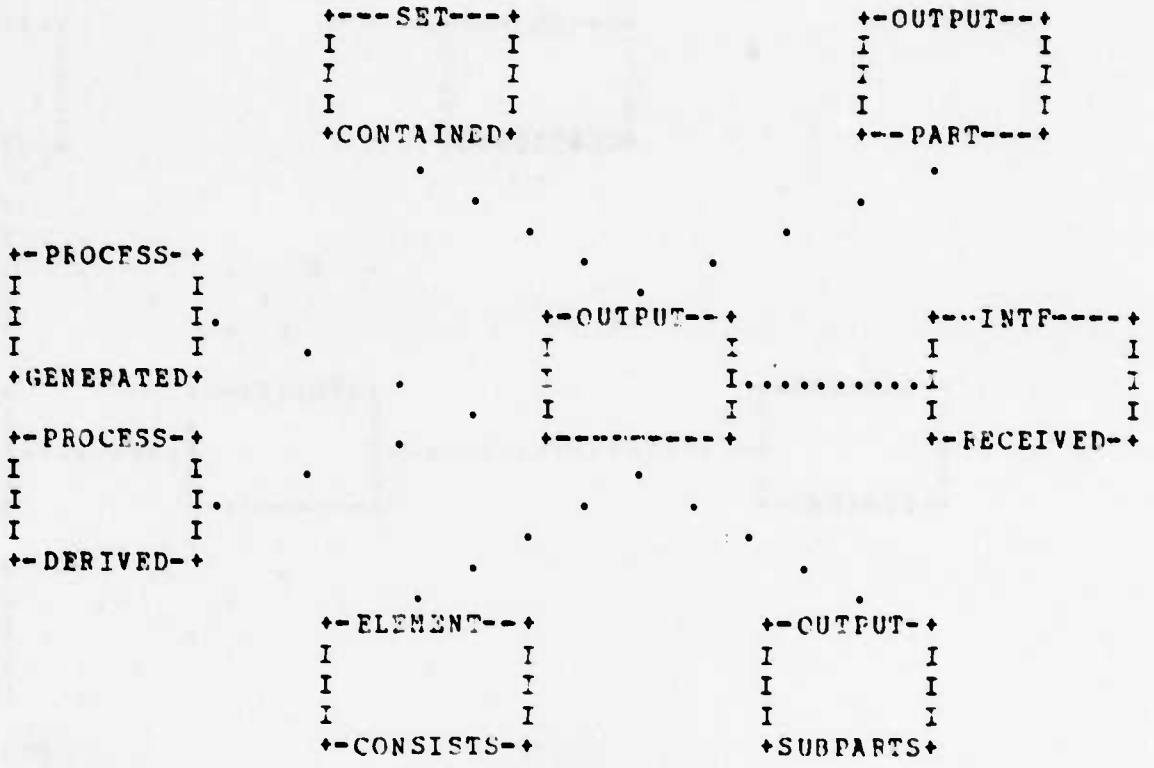


Figure 46

Figure 55

OUTPUT PICTURE

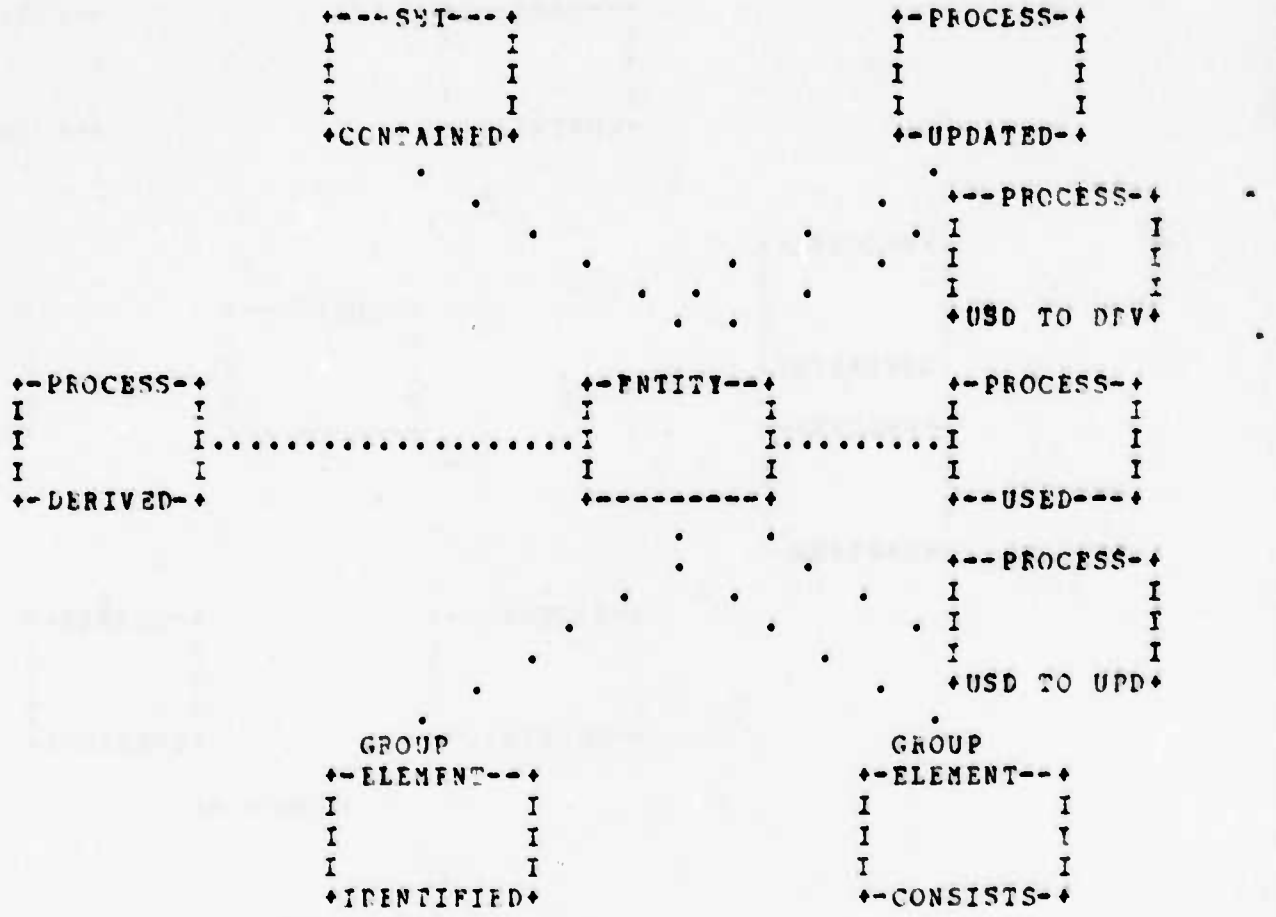


Figure 56

ENTITY PICTURE

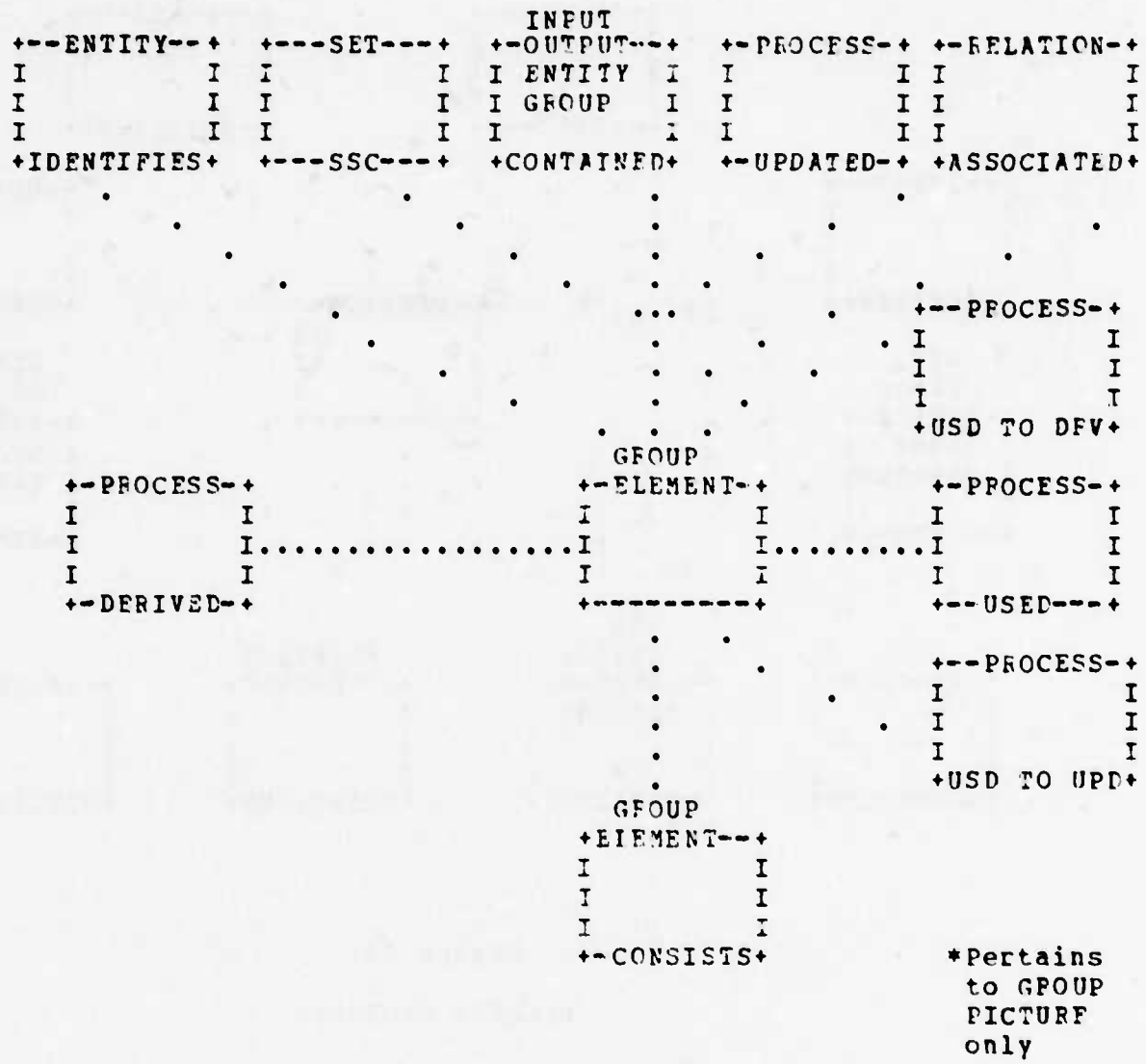


Figure 57

GROUP/ELEMENT PICTURE

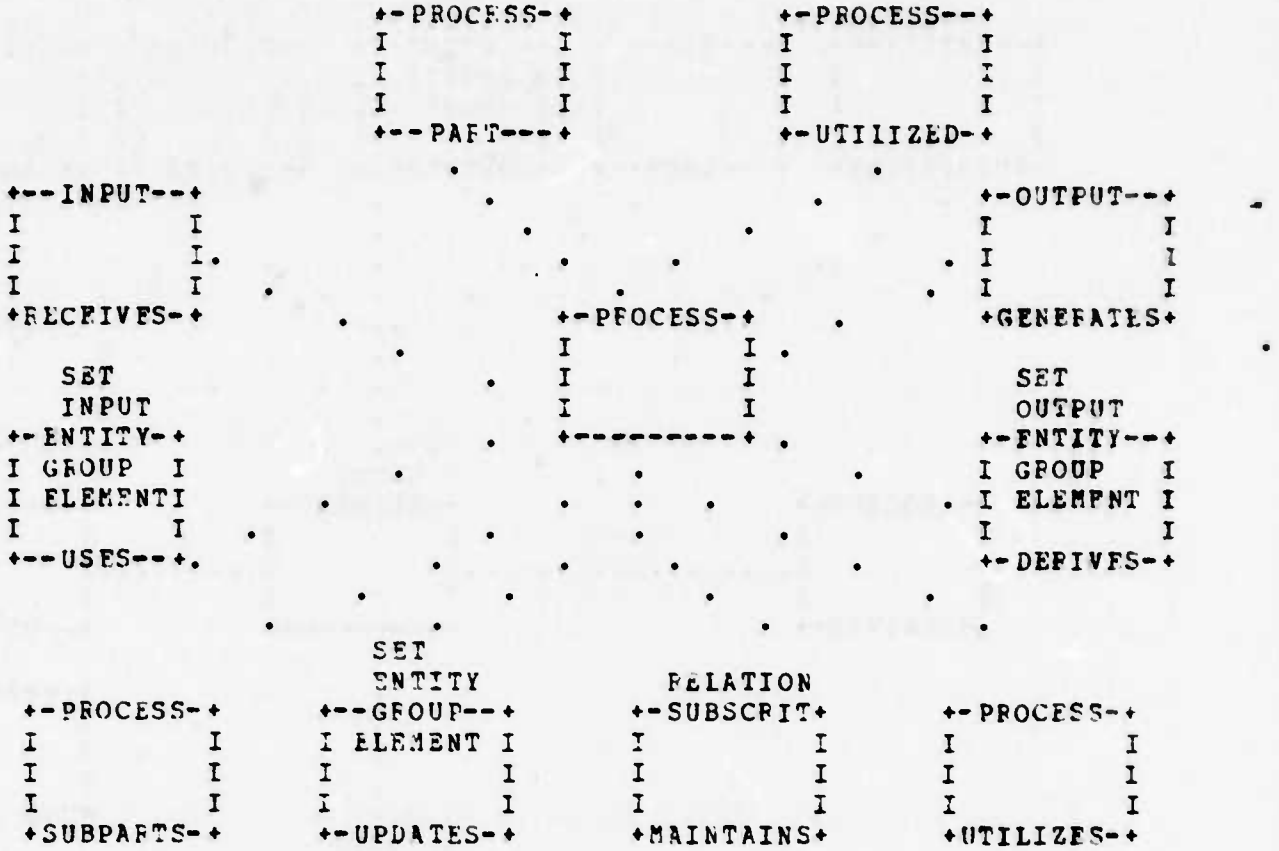


Figure 58

PROCESS PICTURE

Options and Alternatives

The user has the option of displaying any combination of the three types of relationships (DATA, FLOW and STRUCTURE) on the report. See Table 7 for which relationships are displayed in each of these categories for a particular name type. For example, if only the CONSISTS and CONTAINED information (STRUCTURE) were to be displayed for a particular ENTITY name, DATA and FLOW relationships could be suppressed via the NODATA and NOFLOW parameters. The parameters allowed and their effect on the report are described below:

1) DATA - specifies that data type relationships be included in each PICTURE.
   NODATA - specifies that these relationships are not included.

2) FLOW - specifies that flow type relationships be included in each PICTURE.
   NOFLOW - specifies that these relationships are not included.

3) STRUCTURE - specifies that structure type relationships be included in each PICTURE.
   NOSTRUCTURE - specifies that these relationships are not included.

An INDEX for the report is produced when the INDEX parameter is used.

The report may be generated for a single input name (via the NAME parameter) or for a collection of names either specified by the USER or retrieved via NAME-GEN.

Analysis

For each name given as input the software finds the name in the data base. If the name is not found the message:

URA066: MAINPIC: NAME NOT IN D.B. -

is printed. If the name is found it is checked if it is of a legal name type for which a PICTURE may be generated, i.e., a SET, INPUT, OUTPUT, ENTITY, GROUP, ELEMENT, PROCESS, or INTERFACE name. If it is not one of these name types the message:

URA067:MAINPIC: PICTURE NOT AVAILABLE FOR -

is printed. If the name is of a legal name type it is then checked if any of the relationships that can be presented in the PICTURE for that name type exist for the particular name. If none of these relationships exist, the message:

UPA289:PCLRBT: NO PICTURE AVAILABLE FOR

is printed. Otherwise, those relationships available for the name are presented in the report.

Usage

Project management can use this report to gain a basic understanding of the functions of the target system by viewing PICTURES of high level target system objects.

PICTURES provide a good means of communication among people in the project and those external to it. A graphical format is often easier to interpret than a matrix, narrative text, etc.

Problem Definers may use the PICTURE report to visually analyze the description of particular objects to check for completeness. For each type of name (e.g., PROCESS or ELEMENT) several checks can be made depending on the relationships presented in the report. Table 8 presents completeness checks that can be made by visually scanning PICTURE reports.

Examples

Figure 59 presents a PICTURE for an INPUT name "time-card."

Figure 60 presents a PICTURE for an INTERFACE name "employee."

Figure 61 presents a PICTURE for a PROCESS name "hourly-employee-processing." The examples above were produced by giving the following Analyzer commands:

```
PICTURE NAME=time-card
PICTURE NAME=employee
PICTURE NAME=hourly-employee-processing
```

FIGURE_59

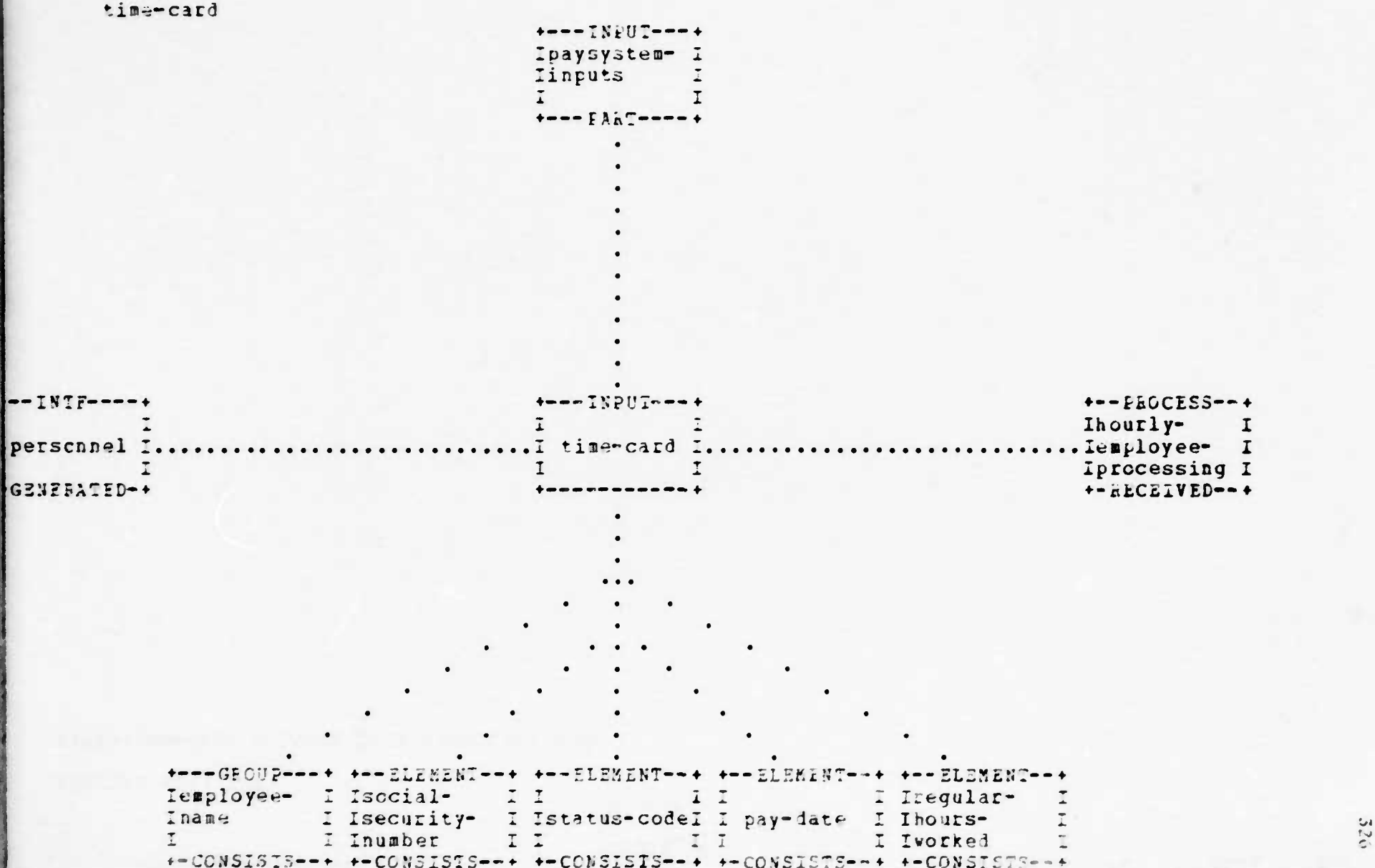
Picture

PARAMETERS FOR: PIC

NAME=time-card NOINDEX DATA STRUCTURE FLOW

FIGURE_59

Input Picture



CONTINUED ON NEXT PAGE...

FIGURE_59

Input Picture

time-card (CONTINUED)

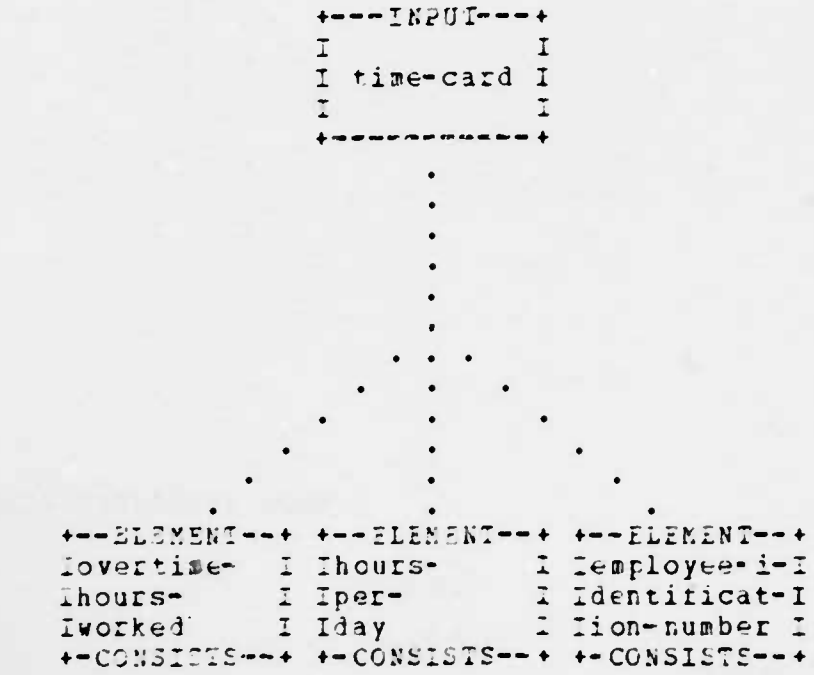


FIGURE_60

Picture

PARAMETERS FOR: PIC

NAME=employee NOINDEX DATA STRUCTURE FLOW

FIGURE_60

Interface Picture

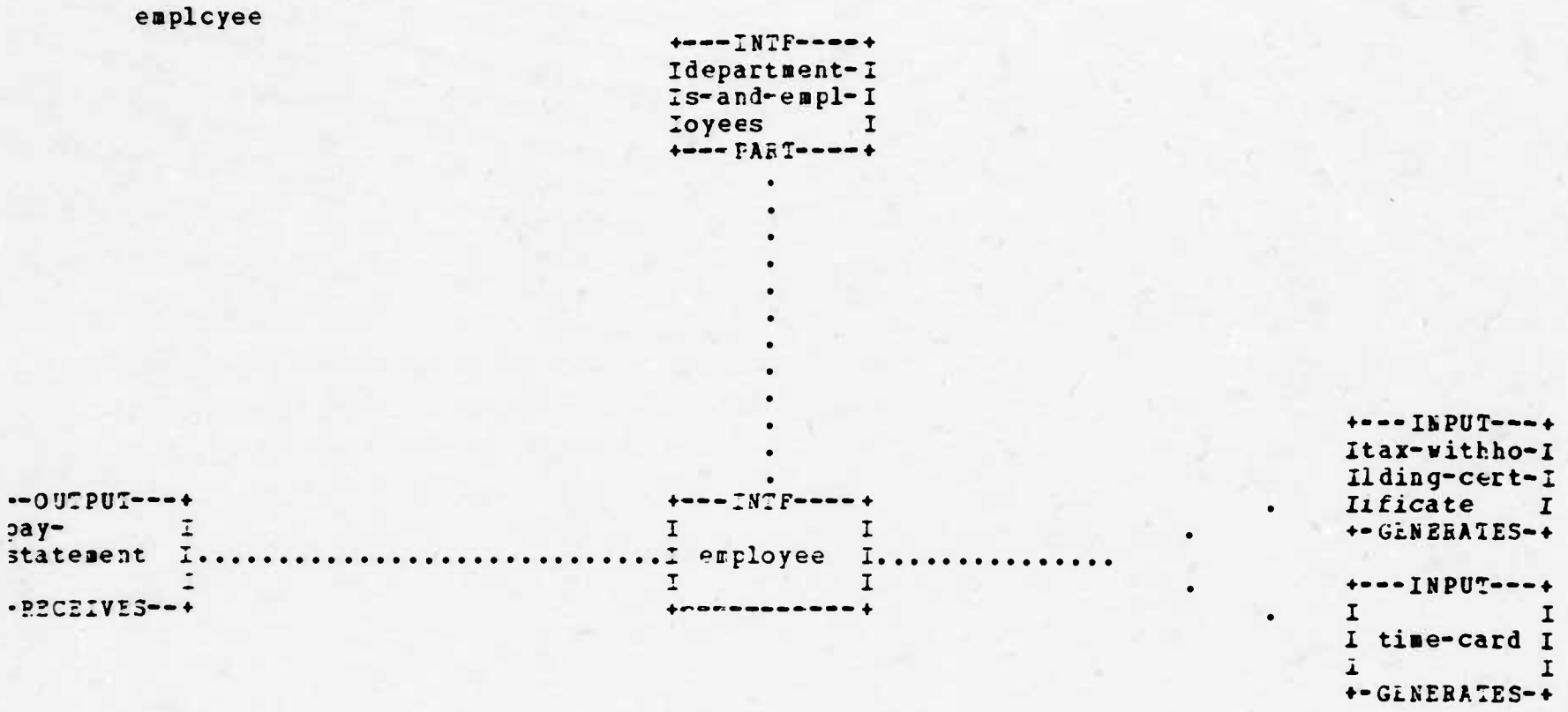


FIGURE_61

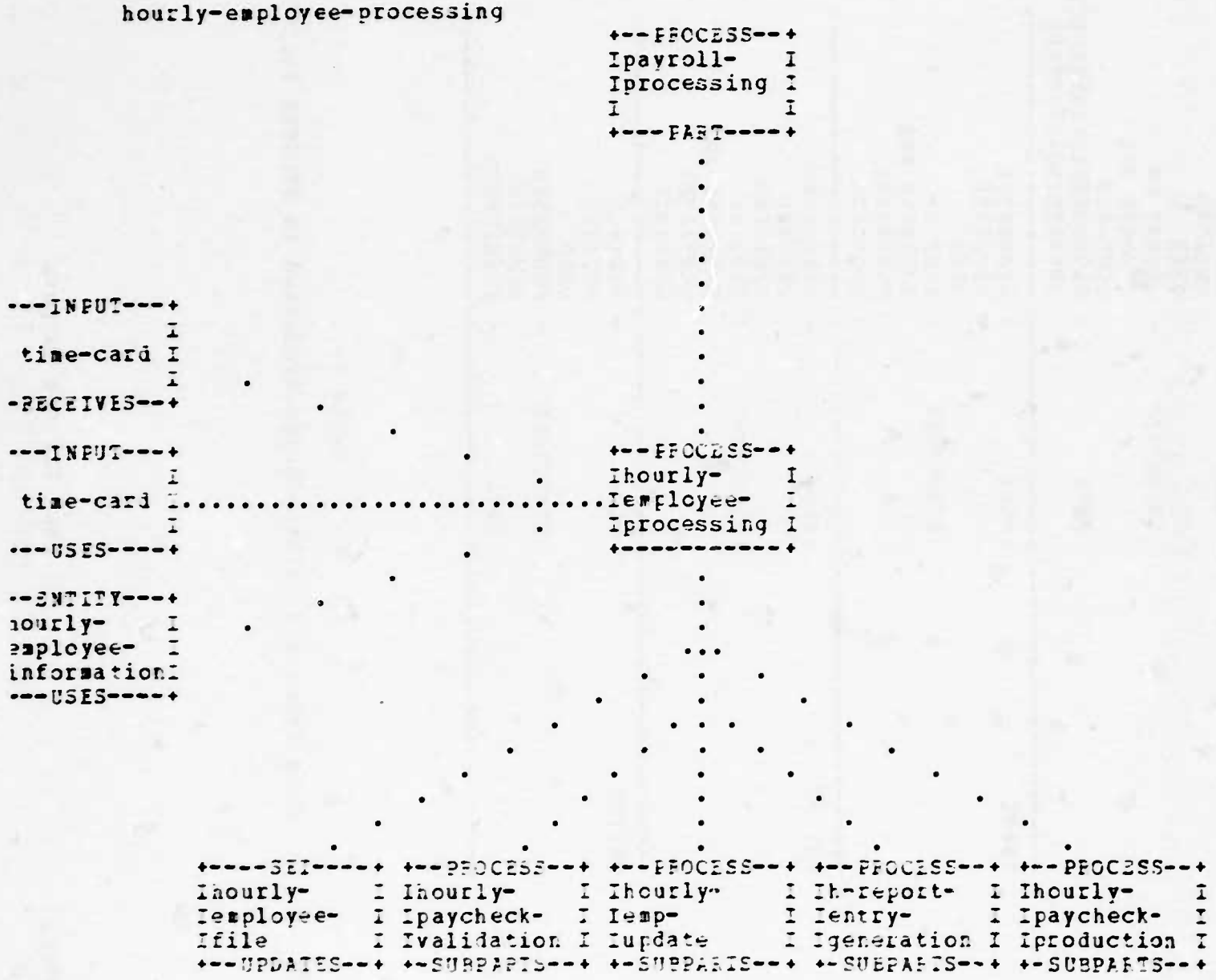
Picture

PARAMETERS PCB: PIC

NAME=hourly-employee-processing NOINDEX DATA STRUCTURE FLOW

FIGURE_61

Process Picture



NAME TYPE		RELATIONSHIPS DISPLAYED
INTERFACE	FLOW	- RECEIVES GENERATES
	STRUCTURE	- PART OF SUBPARTS ARE
	DATA	- RESPONSIBLE FOR
SET	FLOW	- DERIVED UPDATED USED
	STRUCTURE	- SUBSET OF SUBSETS ARE CONSISTS
	DATA	- RESPONSIBLE-INTERFACE SUBSETTING-CRITERIA
INPUT	FLOW	- GENERATED RECEIVED USED
	STRUCTURE	- PART OF SUBPARTS ARE CONTAINED CONSISTS
OUTPUT	FLOW	- GENERATED DERIVED RECEIVED
	STRUCTURE	- PART OF SUBPARTS ARE CONTAINED CONSISTS
ENTITY	FLOW	- DERIVED UPDATED USED
	STRUCTURE	- CONTAINED CONSISTS
	DATA	- IDENTIFIED

Table 7.

Name Types and Relationships Presented in PICTURE Report

NAME TYPE		RELATIONSHIPS DISPLAYED
GROUP/ELEMENT	FLOW	- DERIVED
		UPDATED
		USED
		USED TO DERIVE
		USED TO UPDATE
	STRUCTURE	- CONTAINED
		CONSISTS[1]
	DATA	- ASSOCIATED
		IDENTIFIED
		SUBSETTING-CRITERION
PROCESS	FLOW	- RECEIVES
		USES
		USES TO DERIVE
		USES TO UPDATE
		DERIVES
		GENERATES
		UPDATES
		MAINTAINS
	STRUCTURE	- PART OF
		SUBPARTS ARE
		UTILIZED BY
		UTILIZES

Table 7 (Continued)

[1] This relationship only applies to GROUPS, i.e., an ELEMENT cannot CONSIST of anything.

INTERFACE	An INTERFACE should RECEIVE an OUTPUT, GENERATE an INPUT and/or be RESPONSIBLE for a SET.
SET	A SET should be USED by a PROCESS, DERIVED by a PROCESS, and/or be UPDATED by a PROCESS. A check can also be made that the SET has a RESPONSIBLE-INTERFACE. If the SET has SUBSETS, it should also have SUBSETTING-CRITERIA.
INPUT	An INPUT should be RECEIVED by a PROCESS and GENERATED by an INTERFACE. An INPUT should also be DERIVED by a PROCESS.
OUTPUT	An OUTPUT should be GENERATED by a PROCESS and RECEIVED by an INTERFACE. An OUTPUT should also be DERIVED by a PROCESS.
ENTITY	An ENTITY should be USED by a PROCESS, DERIVED by a PROCESS, and/or be UPDATED by a PROCESS. A check can also be made that the ENTITY is IDENTIFIED by a GROUP or ELEMENT.
GROUP/ELEMENT	A GROUP/ELEMENT should be USED by a PROCESS, DERIVED by a PROCESS, and/or be UPDATED by a PROCESS. A check can be made that the GROUP/ELEMENT may IDENTIFY an ENTITY, be SUBSETTING-CRITERION for a SET and/or be ASSOCIATED with a RELATION.
PROCESS	A PROCESS should RECEIVE an INPUT, GENERATE an OUTPUT, USE a SET, ENTITY, INPUT, GROUP or ELEMENT, DERIVE a SET, OUTPUT, ENTITY, GROUP or ELEMENT, UPDATE a SET, ENTITY, GROUP or ELEMENT, and/or MAINTAIN a RELATION and/or SUBSETTING-CRITERION

Table 8.

Completeness Checks that may be made by the PICTURE Report by the PICTURE Report.

PROCESS CHAIN REPORT

Purpose

To present in a graphical format the sequence of EVENTS and PROCESSES which occur as a result of each EVENT or PROCESS specified as input.

Information Presented

For each EVENT name given as input to the software or encountered during the analysis, the report presents:

1) All PROCESS names which the EVENT TRIGGERS, TERMINATES or INTERRUPTS.

2) All EVENT names which the EVENT CAUSES.

Similarly, for each PROCESS name, the report presents:

1) All EVENT names occurring ON-INCEPTION or ON-TERMINATION of the PROCESS.

2) All PROCESS names which the PROCESS TRIGGERS, TERMINATES or INTERRUPTS.

Starting with a name given as input (either a PROCESS or an EVENT), the analysis is repeated for lower levels and the network continues until a name used previously is encountered or no more relationships are found.

Format

Each name which appears on the output is shown within a box. the top line of the box indicates the name type (EVENT or PROCESS) where the bottom line shows the relationship with the preceding EVENT or PROCESS (TRIGGERED, CAUSED, ON-INCEPTION, ON-TERMINATION, TERMINATED, INTERRUPTED). The report will indicate whether these dynamics relationships are conditional (DEPENDING ON) or repetitive (FOR EACH) if the options requesting this information are used. Boxes containing the related names are linked by dotted lines.

If a name joins two or more chains (strings of related names) into into a loop or loops, every appearance of that name after the first will be followed by the message, "NAME OCCURS ELSEWHERE. SEE INDEX.".

Output is continued across page boundaries. If the right edge of one page continues to the left edge of a second, the right most column of boxes on the first page will be repeated as the left most column of boxes on the second page, in order to facilitate matching of edges. Similarly, if the bottom edge of one page continues to the top edge of a second, the bottom row of boxes on the first page will be repeated as the top row of boxes on the second page.

Options and Alternatives

The report may be generated for a single EVENT or PROCESS name (via the NAME parameter) or for a collection of such names, either input by the user or obtained from a FILE.

The number of columns and rows used on the page may be decreased from their default maximum values of 119 and 39, respectively, via the COLUMNS and ROWS parameters. The minimum acceptable values for COLUMNS and ROWS are 38 and 14, respectively.

The HORIZONTAL-BOXES and VERTICAL-BOXES parameters specify the number of boxes arranged horizontally and vertically on a page. The default value assigned to these parameters is the maximum number of boxes that could appear between the given COLUMN and ROW settings. For example, if COLUMNS=119 and ROWS=39 (their defaults) are specified, then the values for HORIZONTAL-BOXES and VERTICAL-BOXES will default to 6 for both. Values for HORIZONTAL-BOXES and VERTICAL-BOXES that are less than default will result in pictures that are spread out, that is, there will be a greater distance between boxes. Due to the scheme for continuing pages, the minimum value that can be assigned to HORIZONTAL-BOXES and VERTICAL-BOXES is 2 for both.

The number of connections that are to be traced, starting at the given name, may be set at any positive value via the LINKS parameter. The same LINKS value is used for all names input when the FILE parameter is used.

An index, containing each name used on the report and the page(s) on which it appears, may be obtained by specifying the INDEX parameter.

Analysis

Each name given as input is first checked to see that it is in the data base and that it is either a PROCESS or EVENT name. If the name is not in the data base, the message:

UPA391: FILNAT: NAME NOT IN DATA BASE

will be given. If the name is of a type other than PROCESS or EVENT, the user will receive the message:

URA392: FILMAT: NAME NOT EVENT OR PROCESS.

If the name is in the data base and is either an EVENT or PROCESS, it is retrieved and stored in a stack which will be later used to produce the output. The name is then used to generate a tree structure of PROCESS and EVENT names by the following method:

If the name is an EVENT, the PROCESS(es) and EVENT(s) which it TRIGGERS, TERMINATES or INTERRUPTS and the EVENTS which it CAUSES are retrieved from the data base and placed in the stack. Then, the first name is removed from the stack and placed in its proper location in the tree data structure. If this first name is a PROCESS, the EVENT(s) occurring ON-INCEPTION or ON-TERMINATION of the PROCESS and the PROCESS(es) which the given PROCESS TRIGGERS, TERMINATES or INTERRUPTS are retrieved and placed in the stack. If the first name is an EVENT, the actions taken are analogous to the ones described previously. This procedure continues, with names being removed from the top of the stack, placed in the tree structure, and used to obtain further names which are placed in the stack. At any stage of this procedure, no names will be put on the stack if one of the following is true:

1) a) The current name is an EVENT which TRIGGERS, TERMINATES or INTERRUPTS no PROCESS(es) or CAUSES no EVENT(s).

   b) The current name is a PROCESS which has no EVENT(s) occurring ON-INCEPTION or ON-TERMINATION or which TRIGGERS, TERMINATES or INTERRUPTS no PROCESS(es).

2) The current name has been encountered earlier, and is therefore at the end of a chain or forms a loop with some portion of a chain traced earlier.

3) The number of links that has been traced on the current chain is equal to the limit set by the LINKS parameter. Every input name for which this occurs, is followed by the message:

   "USER LINK LIMIT OF no. of links REACHED"

Thus, in any of these cases, the size of the stack will decrease. The entire procedure is complete when, after any search, the stack is empty.

If the name input is a PROCESS name, the first search is for EVENT(s) occurring ON-INCEPTION or ON-TERMINATION of that PROCESS and for PROCESS(es) which the given PROCESS TRIGGERS, TERMINATES or INTERRUPTS. From there, the procedure is identical to that described above.

The data structure constructed from all names found as above is broken into page-size units and is printed a page at a time.

The process described above is repeated until no more names are specified by the user or remain in the input file.

Usage

The PROCESS CHAIN report presents a comprehensive view of the dynamic behavior of the processes within the target system for inclusion in the final specifications of the system or as an aid in communicating this information to others.

Problem Definers may use the PROCESS CHAIN report to visually analyze the description of particular objects and the system as a whole, for completeness. Table 9 presents completeness checks that can be made by visually scanning PROCESS CHAIN reports.

Programmers and System Designers in particular will find this report helpful in identifying and optimizing the system logic. If the processes are defined to the level of computable statements, the PROCESS CHAIN report will essentially chart out the program logic.

Example

Figure 62 presents a PROCESS CHAIN for the EVENT "salaried-emp-processing-init."

PROCESS	The absence of any EVENT as a result of INCEPTION or TERMINATION of the PROCESS should be rationalized. The absence of any PROCESS being TRIGGERED, INTERRUPTED or TERMINATED by the PROCESS should be rationalized.
EVENT	The absence of any PROCESS being TRIGGERED, INTERRUPTED or TERMINATED by the EVENT should be rationalized. The absence of any EVENT being CAUSED By the EVENT should be rationalized.
System Description	All chains should terminate in one of three ways: 1) In a loop back into the chain 2) By a PROCESS designating the last activity in the procedure represented by the chain 3) By an EVENT designating termination of a procedure represented by a chain Given a particular PROCESS or EVENT, the report allows a trace to be made through the system of actions taken. Checks can be made that based on a particular starting point all EVENT-PROCESS chains evolving from the starting point terminate correctly.

Table 9

Completeness Checks that may be made by Visual Analysis of the PROCESS CHAIN Report

FIGURE_62

PROCESS CHAIN

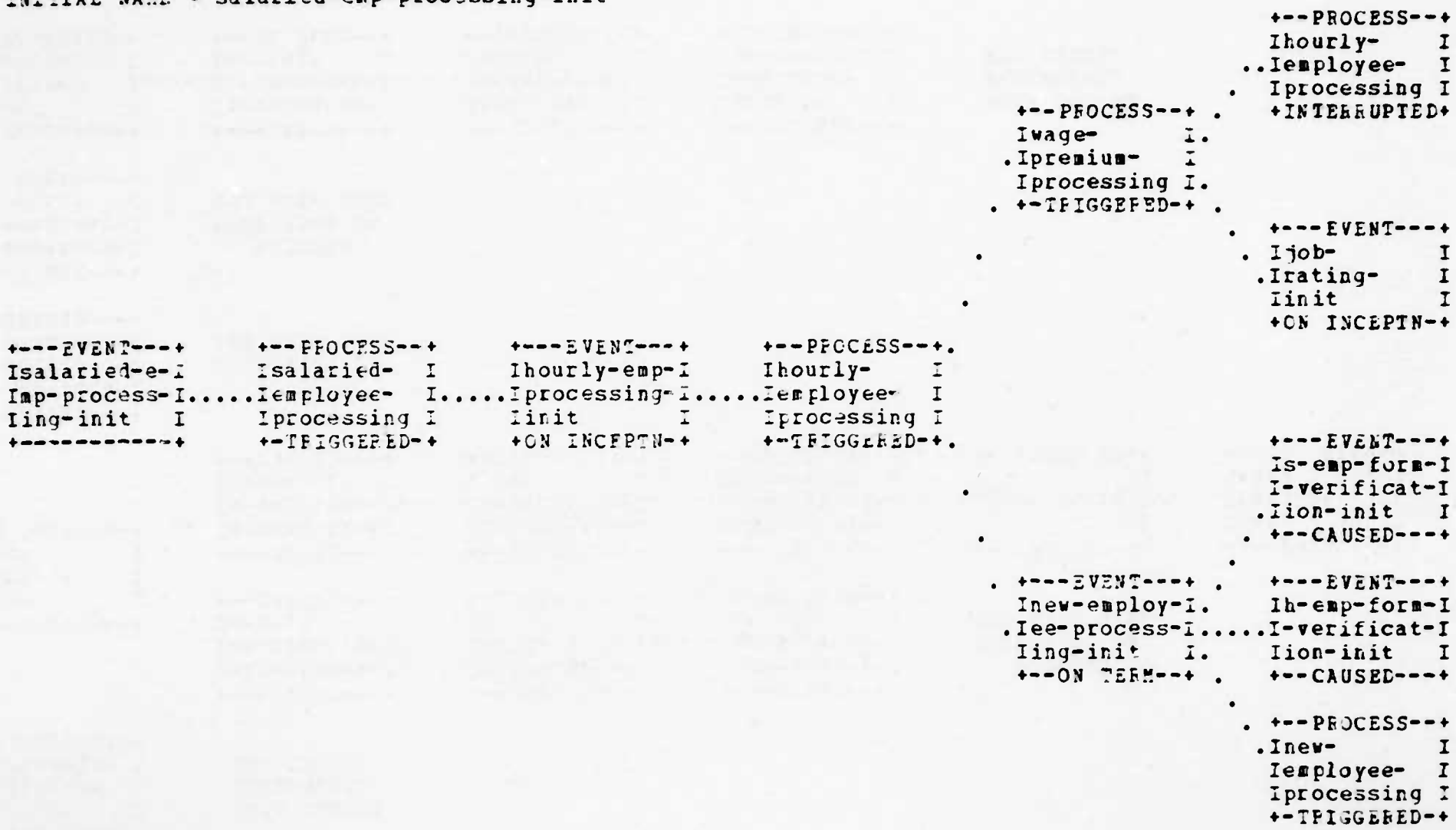
PARAMETERS FOR: PC

NAME=salaried-emp-processing-init LINKS=1000 NODEPENDING-ON NOFOR-EACH NOINDEX COLUMNS=110
ROWS=39 HORIZONTAL-BOXES=6 VERTICAL-BOXES=6

FIGURE_62

PROCESS CHAIN

INITIAL NAME = salaried-emp-processing-init



CONTINUED ON PAGE 140

FIGURE_62

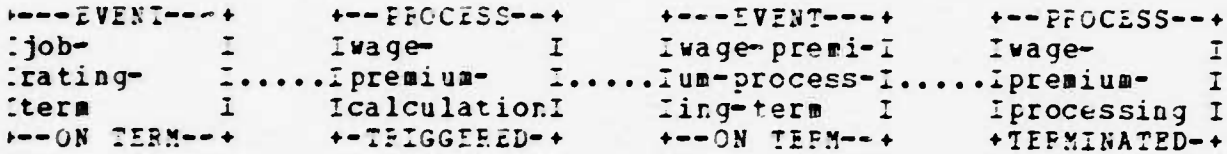
PROCESS CHAIN

CONTINUED ON PAGE 141

FIGURE_62

PROCESS CHAIN

INITIAL NAME = salaried-emp-processing-init



CONTINUED ON PAGE 142

FIGURE_62

PROCESS CHAIN

INITIAL NAME = salaried-emp-processing-init

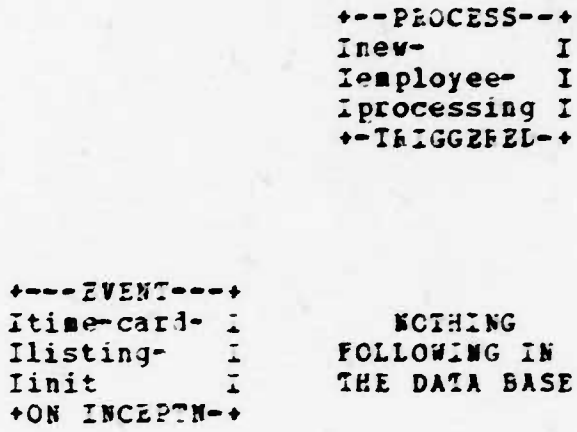
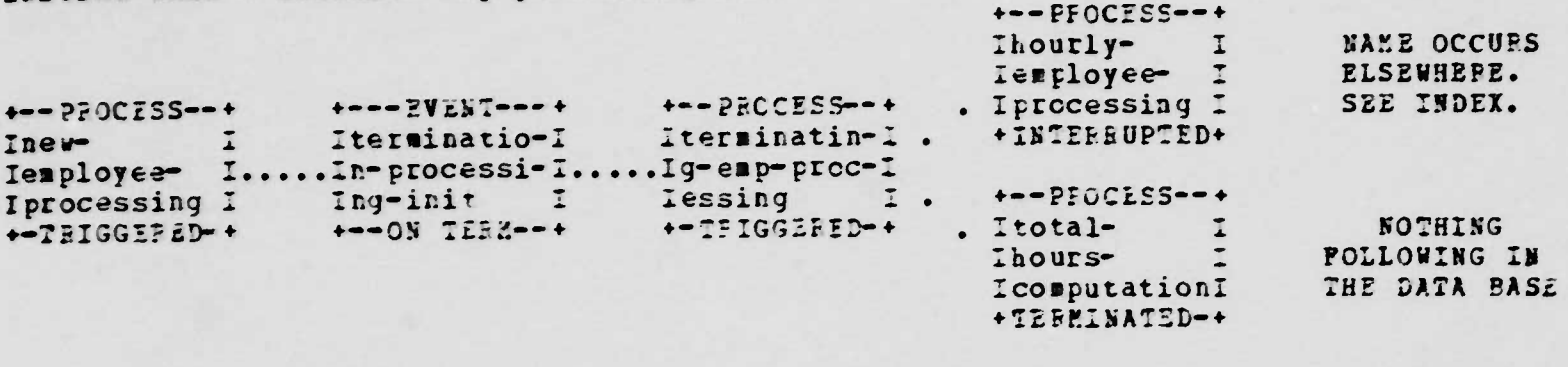


FIGURE_62

PROCESS CHAIN

INITIAL NAME = salaried-emp-processing-init



NOTHING
FOLLOWING IN
THE DATA BASE

FIGURE_62

PROCESS CHAIN

INITIAL NAME = salaried-emp-processing-init

PROCESS INPUT/OUTPUT

Purpose

To present in an easy to examine outline form, the basic functions of one or more PROCESSES in the Language description and how these PROCESSES interact with information.

Information Presented

The report presents, for the PROCESS names given as input, four types of information which may be printed or suppressed by the specification of appropriate parameters for the command generating the report.

The DESCRIPTION parameter permits the printing of the DESCRIPTION comment entry for each PROCESS if available. The PROCEDURE parameter permits the printing of the PROCEDURE comment entry for each PROCESS if available.

The INPUT parameter permits the printing of the names of all SETS, INPUTS, ENTITIES, GROUPS and/or ELEMENTS that are RECEIVED and/or USED by each PROCESS. The OUTPUT parameter permits the printing of the names of all SETS, OUTPUTS, ENTITIES, GROUPS and/or ELEMENTS that GENERATED, UPDATED and/or DERIVED by each PROCESS.

Format

An entry in the report is printed for each PROCESS name given as input. Each name is identified by a number, 1*, 2*, etc., designating its position in the input stream. The following format is used to print out information about each process:

```
**   process name

          [DESCRIPTION comment entry]
          ---------------------------
          [PROCEDURE comment entry]

             *** INPUTS ***

          [All INPUTS RECEIVED by the PROCESS]

          [All SETS, INPUTS, ENTITIES, GROUPS and ELEMENTS USED
          by the PROCESS]

             *** OUTPUTS ***

          [All OUTPUTS GENERATED by the PROCESS]
```

[All SETS, OUTPUTS, ENTITIES, GROUPS and ELEMENTS DERIVED by the PROCESS]

[All SETS, ENTITIES, GROUPS and ELEMENTS UPDATED by the PROCESS]

All the names listed under the INPUTS and OUTPUTS headings are numbered sequentially.

If a DESCRIPTION or PROCEDURE comment entry is not available for a particular name, that part of the format is not included in the report. If no names are listed under the INPUTS heading, the message:

NO INPUTS FOR THIS PROCESS

will be printed. If no names are listed under the OUTPUTS heading, the message:

NO OUTPUTS FOR THIS PROCESS

will be printed.

Options and Alternatives

Any part of the information presented for each PROCESS name can be included in or omitted from the report depending on the parameters used when generated it. The parameters and their effect on the report are given below:

1) DESCRIPTION - specifies that the DESCRIPTION comment entry for each name be included in the report.

NODESCRIPTION - specifies that the comment entry is not printed.

2) PROCEDURE - specifies that the PROCEDURE comment entry for each name be included in the report.

NOPROCEDURE - specifies that the PROCEDURE comment entry is not printed.

3) INPUT - specifies that names USED or RECEIVED by the PROCESS are presented in the report.

NOINPUT - specifies that those names are not printed.

4) OUTPUT - specifies that names DERIVED, UPDATED or GENERATED by the PROCESS are presented in the report.

NOOUTPUT - specifies that these names are not printed.

Each entry of the report is started at the beginning of a new page when the NEW-PAGE parameter is specified. When NONEW-PAGE is in effect, the entries are printed one after another in the report.

An INDEX for the report is produced when the INDEX parameter is specified.

The report may be generated for a single name (via the NAME parameter) or for a collection of names either specified by the user or retrieved via NAME-GEN.

Analysis

Each name given as input to the software producing the report is searched for in the data base. If it is not found the message:

URA0076: MAINPRIO: NAME NOT IN DATA BASE -

is printed. If it is found a check is made that it is a PROCESS name. If it is not, the message:

URA0086: MAINPRIO: NAME NOT A PROCESS NAME -

is printed. If the name is a PROCESS name, then the information available for it, as requested by the parameters, is presented on the report.

Usage

This report is beneficial in presenting a general description of the functions of target system (as described by the PROCESS) for purposes of communications between analysts and users.

It may also be used by analysts to check that the DESCRIPTION and PROCEDURE defined for each PROCESS is in agreement with the information which is input to or output from the PROCESS.

Examples

Figure 63 presents a PROCESS INPUT/OUTPUT report for a single name "payroll-processing." This was done by the following command:

```
PROCESS-INPUT-OUTPUT NAME= payroll-processing
```

Figure 64 presents the report generated for the SUBPARTS of "payroll-processing." This was done by the following commands:

```
NAME-GEN S='SUBPARTS-OF=payroll-processing,1'
PROCESS-INPUT-OUTPUT PROCEDURE
```

FIGURE_63

Process Input/Output

RAMETERS FOR: PRIC

AME=payroll-processing INPUT OUTPUT DESCRIPTION NOPROCEDURE NONEW-PAGE NOINDEX PRINT NOPUNCH

1* payroll-processing

This process represents the highest level process in the target system. it accepts and processes all inputs and produces all outputs.

*** INPUTS ***

1	paysystem-inputs	RECEIVED
2	paysystem-inputs	USED
3	payroll-master-information	USED

*** OUTPUTS ***

1	payroll-master-information	UPDATED

FIGURE_64

Process Input/Output

PARAMETERS FOR: PRIC

FILE INPUT OUTPUT DESCRIPTION PROCEDURE NONEW-PAGE NOINDEX PRINT NOPUNCH

1* hourly-employee-processing

*** INPUTS ***

1	time-card	RECEIVED
2	time-card	USED
3	hourly-employee-information	USED

*** OUTPUTS ***

1	hourly-employee-file	UPDATED

2* new-employee-processing

This process produces the new hire section
in the h-t report.

---

1. add new employee information
2. increment count of number of employees in appropriate department
3. specify relationship between employee information and department
4. initialize all appropriate fields in employee information.
5. print the new hire section of the h-t report.

*** INPUTS ***

1	hourly-employment-form	RECEIVED
2	salaried-employment-form	RECEIVED
3	tax-withholding-certificate	RECEIVED

FIGURE_63

Process Input/Output

PARAMETERS FOR: PRIC

NAME=payroll-processing INPUT OUTPUT DESCRIPTION NOPROCEDURE NONEW-PAGE NOINDEX PRINT NOPUNCH

1* payroll-processing

This process represents the highest level process
3* in the target system. it accepts and processes
all inputs and produces all outputs.

*** INPUTS ***

1	paysystem-inputs	RECEIVED
2	paysystem-inputs	USED
3	payroll-master-information	USED

*** OUTPUTS ***

1	payroll-master-information	UPDATED

4*

5*

FIGURE_64

Process Input/Output

---

1. determine type of employee by employment status item
2. from this, retrieve the contents of the appropriate employee information and print in report format
3. update number of employees field in appropriate department information
4. delete employee information.

*** INPUTS ***

1	employment-termination-form	RECEIVED
2	employment-termination-form	USED

*** OUTPUTS ***

NO OUTPUTS FOR THIS PROCESS

PROJECTED COST REPORT

Purpose

This report is intended to calculate the projected cost of a system or subsystem using the user provided projected cost equation which contains system-parameters and attribute names in the URA data base.

Information Presented

For each name received as input, the report presents a list of all related SYSTEM-PARAMETERS and ATTRIBUTE names together with their associated values used to evaluate the projected cost equation.

The projected cost equation is an expression comprised of operands and operators. The operands consist of attributes, system-parameters, integers and decimal constants. The arithmetic operators consist of +, -, *, and /(divide). Function modifiers may be used in the expression for computing natural logs (LN), base-10 logs (LOG), and natural exponentiation (EXP).

The expression is evaluated for each name given as input using the values of the corresponding attributes and system-parameters. The value of the expression is the estimated total amount of resource units required.

Format

First, the computer searches the data base for all ATTRIBUTE names and SYSTEM-PARAMETER used in the equation and retrieves the values associated with them. If the names are not of the ATTRIBUTE or SYSTEM-PARAMETER type then an invalid operand error message is given.

A list containing these attribute names and system-parameters is printed under the "Component" column heading in the report with the corresponding value under the "Amount" column heading. Following the list, the total units of resource caluculated from the equation is presented under the "Amount" column as:

total units OF resource REQUIRED

where the "total" is replaced by the calculated amount, and the "units" and "resource" are replaced by the values of the UNITS and RESOURCE parameters.

Options and Alternatives

If some system parameter occurs in the expression but does not have a numerical value, the default value specified by the DEFAULT parameter is used as the value for that system parameter.

An index, containing each name used on the report and the page(s) on which they appear, may be obtained by specifying the INDEX parameter.

Analysis

Each name given as input is first checked to see if it is in the data base. If it is not the message

URA500:MAINPCR: NAME NOT IN DATA BASE-

is printed and the next name is similarly considered.

If the name is in the data base, the program starts evaluating the arithmetic expression.

The evaluation of the expression begins by isolating each component of the expression starting from the leftmost component.

If the isolated component is either an operator or a numerical operand, the parsing starts using a push-down stack and "polish" form. The parsed expression is stored in permanent stack and is used to evaluate the expression for all input names.

If the isolated component is a system parameter, the value of the system parameter is retrieved from the data base and stored in the stack. If the isolated component is an attribute-name, its data base key is retrieved and stored in the stack. The numeric value of an attribute for a given name is retrieved from data base during the evaluation of expression for that given name.

If the component is neither a system-parameter nor attribute-name associated with the given input name, the message:

URA495:PCR: NON-NUMERIC OPERAND -

will be printed.

If the name does not have attribute specified in the expression, the message:

URA496:PCR: NAME DOES NOT HAVE ATTRIBUTE -

will be printed.

If the component is an attribute-name but does not have numerical value, the message:

URA497:PCR: ATTRIBUTE DOES NOT HAVE NUMERIC VALUE -

will be printed.

If the component is a system-parameter but does not have numerical value, the default value will be assigned to the component.

When a system parameter or an attribute has a range of numeric values, the value of the lower bound is used in computation.

If any error condition occurs during the parsing of the arithmetic expression, the message:

URA 493:PCR: ILLEGAL ARITHMETIC EXPRESSION -

will be printed, and the processing will be terminated for the given input name.

During the evaluation of the expression for an input name, if the value assigned for LN or LOG is found to be negative or if the denominator is found to be zero, the error messages:

URA498:PCR: NEGATIVE VALUE FOR LN OR LOG -
URA499:PCR: ZERO DENOMINATOR -

will be printed respectively and the evaluation will be terminated for the given input name.

Since the user-defined names may contain the operator characters as part of their name the operators in the expression must always be delimited by blanks. If any operator is not delimited by blanks, it will be considered as part of the non-numeric operand and will result in an error condition.

Braces ({}) should be employed to indicate the precedence within the expression instead of using parentheses, because the parentheses are valid characters in user-defined names.

Usage

It is common practice for the system designer to attempt to evaluate the total resource required under certain design specifications of the system. Furthermore, if there are several design alternatives one of the selection criteria might be the costs estimated for the various alternatives.

The analyst can use this report to calculate a cost for a system

or to evaluate design alternatives in terms of total resource required.

The analyst may develop numerous arithmetic expressions. It is possible to calculate various costs using the different cost expressions.

Example:

Figure 65 illustrates the Project Cost Report from the following Analyzer commands:

```
PCR N=hired-employee-report DEF=1C RSC=money
                                U=$ E='copies * many'
```

FIGURE_65

Projected Cost Report

PARAMETERS FOR: PCR

NAME=hired-employee-report NOINDEX EXPRESSION='copies * many' RESOURCE=money UNITS=$$
DEFAULT=10

Component	Amount
copies	2
many	10
hired-employee-report	12.00 $ OF money REQUIRED

PUNCHED COMMENT ENTRIES

Purpose

To present selected comment entries given for one or more names in a particular data base.

Information Presented

The report presents, for those names given as input, any comment entries which are specified as parameters and are available for the names. The types of comment entries available for each name are dependent on the name type of the name the report is being generated for. The table below shows the types of comment entries that may be presented and the types of names they may be presented for.

Comment Entry Type	Name Type
DESCRIPTION	All name types
PROCEDURE	PROCESS
VOLATILITY	ENTITY
VOLATILITY-MEMBER	SET
VOLATILITY-SET	SET
DERIVATION	RELATION and SET
TRUE-WHILE	CONDITION
FALSE-WHILE	CONDITION

Format

An entry in the report is printed for each comment entry presented for each name given as input. Each entry is numbered 1*, 2*, etc. The format of each entry is:

```
name
   comment-entry-statement;

         [comment entry text];
```

Each line of the comment entry text is numbered within a given report entry.

Options and Alternatives

An entry in the report is produced for each comment entry (as specified by the parameters for the command generated the report) available for each name given as input. The following parameters designate the comment entries to be presented:

```
DERIVATION              DESCRIPTION FALSE-WHILE
PROCEDURE               TRUE-WHILE  VOLATILITY
VOLATILITY-MEMBER       VOLATILITY-SET
```

Any of these parameters prefixed with "NO" specifies that the corresponding comment entries are not to be presented in the report.

Analysis

Each name given as input to the software generating the report is searched for in the data base. If it is not found the message:

```
UFA135: MAINPCOM: NAME NOT FOUND IN DATA BASE -
```

is printed. If the name is found then those comment entries (as specified by the parameters) which are available for it are printed on the report.

Usage

The report may be used by analysts to check the availability of specific types of comment entries for a class of names. For example, to check that all SETS have VOLATILITY-MEMBER, VOLATILITY-SET, and DERIVATION comment entries the commands:

```
NAME-GEN S='SET'
PUNCH-COMMENT-ENTRY VOLATILITY-MEMBER VOLATILITY-SET
      DERIVATION
```

can be given.

Examples

Figure 66 presents the report for the name "salaried-employee-processing." The command used to produce this example was:

```
PUNCH-COMMENT-ENTRY NAME=salaried-employee-processing
   PROCEDURE
```

FIGURE_6e

Punched Comment Entries

```
PARAMETERS FOR: PCCM

   NAME=salaried-employee-processing NONDESCRIPTION PROCEDURE NOVOLATILITY NOVOLATILITY-MEMBER
   NOVOLATILITY-SET NONDEVIATION NOFOR-WHILE NOFALSE-WHILE PRINT PUNCH
```

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RESOURCE CONSUMPTION REPORT

Purpose

To estimate the amount of the resources that are consumed by the processors in performing a given root process.

Information Presented

The RESOURCE CONSUMPTION Report can present two kinds of information:

a) For each processor which is used to perform the given root process the following appears:

   1) The name of the processor.
   2) The frequency of processor use in terms of a user supplied interval.
   3) A list of names of the resources that the processor consumes together with the amount consumed and the unit in which the resource is measured.

b) For each resource consumed when the root process is performed the following appears:

   1) A list of names of the processors which consume the resource together with the frequency of usage in terms of the specified interval and the amount of the resource consumed.

Format

The format for the PROCESSOR and RESOURCE information is as shown in the following example:

```
PROCESSOR PETER          IS INVOKED          64 TIMES PER YEAR

  RESOURCE CONSUMED      AMOUNT CONSUMED     MEASURED IN

  R1                        145768           DOLLARS
  R2                         1?512           TONS
  R3                          1644           MICROSECONDS

RESOURCE R1              MEASURED IN DOLLARS
```

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
PETER	64	145768
SAM	52	592800
FRED	12	612
TOTALS	128	739180

Options and Alternatives

If one is only interested in a certain type of processor, the PROCESSOR-KEYWORD parameter may be specified. In this case, the processor part of the report will be broken into two sections. The first section will show those processors which have the specified keyword, and the second section will list all the other processor under the heading "OTHER PROCESSORS."

The resource part of the report will also be altered if the PROCESSOR-KEYWORD parameter is specified. For each resource, the processors which have the specified keyword are first listed and the other processors that consume the resource are listed under "OTHER PROCESSORS."

The PROCESS-LEVEL=number parameter does not change the format of the output, but it is used to control the "level of detail" of the analysis. Only as many levels as specified in this parameter will be probed in the process structure beginning at the root-process.

When the output is expected to be fairly large (i.e., contains many user-names in it), it is advantageous to specify the INDEX parameter to generate an index report that shows all the user-names that appear in the report and the report page number(s) on which they appear.

Analysis

The program searches the data base for each process name given as input. If the name is not found, the message:

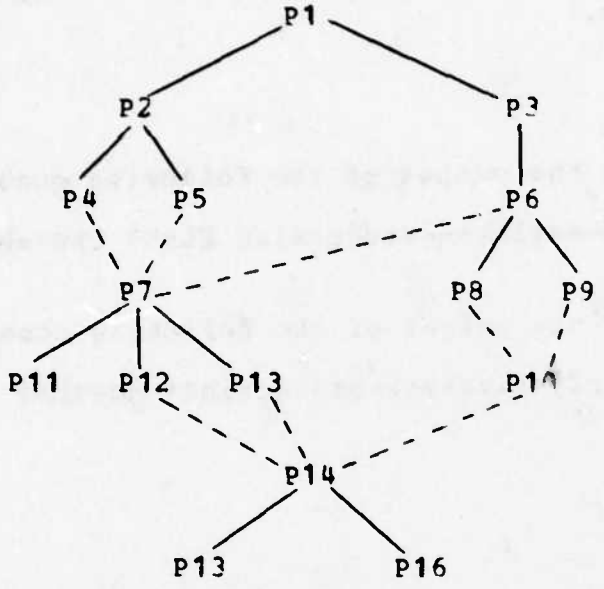
UPAC59: PREPRO: ROOT PROCESS NOT FOUND IN DATA BASE -

is printed and no information is presented for that process name.

If the process is found in the data base, the program then performs a walk of the subparts-utilizes network which starts at the specified process name and extends downward to the specified number of levels. For each visit to each process in the structure, the resource consumption and processor frequency information is computed and recorded. After the network has been traversed, the recorded information is printed.

It is important to realize that a process may be visited more than once, and that its resource consumption is computed each time it is visited. This corresponds to the fact that a component process may be performed many times as a root process is performed once.

For the network shown below, where continuous lines represent a subpart relation and broken lines represent a utilizes relation, processes P1, P2, P3, P4, P5, P6, P8 and P9 are each counted once. Processes P7, P11, P12 and P13 are each counted three times. Process P10 is counted twice. And process P14, P13 and P16 are each counted eight times.



Thus, a very simple structure can generate a large number of computations.

The program expects to find the following information in the data base:

- Each process must have a frequency value. The frequency value must be convertable to "times per given INTERVAL." The program will only make one level interval conversions. For example, if the following information is in the data base:

```
YEAR  CONSISTS OF 52 WEEKS;
WEEKS CONSISTS OF 7 DAYS;
```

Then the program will convert weeks to years or years to weeks but will not convert years to days or days to years. For this, the statement:

```
YEAR CONSISTS OF 365 DAYS;
```

must be given.

Part III URA Outputs

- Each process must be performed by exactly one processor.

If the above conditions are not met, error messages will be printed and the analysis will be incomplete.

Usage

The report can be used to estimate the usage of the resources that are consumed by the processors in performing a given process. The estimate is accumulated for a given interval based on the user-specified resource usage parameters for each processor and the resource usage parameters which are components of the given process.

Examples

Figure 67 represents the output of the following command:

```
RCA N=hourly-employee-processing PL=50 INT=week BP BR
                                                PR=ALL
```

Figure 68 represents the output of the following command:

```
NG s='SO=hourly-paycheck-production' NOPRINT
RCA F INT=week
```

FIGURE_67

Resource Consumption Analysis

ARAMETERS FOR: RCA

NAME=hourly-employee-processing NOINDEX PROCESS-LEVEL=50 INTERVAL=week BYPROCESSOR BYRESOURCE
PROCESSOR-KEYWORD=ALL

ROOT PROCESS: hourly-employee-processing

PROCESSOR validation-clerk IS INVOKED 150 TIMES PER week

RESOURCE CONSUMED	AMOUNT CONSUMED	MEASURED IN
paper	250	page

PROCESSOR computer-processor IS INVOKED 7000 TIMES PER week

RESOURCE CONSUMED	AMOUNT CONSUMED	MEASURED IN
cpu-time	172500	seconds
paper	80250	page

PROCESSOR payroll-processor IS INVOKED 1 TIMES PER week

RESOURCE CONSUMED	AMOUNT CONSUMED	MEASURED IN
paper	20	page
cpu-time	300	seconds

FIGURE_67

Resource Consumption Analysis

RESOURCE paper MEASURED IN page

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
validation-clerk	150	250
computer-processor	7000	862500
payroll-processor	1	20
TOTALS	7151	862770

RESOURCE cpu-time MEASURED IN seconds

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
computer-processor	7000	172500
payroll-processor	1	300
TOTALS	7001	172800

FIGURE_6F

Resource Consumption Analysis

PARAMETERS FOR: RCA

FILE NOINDEX PROCESS-LEVEL=5[illegible] INTERVAL=week BYPROCESSOR BYRESOURCE PROCESSOR-KEYWORD=ALL

ROOT PROCESS: h-gross-pay-computation

PROCESSOR computer-processor IS INVOKED 5[illegible] TIMES PER week

RESOURCE CONSUMED	AMOUNT CONSUMED	MEASURED IN
cpu-time	15[illegible]	seconds
paper	75[illegible]	page

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USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
JUL 78 F19628-76-C-0197

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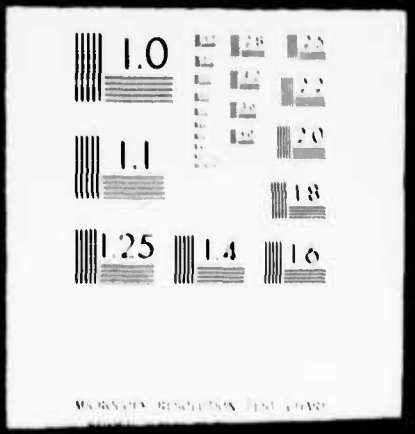


FIGURE_68

Resource Consumption Analysis

RESOURCE cpu-time MEASURED IN seconds

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
computer-processor	500	15000
TOTALS	500	15000

RESOURCE paper MEASURED IN page

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
computer-processor	500	75000
TOTALS	500	75000

FIGURE_68

Resource Consumption Analysis

ROOT PROCESS: total-hours-computation

PROCESSOR computer-processor IS INVOKED 500 TIMES PER week

RESOURCE CONSUMED	AMOUNT CONSUMED	MEASURED IN
cpu-time	15000	seconds
paper	75000	page

FIGURE_68

Resource Consumption Analysis

RESOURCE cpu-time MEASURED IN seconds

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
computer-processor	500	15000
TOTALS	500	15000

RESOURCE paper MEASURED IN page

PROCESSOR CONSUMING	FREQUENCY	AMOUNT CONSUMED
computer-processor	500	75000
TOTALS	500	75000

SECURITY ANALYSIS REPORT

Purpose

To idenfity security conflicts in the design of the target system.

Information Presented

For each name received as input, the report prints a message for each security conflict associated with that name and then, at the end of the report, prints a matrix which summarizes the security conflicts encountered for all the names received as input.

Optionally, the report also produces a list of those names in the data base for which security information is possible but for which such information does not exist.

Format

The format of the report is self-explanatory.

Options and Alternatives

There are only two options:

1) Whether or not to have an index produced.
2) Whether or not to include a list of names without security information.

Analysis

The program searches the data base for each name given as input. If the name is not found, the message:

URA195: MAINSECA : NAME NOT FOUND IN DB -- user-name

is printed and no information is presented for that name. The type of the name is then checked. If its type does not make sense in the context of the Security Analysis Report the message:

URA203: MAINSECA : INPUT NAME HAS INVALID TYPE

is printed and no information is presented for that name.

If the name is a data type (i.e., SET, INPUT, OUTPUT, ENTITY, GROUP or ELEMENT) the following steps are taken:

1) For every name contained in the given name, every classification of the contained name is checked to see that the given (containing) name has the same classification at a level greater than or equal to the level of the contained name.

2) For every PROCESS, PROCESSOR or INTERFACE which accesses the given name, every classification of the given name is checked to see that the accessor has the same classification at a level greater than or equal to the level of the given (accessed) name.

If a classification is found missing, or a level mismatch occurs in one of the above steps, an appropriate message is printed which explains the security conflict.

If the given name is a PROCESS, PROCESSOR or INTERFACE, then the following occurs for each name in the subparts structure of the given name.

Each classification of each data item that the name accesses is checked to see that the accessing name has the same classification at a level greater than or equal to the level of the accessed item. If not, an appropriate message is printed.

Usage

The report can be used to check the consistency of the security provisions of the target system and to identify components of the system for which no security provisions exist.

Examples

Figure 69 represents the output of the following command:

```
SECA N=hourly-paycheck-validation PNSI PNAT NOINDEX
```

FIGURE_69

Security Analysis Report

PARAMETERS FOR: SECA

NAME=hourly-paycheck-validation PRINT-NO-SECURITY-INFORMATION PRINT-MATRIX NOINDEX

The PROCESS actual-time-error-proc has no security information.

The PROCESS actual-time-verification has no security information.

The GROUP address has no security information.

The ELEMENT age has no security information.

The ELEMENT apartment-number has no security information.

The GROUP birthdate has no security information.

The GROUP check has no security information.

The ELEMENT check-number has no security information.

The ELEMENT city has no security information.

The PROCESSOR computer-processor has no security information.

The ELEMENT count-of-hourly-employees has no security information.

The ELEMENT count-of-salaried-employees has no security information.

The ELEMENT cumulative-federal-deductions has no security information.

The ELEMENT cumulative-fica-deductions has no security information.

The ELEMENT cumulative-gross-pay has no security information.

The ELEMENT cumulative-hours has no security information.

The ELEMENT cumulative-state-deductions has no security information.

The ELEMENT cumulative-tax-deductions has no security information.

FIGURE_69

Security Analysis Report

The ELEMENT current-date has no security information.

The ELEMENT department has no security information.

The SET department-file has no security information.

The PROCESS department-file-addition has no security information.

The PROCESS department-file-removal has no security information.

The ENTITY department-information has no security information.

The GROUP department-update-data has no security information.

The INTERFACE departments-and-employees has no security information.

The GROUP emp-termination-data has no security information.

The GROUP employee-name has no security information.

The ELEMENT employment-date has no security information.

The ELEMENT employment-status has no security information.

The ELEMENT error-code has no security information.

The PROCESS federal-deductions-update has no security information.

The ELEMENT federal-tax has no security information.

The PROCESS fica-deductions-update has no security information.

The ELEMENT fica-tax has no security information.

The ELEMENT first-name has no security information.

The PROCESS funds-update has no security information.

The ELEMENT gross-pay has no security information.

The PROCESS gross-pay-update has no security information.

FIGURE_69

Security Analysis Report

The GROUP h-derived-pay-data has no security information.

The GROUP h-emp-report-entry has no security information.

The PROCESS h-gross-pay-computation has no security information.

The PROCESS h-report-entry-generation has no security information.

The PROCESS hire-report-entry-generation has no security information.

The GROUP hired-report-entry has no security information.

The PROCESS hourly-emp-processing has no security information.

The PROCESS hourly-emp-update has no security information.

The PROCESS hourly-employee-processing has no security information.

The INPUT hourly-employment-form has no security information.

The PROCESS hourly-information-creation has no security information.

The PROCESS hourly-information-deletion has no security information.

The GROUP hourly-job-data has no security information.

The PROCESS hourly-paycheck-production has no security information.

The PROCESS hours-emp-update has no security information.

The ELEMENT hours-per-day has no security information.

The PROCESS hours-update has no security information.

The ELEMENT house-number has no security information.

The ELEMENT initial has no security information.

The ELEMENT job-number has no security information.

FIGURE_69

Security Analysis Report

The PROCESS job-rating has no security information.

The ELEMENT job-title has no security information.

The PROCESS name-one has no security information.

The INPUT name-six has no security information.

The INPUT name-two has no security information.

The ELEMENT net-pay has no security information.

The PROCESS net-pay-computation has no security information.

The PROCESS new-employee-processing has no security information.

The ELEMENT number-of-deductions has no security information.

The ELEMENT number-of-employees has no security information.

The ELEMENT overtime-hours-worked has no security information.

The PROCESS pay-computation-validation has no security information.

The ELEMENT pay-date has no security information.

The ELEMENT pay-rate has no security information.

The GROUP pay-stub has no security information.

The INTERFACE payroll-department has no security information.

The SEI payroll-master-information has no security information.

The PROCESS payroll-processing has no security information.

The PROCESSOR payroll-processor has no security information.

The INPUT paysystem-inputs has no security information.

The GROUP personal-data has no security information.

FIGURE_69

Security Analysis Report

The ELEMENT phone has no security information.

The PROCESS process-library has no security information.

The ELEMENT regular-hours-worked has no security information.

The ELEMENT remaining-funds has no security information.

The GROUP s-derived-pay-data has no security information.

The GROUP s-emp-report-entry has no security information.

The PROCESS s-gross-pay-computation has no security information.

The PROCESS s-report-entry-generation has no security information.

The GROUP salaried-emp-pay-data has no security information.

The PROCESS salaried-emp-update has no security information.

The SET salaried-employee-file has no security information.

The ENTITY salaried-employee-information has no security information.

The PROCESS salaried-employee-processing has no security information.

The INPUT salaried-employment-form has no security information.

The PROCESS salaried-information-creation has no security information.

The PROCESS salaried-information-deletion has no security information.

The GROUP salaried-job-data has no security information.

The PROCESS salaried-paycheck-production has no security information.

The PROCESS salaried-paycheck-validation has no security information.

The ELEMENT salary has no security information.

FIGURE_69

Security Analysis Report

The ELEMENT sex has no security information.

The ELEMENT state has no security information.

The PROCESS state-deductions-uplate has no security information.

The ELEMENT state-tax has no security information.

The PROCESS std-time-error-proc has no security information.

The PROCESS std-time-verification has no security information.

The ELEMENT street has no security information.

The ELEMENT supervisor has no security information.

The GROUP surname has no security information.

The PROCESS tax-computation has no security information.

The INPUT tax-withholding-certificate has no security information.

The GROUP term-report-entry has no security information.

The PROCESS term-report-entry-generation has no security information.

The ELEMENT termination-date has no security information.

The PROCESS time-card-audit has no security information.

The PROCESS time-card-correction has no security information.

The ELEMENT total-budget has no security information.

The ELEMENT total-deductions has no security information.

The PROCESS total-deductions-computation has no security information.

The ELEMENT total-hours has no security information.

The PROCESS total-hours-computation has no security information.

FIGURE_69

Security Analysis Report

e PROCESS transaction-listing has no security information.

e PROCESS wage-premium-calculation has no security information.

e PROCESS wage-premium-processing has no security information.

e ELEMENT zip-code has no security information.

e PROCESS hourly-paycheck-validation accesses the GROUP time-card-data
t does not have the security access right classified. It must have this security access right at a level o
or higher in order to access time-card-data.

e PROCESS hourly-paycheck-validation accesses the GROUP time-card-data and has the security access right
p-secret at a level of 2. However, it must have this security access right
a level greater than or equal to 5 in order to access time-card-data.

e PROCESS hourly-paycheck-validation accesses the GROUP hourly-emp-pay-data
t does not have the security access right classified. It must have this security access right at a level o
or higher in order to access hourly-emp-pay-data.

e PROCESS hourly-paycheck-validation accesses the GROUP hourly-emp-pay-data and has the security access rig
p-secret at a level of 2. However, it must have this security access right
a level greater than or equal to 5 in order to access hourly-emp-pay-data.

e PROCESS hourly-paycheck-validation accesses the GROUP error-listing-entry
t does not have the security access right classified. It must have this security access right at a level o
or higher in order to access error-listing-entry.

PROCESS time-card-validation accesses the ELEMENT employee-identification-number
t does not have the security access right classified. It must have this security access right at a level o
or higher in order to access employee-identification-number.

PROCESS time-card-validation accesses the ELEMENT social-security-number
does not have the security access right classified. It must have this security access right at a level o
or higher in order to access social-security-number.

FIGURE_69

Security Analysis Report

The PROCESS time-card-validation accesses the ELEMENT status-code but does not have the security access rig
classified. It must have this security access right at a level of ^ or higher in order to access status-co

FIGURE_69

Security Analysis Report

the following matrix, the row names represent data items
th which the column names are in conflict.

X in entry (i,j) signifies that the name whose column number
j does not have a high enough security level (for one or
re classifications) to access or contain the name whose row
mber is i.

M in entry (i,j) signifies that the name whose column number
j is missing at least one access right or classification
at it must have in order to access or contain the name
cse row number is i.

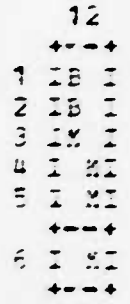
B in entry (i,j) signifies that both the above conditions
ld.

a blank occurs in entry (i,j), the names involved have no
curity conflicts.

ROW NAMES		COLUMN NAMES	
time-card-data	GROUP	1 hourly-paycheck-validation	PROCESS
hourly-emp-pay-data	GROUP	2 time-card-validation	PROCESS
error-listing-entry	GROUP		
employee-identification-number	ELEMENT		
social-security-number	ELEMENT		
status-code	ELEMENT		

FIGURE_69

Security Analysis Report



STRUCTURE

Purpose

To present the implied hierarchy of PROCESSES, INPUTS, OUTPUTS, INTERFACES or PROCESSORS defined in the Analyzer data base, from the use of the SUBPARTS statements relating them.

Information Presented

The report presents all SUBPARTS structures for a given class of names (INTERFACES, INPUTS, OUTPUTS, PROCESSES or PROCESSORS) as specified by the parameters when generating the report.

The structures start with all names which are not PART of any higher structure. These names are designated level 1 names. The SUBPARTS of level 1 names are presented as level 2 names. The SUBPARTS of the level 2 names are then presented and so on.

Format

The report presents the structures under three headings: COUNT, LEVEL, and NAME. NAME presents the name of the object in the structure, LEVEL presents the level number associated to the name corresponding to its position in the structure and COUNT presents the position (line) in the report where the name is printed out. Each level is indented (as specified by the INDENT parameter) to further accent the idea of structure.

A summary section for the report provides a count (under the COUNT heading) of the number of names presented at a given level (as designated by the LEVEL heading).

Options and Alternatives

The INPUT, OUTPUT, PROCESS, INTERFACE and PROCESSOR parameters for the command specify which type of names the report will be produced for. One and only one of these parameters may be specified for the command producing the report.

The number of spaces which each level of the structure is indented may be assigned by the INDENT parameter. If no value is given INDENT defaults to 3, but may take on any value from 1 to 10.

An INDEX for the report is produced when the INDEX parameter is used.

Analysis

A check is made that at least one name (of the name type designated by the parameters) exists in the data base which is not PART of a larger structure. If no such name exists the message:

URA288: STATPS: NO NAMES AT LEVEL ONE -

is printed. For each name found, its SUBPARTS structure is traced and presented in the report.

If a loop is encountered in the structure the message:

URA285: PRRPS: THE FOLLOWING NAMES ARE INVOLVED IN LOOPS -

is printed with the names involved.

Should the structure consist of more than 50 levels (the limit that the software has been designed to handle) the message:

URA284: MAINSTP: TOO MANY LEVELS - CONTINUING -

is printed.

Usage

The report is an aid to analysts in maintaining consistency in structures defined for the target system description. Especially where a top-down approach is being used, the analyst is concerned that names have been inserted into the proper level of a strucutre.

Examples

Figure 70 presents a STRUCTURE report for INPUT names. Figures 71, 72, 73 and 74 present STRUCTURE reports for OUTPUT, INTERFACE, PROCESS, and PROCESSOR names, respectively.

FIGURE_7C

Input Structure

```
PARAMETERS FOR: SIB

   INPUT INDENT=3 MCINDEX

COUNT LEVEL NAME


   1      1 name-six

   2      1 name-two

   3      1 paysystem-inputs
   4        2   time-card
   5        2   hourly-employment-form
   6        2   salaried-employment-form
   7        2   tax-withholding-certificate
   8        2   employment-termination-form



LEVEL COUNT   LEVEL COUNT   LEVEL COUNT   LEVEL COUNT   LEVEL COUNT
   1     3       2     5
```

FIGURE_71

Output Structure

```
PARAMETERS FOR: STP

   OUTPUT INDENT=3 NOINDEX

COUNT LEVEL NAME

   URA288:STATPS  : NO NAMES AT LEVEL ONE
```

FIGURE_72

Interface Structure

```
PARAMETERS FOR: STR

   INTERFACE INDENT=3 NOINDEX

OUNT LEVEL NAME


   1     1 departments-and-employees
   2      2   personnel
   3      2   payroll-department



EVEL COUNT   LEVEL COUNT   LEVEL COUNT   LEVEL COUNT   LEVEL COUNT
   1     1       2     2
```

FIGURE_73

Process Structure

```
PARAMETERS FOR: STP

   PROCESS INDENT=3 NOINDEX

COUNT LEVEL NAME

    1     1 actual-time-error-proc

    2     1 actual-time-verification

    3     1 hourly-emp-processing

    4     1 hours-emp-update

    5     1 job-rating

    6     1 name-one

    7     1 payroll-processing
    8      2   new-employee-processing
    9       3     salaried-information-creation
   10       3     hourly-information-creation
   11       3     hire-report-entry-generation
   12       3     department-file-addition
   13      2   terminating-emp-processing
   14       3     salaried-information-deletion
   15       3     hourly-information-deletion
   16       3     term-report-entry-generation
   17       3     department-file-removal
   18      2   hourly-employee-processing
   19       3     hourly-paycheck-validation
   20        4       time-card-validation
   21       3     hourly-emp-update
   22        4       hours-update
   23       3     h-report-entry-generation
   24       3     hourly-paycheck-production
   25        4       h-gross-pay-computation
   26        4       total-hours-computation
   27      2   salaried-employee-processing
   28       3     salaried-paycheck-validation
```

FIGURE_73

Process Structure

```
COUNT LEVEL NAME
   29       3      salaried-emp-update
   30       3      s-report-entry-generation
   31       3      salaried-paycheck-production
   32        4        s-gross-pay-computation
   33      2    process-library
   34       3      pay-computation-validation
   35       3      tax-computation
   36       3      net-pay-computation
   37       3      total-deductions-computation
   38       3      gross-pay-update
   39       3      federal-deductions-update
   40       3      state-deductions-update
   41       3      fica-deductions-update
   42       3      funds-update

   43     1 std-time-error-proc

   44     1 std-time-verification

   45     1 time-card-audit

   46     1 time-card-correction

   47     1 transaction-listing

   48     1 wage-premium-calculation

   49     1 wage-premium-processing
```

LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT
1	14	2	5	3	29	4	5		

FIGURE_74

Processor Structure

PARAMETERS FOR: SIP

PROCESSOR INSTANCE: DUMMY

COUNT	LEVEL	NAME
1	1	payroll-processor
2	2	validation-clerk
3	2	computer-processor

LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT	LEVEL	COUNT
1	1	2	2						

SUMMARY OF THE DATA BASE

Purpose

This report provides statistical information with respect to the usage of different name types (e.g., PROCESSES, ELEMENTS, etc.) and can be used as an aid in estimating size of the Language description in an Analyzer data base.

Information Presented

The report provides an entry for each different name type (PROCESS, ELEMENT, etc.) defined in a particular data base. For example, if only PROCESSES have been defined, only a PROCESS entry will appear in the report. For each name type the report entry presents:

- The number of names in the data base of that name type (COUNT)
- The number of these names that have SYNONYMS (#W/SYN)
- The percentage of these names with SYNONYMS (PERCENT)
- The number of these names that have a DESCRIPTION (#W/DESC)
- The percentage of these names with a DESCRIPTION (PERCENT)

An entry is also provided consisting of all of the above considering all name types (**TOTAL**) in the data base.

Format

The report presents six columns of information as follows:

name-type COUNT #W/SYN PERCENT #W/DESC PERCENT

in a table format. A row of the table consists of values for each of the above columns. A row is presented for each name type defined in the data base and the name types are presented in alphabetical order. A row is also printed presenting the total for each column. Since there are a limited number of name types, the report always fits on one page.

Options and Alternatives

There are no options available for this report.

Analysis

The software generating the report looks at every name in the data base and updates three fields according to its name type (COUNT), whether or not it has a DESCRIPTION (#W/DESC), and whether or not it has any SYNONYMS (#W/SYN). After all names have been looked at, percentages (PERCENT) for these names with DESCRIPTIONS and SYNONYMS are computed within each name type.

Finally, totals are produced for values retrieved for each table heading and are printed.

If the report is generated for an empty data base, the message:

NO NAMES IN D.B.-

is printed.

Usage

The major benefit of this report is to project management personnel in recording progress being made in the target system description procedure. Comparing a particular DATA BASE SUMMARY with previous summaries allows management to see where some of the work effort has been concentrated. For example, if 52 PROCESSES are counted in the report compared to 12 previously, it shows that the major project effort has been centered around definition of PROCESSES.

General progress may be evaluated by looking at the totals presented for successive reports.

Examples

Figure 75 presents the SUMMARY generated from a description of a target system.

FIGURE_75

Data Base Summary

	COUNT	#W/SYN	PERCENT	#W/DESC	PERCENT
*** UNDEFINED ***	7	0		0	
.TTRIBUTE	9	3		4	44.44
.TTRIBUTE-VALUE	11	0		1	9.09
:ONDITION	7	0		0	
:LEMENT	50	0		12	24.00
:NTITY	3	3	100.00	3	100.00
:VENT	35	0		4	11.43
:ROUP	21	0		5	23.81
:NPUT	8	6	75.00	6	75.00
.NTERVAL	21	1	4.76	0	
.EYWORD	5	0		0	
AILBOX	1	0		0	
EMO	7	0		3	42.86
ROBLEM-DEFINER	13	0		0	
ROCESS	49	3	6.12	5	10.20
NTERFACE	3	3	100.00	3	100.00
ELATION	2	0		2	100.00
ECURITY	3	0		0	
ET	4	4	100.00	4	100.00
OURCE	5	0		0	
YSTEM-PARAMETER	34	0		5	14.71
NIT	2	1	50.00	1	50.00
ROCESSOR	3	1	33.33	1	33.33
ESOURCE	2	1	50.00	1	50.00
ESOURCE-USAGE-PARAMETER	3	1	33.33	1	33.33
LASSIFICATION	4	0		0	
** TOTAL **	312	24	7.69	61	19.55

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INDEX

Purpose

To provide a reference into a particular URA report to locate all occurrences of the use of a particular user defined name in the report.

Information Presented

The report presents all the user defined names used in a given URA report, which must be one of the:

CONTENTS REPORT
DICTIONARY REPORT
EXTENDED PICTURE
FORMATTED-PROBLEM-STATEMENT
FREQUENCY REPORT
INTERVAL CONSISTENCY REPORT
PICTURE
PROCESS CHAIN
PROCESS INPUT/OUTPUT
PROJECTED COST REPORT or
STRUCTURE,

the page numbers in the report where each name occurs, and the number of times the name appears within the pages it occurs (if more than once).

Format

The report consists of an entry for each name used in one of the above reports. The entry consists of:

-the name presented in the report.

-the page numbers (separated by commas) that the name occurs on in the report.

-the number or occurrences (enclosed in brackets) of the name on a particular page.

Each entry is numbered and the entries are arranged in alphabetical order by name.

Options and Alternatives

There are no options for this report.

Analysis

The input for the software producing the INDEX is obtained from one of the report-producing modules which allows the INDEX parameter. If no input is available, because the report presents no information, the message:

URA287: MAINIDX: NO NAMES IN INDEX

is printed if input is available (in the form of names and line numbers) the names are sorted and presented as the INDEX report.

Usage

The INDEX is intended as a reference into a report for purposes of locating all occurrences of the use of a particular name in the report. The INDEX is usually desirable whenever a report over a few pages in size is to be generated.

Examples

Figure 76 presents a PROCESS INPUT/OUTPUT REPORT with an INDEX.

FIGURE_76

Process Input/Output

PARAMETERS FOR: PRIC

NAME=payroll-processing INPUT OUTPUT DESCRIPTION NOPROCIDURE NONE4-PAGE INDEX PRINT NOPUNCH

1* payroll-processing

This process represents the highest level process in the target system. it accepts and processes all inputs and produces all outputs.

*** INPUTS ***

1	paysystem-inputs	RECEIVED
2	paysystem-inputs	USED
3	payroll-master-information	USED

*** OUTPUTS ***

1	payroll-master-information	UPDATED

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FIGURE_76

Index

1 payroll-master-information 172(2)

2 payroll-processing 172

3 paysystem-inputs 172

PART IV

USER REQUIREMENTS ANALYZER

COMMAND DESCRIPTIONS

THE URA COMMAND LANGUAGE

The URA Command Language consists of three basic types of commands:

Report Commands

Modifier Commands

Control Commands

Report Commands retrieve data from the URA data base and output it in some meaningful format. These reports do not change the contents of the data base whatsoever. Their purpose is solely that of displaying orderings and/or relationships within the current problem statement. The following Report Commands are available in this version of the Analyzer:

CONSISTS-COMPARISON
CONSISTS-MATRIX
CONTENTS
DATA-PROCESS
DICTIONARY
DYNAMIC-ANALYSIS
ENTITY-IDENTIFIER
EXTENDED-PICTURE
FORMATTED-PROBLEM-STATEMENT
FREQUENCY
INTERVAL-CONSISTENCY
KWIC
LIST-CHANGES
NAME-GEN
NAME-LIST
PICTURE
PRINT-ATTRIBUTE-VALUES
PROCESS-CHAIN
PROCESS-INPUT-OUTPUT
PROJECTED-COST-REPORT
PUNCH-COMMENT-ENTRY
RESOURCE-CONSUMPTION-ANALYSIS
SECURITY-ANALYSIS
STRUCTURE
SUMMARY

Modifier Commands are intended to modify the contents of the URA data base in the manner defined by the problem definer. These commands take legal URL statements or URL names as input. URA then generates error diagnostics as well as an output report to present the outcome of the data base alteration. The following Modifier Commands are available in this version of the Analyzer:

CHANGE-TYPE
DELETE
DELETE-COMMENT-ENTRY
DELETE-PSL
INPUT-PSL
RENAME
REPLACE-COMMENT-ENTRY

Control Commands are the means to pass certain control information to the User Requirements Analyzer. The SET command, for example, allows the user to define which UPA data base is to be accessed by the Report and Modifier Commands as well as setting various switches and assigning input and output files. Control Commands are installation dependent and therefore are given in Appendix E.

Although any of the commands can be issued independently of each other, it is often advantageous to use some commands in sequence. This means that output of one command can be used as input by another. The most common instance of this is when NAME-GEN is used to select certain names (say all PROCESSES for example) which can then be used as input to a Report Command (possibly PICTURE, for a PICTURE REPORT for all PROCESS names).

THE UPA COMMAND LANGUAGE/INSTALLATION DEPENDENCIES

UPA is a software system that is designed to be used interactively in a time sharing system environment. It contains its own data base management system but it is dependent on the time sharing operating system for the usual facilities of sign on, identification and security, file creation and editing, etc.

Differences in operating systems and operations at particular installations affect the way in which UPA is executed at a particular installation. There are basically three aspects of UPA that are installation "dependent":

1) Control commands

2) Method of initiating and executing UPA

3) File names used by UPA

These dependencies are presented in Appendix E.

UPA can also be used in batch mode at most installations. The commands necessary to accomplish this are also installation dependent and are not covered in this manual.

COMMAND LANGUAGE SYNTAX NOTATION

ABBREVIATIONS

To enable the user to fit a lengthy command on the alotted line and eliminate some of the tedium of command specification, abbreviated forms for both commands and parameters may be used. Each abbreviation can be found in parentheses immediately following the word it represents. For example, the command:

CHANGE-TYPE NAME=GROSS-PAY TYPE=ELEMENT can be written as

CT N=GROSS-PAY T=ELEMENT

BLANKS

A blank must appear between the command and any accompanying parameter, and between successive parameters. Several blanks are treated as a single blank and may be inserted whenever a single blank is necessary. For example:

CT N=GROSS-PAY T=ELEMENT can be written as

CT N=GROSS-PAY T=ELEMENT

BRACES

In the following examples, when parameters or parameter values are enclosed in braces ({ }), a choice among the two or more entries must be made. It is important to note that one and only one of the options must be chosen. For example, the braces used in describing the syntax of the CHANGE-TYPE command specifies that the command must either be of the form:

CT N=user-name T=name-type

or

CT F=fdname [T=name-type]

BRACKETS

Whenever parameter notation in an example appears within brackets ([ ]), it indicates a feature the user may optionally use. For example, the TYPE parameter in the CHANGE-TYPE command is optional when the FILE parameter is also used. Therefore, the command may be of the form:

CT FILE=fdname TYPE=name-type

or

CT FILE=fdname

The syntax of the FILE parameter shows that the parameter may be given either as:

FILE=fdname

or just

FILE

No other variations are acceptable (except those already specified, i.e., abbreviations, etc.).

COMMAND LINE

Each command must appear on a separate line. Only columns 1 through 80 of each line can be used. A command line can be continued on the succeeding line by typing a hyphen or a minus sign ('-') at the end of the current line.

GENERAL COMMAND SYNTAX

The command identifiers (name of the command) must precede any accompanying parameter or list of parameters.

COMMAND PARAMETERS

Parameters for a command separated by one or more blanks. Parameters may be given in any order, but are processed from left to right. If conflicting parameters are used, the right-most parameter, i.e., the last one given, is considered to be correct and is the one used in the processing of the command.

ELLIPSIS

The ellipsis (...) signifies that the command construct immediately preceding the ellipsis can be repeated as many times as desired by the user.

INTEGERS

The integers required for parameters must be positive integers. If a value range is given for a particular parameter description, that restriction must also be met.

NAMES

All user defined names (user-names) must be formed from the legal character set presented in the Appendix I. Note the following:

- A name can be any combination of thirty or less code 3 or code 4 characters where the first character is a letter or other code 3 character.

- Blanks cannot be used in the name.

- A user defined name cannot be a URL RESERVED WORDS. For a list of Reserved words see Appendix B of Part II, URL User's Maual.

For example,

GROSS-PAY, EMPLOYEE-NUMBER, #-of-UNITS @ $.06/lbs.

are all legal names.

PROCESS, 123-HILL-STREET, WHY?, and BL ANK

are illegal names. "PROCESS" cannot be used as a user-name because it is a URL Reserved Word. "123-HILL-STREET" is illegal because it starts with an integer rather than a letter. "WHY" is illegal because it contains the "?" character which is not allowed, and "BL ANK" contains an imbedded blank.

CAPITALIZATION

In this working paper all URA commands, parameters and reserved words appear in upper case. In some systems, such as Multics, where the standard command convention is lower case, the user should use lower case for all URA commands, parameters, and reserved words.

FORMAT OF COMMAND DESCRIPTIONS

All the URA commands in this paper are described in the following format:

Command: COMMAND-NAME Type: command type

Purpose: This presents the function of the command in the URA system whether it generates a report, modifies the data base or gives control information to URA. (The "URA Users Manual" and "URA Reports" present detailed descriptions of the reports generated by each command.)

Prototype: This presents the legal syntax for the command. The Command Language Syntax Notation specifies what the special symbols (such as braces and brackets) represent in interpreting the syntax.

Parameters:

For each parameter available for the command, this section provides a brief description explaining how the parameter changes the action of the command. (Part I and Part III explain how to use these parameters effectively.)

There are basically five types of parameters:

Input data parameters - these parameters specify the data to be used as input to the command. FILE and NAME are examples of Input data parameters.

Input control parameters - these parameters specify how the input data is to be used, changed, etc., by the command. The TYPE parameter for the CHANGE-TYPE command and CONTAINED/CONSISTS parameter for the CONSISTS-MATRIX command are examples of this type.

Output data parameters - these parameters specify if output is to be generated from the command and the form in which it is presented. The PUNCH an PRINT parameters are examples of this type of parameter.

Output option parameters - these parameters specify options which may be included or omitted from the output. The LEVELS parameter for the CONTENTS command and the DESCRIPTION parameter for the DICTIONARY command are examples of this type.

Output format parameters - these parameters specify alternate formats for the presenting the information in the output from the command. The NEW-PAGE parameter and HMARG parameter for the FPS command are examples of this.

The parameters for each command will be presented in the above order according to type.

Defaults: These present which parameters will be used for the command, or what value a parameter will have, if the parameter, or value, is not explicitly defined. For example, if

CONTENTS

is specified, the defaults for this command are such that this has the same effect as specifying:

CONTENTS FILE NOINDEX LEVELS=ALL NONCFLAG

If a "no default" is given, this means that if not explicitly defined, the corresponding parameter will not be used for the command.

Messages: These are the possible error messages that may occur if the parameters for the command are not specified correctly. The "UFA Users Manual" explains what to do should these messages be encountered.

Examples: Actual example of the command syntax are presented. (The results from these examples are presented in Part I and Part III.)

Command: CHANGE-TYPE Type: modifier command

Purpose: To change the name type of a user name defined in the user's data base. A record of this change is generated in the form of the CHANGE-TYPE-REPORT.

Prototype: CHANGE-TYPE(CT) {NAME(N)=user-name TYPE(T)=name-type|
{FILE(F)[=fdname] [TYPE(T)=name-type]}

Parameters:

Input-data FILE(F)[=fdname] Default: no default

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. The file format for each line of the input file must be of the form:

user-name [name-type]

Free format is allowed so the user-name does not have to start in the first position in the line. The two names must be separated by one or more blanks. The name-type is optional. If a name-type is not specified for each user-name, the name type for each of these names will be changed to the type specified in the TYPE parameter. One of these alternative methods of assigning a type must be used, but not both. If both are used, all the names in the file will be assigned the name type specified by the TYPE parameter.

NAME(N)=user-name Default: no default

The given user-name is the name for which the change is to be made. When the NAME parameter is used, the TYPE parameter must be used in conjunction with it.

Input-Control TYPE(T)=name-type Default: no default

This parameter specifies the new name type to be used in the change. See Appendix F of "The User Requirements Language, Language Reference Manual"[2] for a list of all possible name types.

Messages: If neither FILE nor NAME parameter are given, the error message:

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.
[2] Part II, URL User's Manual.

NO NAME GIVEN

will be generated by URA. If one of these two parameters are given, but no TYPE is specified, the error message:

NO TYPE GIVEN WITH "NAME=" OR "FILE" PARAMETER

will be given.

Examples: CHANGE-TYPE NAME=gross-pay TYPE=ELEMENT

CT P T=ELEMENT

CT FILE T=GROUP

Command: CONSISTS-COMPARISON Type: report command

Purpose: To produce the CONSISTS-COMPARISON REPORT.

Prototype: CONSISTS-COMPARISON(CNC) [parameter]...

Parameters:

Input-Data FILE(F)[=FDNAME] Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and the report is produced using all the names in the file. In any case, the names in the input file must be SET, INPUT, OUPUT, ENTITY and/or GROUP names. The format of the input file must be one name per line.

Examples: CNC

CNC FILE

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

Command: CONSISTS-MATRIX Type: report command

Purpose: To produce the CONSISTS MATRIX REPORT.

Prototype: CONSISTS-MATRIX(CM) {CONTAINED(CNTD)}
{CONSISTS(CSTS) } [parameter]...

Parameters:

Input-Data FILE(F)[=FDNAME], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is specified via the NAME parameter, the report is produced only for that name. The format of the input file must be one name per line.

Input-Control CONTAINED(CNTD), CONSISTS(CSTS) Default: no default

Since no default exists, one of the above must be specified. If CONTAINED is given, the names used as input must be ELEMENT, GROUP, ENTITY, INPUT and/or OUTPUT names. If the CONSISTS parameter is given the names used as input must be SET, ENTITY, INPUT, OUTPUT and/or GROUP names.

Messages: If neither CONTAINED nor CONSISTS is specified, the message:

MUST GIVE EITHER CONSISTS OR CONTAINED PARAMETER

will be printed.

Examples: CM N=employee-number CNTD

CM FILE CSTS

CM CSTS

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

Command: CONTENTS Type: Report command

Purpose: To produce the CONTENTS REPORT.

Prototype: CONTENTS(CONT) [parameter]...

Parameters:

Input-Data: FILE(F)[=fdname],NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and the report is produced for all the names in the file. When a name is specified by the NAME parameter, the report is produced for that name alone. In any case, the names used as input to the command must be SET, INPUT, OUTPUT, ENTITY and/or GROUP names. The format of the input file must be one name per line.

Output-Data: INDEX,NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the report consisting of an alphabetical listing of all names used in the report and the pages on which they occur.

Output-Option: LEVELS={integer} Default: LEVELS=ALL
{ALL }

The LEVELS parameter specifies the lowest level of subordinate names to be outputted. The ALL value indicates that all subordinate names should be outputted. LEVELS can take on any integer value from 1 to 50.

NCFLAG,NONCFLAG Default: NONCFLAG

The NCFLAG parameter flags all GROUPS in the output reports that do not CONSIST of anything else, and those undefined names which are contained in a GROUP, INPUT, OUTPUT, ENTITY or SET.

PRINT-SECURITY-INFORMATION(PSI),
NO-PRINT-SECURITY-INFORMATION(NPSI)
Default: PSI

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

The PSI parameter requests that the classification of each entry be printed.

Examples: CONTENTS N=varying-employee-data

CONT F

Command: DATA-PROCESS Type: report command

Purpose: To produce the DATA PROCESS REPORT.

Prototype: DATA-PROCESS(DP)
{DATA(D) } [parameter]...
{PROCESS(P)}

Parameters:

Input-Data

FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. The format of the input file must be one name per line.

When a name is given via the NAME parameter, the report is produced only for that name.

Input-Control

DATA(D), PROCESS(P) Default: no default

Since no default exists, one of the above must be specified. If DATA is specified, the names used as input to the comand must be SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names. If PROCESS is specified, the names used as input to the command must be PROCESS names.

Output-Options

DPMAT, NODPMAT Default: DPMAT

With the DPMAT parameter in effect, the DATA PROCESS INTERACTION MATRIX is presented as part of the report. When NODPMAT is specified, this matrix is not printed.

DPANL, NODPANL Default: DPANL

With the DPANL parameter in effect, analysis is done on the DATA PROCESS INTERACTION MATRIX (whether printed or not) and presented as the DATA PROCESS INTERACTION ANALYSIS. When NODPANL is specified, this analysis is not done.

PMAT, NOPMAT Default: PMAT

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

With the PMAT parameter in effect, the PROCESS INTERACTION MATRIX is presented as part of the report. When NOPMAT is specified, this matrix is not printed.

PANL, NOPANL Default: PANL

With the PANL parameter in effect, analysis is done on the PROCESS INTERACTION MATRIX (whether printed or not) and presented as the PROCESS INTERACTION MATRIX ANALYSIS. When NOPANL is specified, this analysis is not done.

Messages: If neither DATA nor PROCESS is specified, an error message:

MUST GIVE EITHER "DATA" OR "PROCESS" PARAMETER

will be printed.

Examples: DP N=payroll-processing process

DP DATA

Command: DELETE Type: modifier command

Purpose: To delete a name or list of names from the data base. When a name is deleted all of its connections to other names in the data base are also deleted. A permanent record of the change is also generated in the form of the DELETION REPORT.

Prototype: DELETE(DEL)
{FILE(F)[=fdname] }
{NAME(N)=user-name}

Parameters:

Input Data: FILE(F)[=fdname], NAME(N)=user-name
Default: no default

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and all names in the file are deleted from the data base. The format of the input must be one name per line. When a name is specified by the NAME parameter, that name is deleted from the data base.

Messages: If neither the FILE nor NAME parameter is specified, the message:

NO NAME OR FILE WAS SPECIFIED

will be given.

Examples: DELETE N=field-check-new

DEL FILE

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Command: DELETE-COMMENT-ENTRY Type: modifier command

Purpose: To delete from the data base, for the given name or list of names, those comment entries associated with each comment entry statement specified in the list of parameters. A permanent record of the change is generated in the form of the DELETED COMMENT ENTRIES report.

Prototype: DELETE-COMMENT-ENTRY(DCCM)
{FILE(F)[=fdname]}
{NAME(N)=user-name}[parameter]...

Parameters:

Input-Data FILE(F)[=fdname], NAME(N)=user-name
Default: no default

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is given via the NAME parameter, only the specified comment entries for that name are deleted. Either FILE or NAME must be given but not both. The format of the input file must be one name per line.

Input-Control When given as parameters, the comment entries for the following comment entry statements are deleted.

DERIVATION(DER),	NODERIVATION(NDER)	Default: NODERIVATION
DESCRIPTION(DESC),	NODESCRIPTION(NDESC)	NODESCRIPTION
FALSE-WHILE(FW),	NOFALSE-WHILE(NFW)	NOFALSE-WHILE
PROCEDURE(PRCD),	NOPROCEDURE(NPRCD)	NOPROCEDURE
TRUE-WHILE(TW),	NOTRUE-WHILE(NTW)	NOTRUE-WHILE
VOLATILITY(VOL),	NOVOLATILITY(NVOL)	NOVOLATILITY
VOLATILITY-MEMBER(VOLM),	NOVOLATILITY-MEMBER(NVOLM)	NOVOLATILITY-MEMBER

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

VOLATILITY-SET(VOLS), NOVOLATILITY-SET(NVOLS)
NOVOLATILITY-SET

Output-Data PRINT(P), NOPRINT(NP) Default: PRINT

The PRINT parameter initiates the production of a printed DELETED COMMENT ENTRIES report. NOPRINT suppresses the printing.

Messages: If neither the FILE nor NAME parameter are given, the message:

NO NAME OR FILE SPECIFIED

is printed.

Examples: DELETE-COMMENT-ENTRY N=new-info-validation PPCD DESC

DCOM FILE DESC

Command: DELETE-PSL Type: modifier command

Purpose: To delete specific URL statements in the problem definer's data base. These statements used as input to the command are deleted. A permanent record for the change is generated in the form of the DELETED URL report.

Prototype: DELETE-PSL(DPSL) [parameter]...

Parameters:

Input-Data INPUT(I)[=fdname] Default: INPUT=terminal

When INPUT is used and an fdname is specified, the contents of the designated fdname are used as input to the command. This input must be in the same format allowable by the INPUT-PSL command (i.e., legal URL statements). The only exception is that no comment entry statements are allowed in the input (DESCRIPTION, for example). The EOF statement terminates input. If no fdname is specified, its value defaults to the terminal so that the URL statements can be entered interactively.

Output-Data SOURCE(S), NOSOURCE(NS) Default: SOURCE

When the SOURCE parameter is in effect, an AS-IS SOURCE LISTING (the DELETED URL output) of the deleted URL statements is produced. When the NOSOURCE parameter is given, no AS-IS SOURCE LISTING is produced.

XREF(X), NOXREF(NX) Default: NOXREF

The user may desire a cross reference for the AS-IS SOURCE LISTING. This consists of a list of all user-defined names from the input file and the line numbers on which they occur in the DELETED URL report. To accomplish this, the problem definer should specify XREF. When NOXREF is in effect, no cross reference is produced.

Example:
```
DELETE-PSL  NS
DPSL    X
```

Command: DICTIONARY Type: report command

Purpose: To produce the DICTIONARY REPORT for a name or list of names in the user's data base

Prototype: DICTIONARY(DICT) [parameter]...

Parameters:

Input-Data: FILE(F)[=fdname], NAME(N)=user-name
Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for production of the DICTIONARY REPORT. When a name is specified via the NAME parameter, the report is generated for that name alone. The format of the input file must be one name per line.

Output-Data: INDEX, NOINDEX Default: NOINDEX

When given, the INDEX parameter specifies the production of an index to the report. This index consists of an alphabetical listing of all names used in the report and the page(s) on which they occur in the report.

Output-Option: The following four parameters specify the information to be included in the DICTIONARY. The "NO" prefix on a parameter specifies that such information not be included for the name(s).

DESCRIPTION(DESC),
NODESCRIPTION(NDESC) Default: DESCRIPTION

KEYWORDS(KEY), NOKEYWORDS(NKEY)
Default: KEYWORDS

RESPONSIBLE-PD(RPD),
NORESPONSIBLE-PD(NRPD) Default: RESPONSIBLE-PD

SYNONYMS(SYN), NOSYNONYMS(NSYN)
Default: SYNONYMS

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

Output-Format

NUM-SPACE(NS)=integer Default: NUM-SPACE=2

For ease in reading, the number of lines skipped between dictionary entries can be modified by varying this parameter. NUM-SPACE may take on any value between 0 and 10.

Examples: DICTIONARY N=payroll-processing

DICT FILE

Command: DYNAMIC-ANALYSIS Type: report command

Purpose: To produce the DYNAMIC Analysis report

Prototype: DYNAMIC-ANALYSIS(DA) [parameter]...

Parameters:

Input-Data FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is given, that file is used as the input file for the command. The format for the input file must be one name per line. When a name is given via the NAME parameter, the analysis commences with that name and continues with all dynamically related names. Regardless of whether FILE or NAME is specified, all names used as input to this command must be PROCESS, EVENT, CONDITION, or INPUT names.

Output - Option DYNAMIC-ANALYSIS-MATRIX (DAMAT), NODYNAMIC-ANALYSIS-MATRIX(NDAMAT) Default: DAMAT

If the NODAMAT parameter is used, the DYNAMICS ANALYSIS MATRIX will not be printed on the report.

DYNAMICS-ANALYSIS(DANL), NODYNAMICS-ANALYSIS(NDANL)
Default: DANL

If the NODANL parameter is specified, then the analysis of the matrix is not performed and no diagnostics will appear on the report.

ORDER={BYTYPE-ALPHA} Default: ORDER=BYTYPE
{BYTYPE }
{NOBYTYPE }

The BYTYPE-ALPHA option specifies the names in the rows and the columns are sorted by object type and alphabetically within type. The BYTYPE option is similar but the names within each type appear in the order encountered during processing. The order of the object types are CONDITIONS, EVENTS, INPUTS, PROCESSES. The NOBYTYPE option specifies the names in the rows and the columns will be in the order encountered during processing.

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

UTILIZES, NOUTILIZES Default: UTILIZES

The UTILIZES parameter specifies that the UTILIZES relationship between processes should be shown in the matrix.

LINKS=integer Default: LINKS=1000

The LINKS parameter specifies the maximum number of connections between names to be followed in generating the matrix. LINKS may take on any integer value between 1 and 1000, inclusive.

Examples: DYNAMIC-ANALYSIS N=employee-processing-init

NG S='PROCESS OR EVENT OR CONDITION OR INPUT' NP
DA

Command: ENTITY-IDENTIFIER Type: report command

Purpose: To produce the IDENTIFIER INFORMATION REPORT.

Prototype: ENTITY-IDENTIFIER(EI) {IDENTIFIER(I)} [parameter]...
{ENTITY(E) }

Parameters:

Input-Data FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as in the input file for the command. If a name is specified via the NAME parameter, the report is generated for that name alone. The format of the input file must be one name per line.

Input-Control IDENTIFIER(I), ENTITY(E) Default: no default

Since no default is allowed, one of the above must be specified. If IDENTIFIER is specified, the names used as input to the command must be names used as IDENTIFIERS in the data base. If the ENTITY parameter is given, the names used as input must be defined ENTITY names.

Messages: If neither the IDENTIFIER nor ENTITY parameter is specified, the message:

MUST GIVE EITHER ENTITY OR IDENTIFIER PARAMETER

will be given.

Examples: EI N=employee-number I

EI FILE ENTITY

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

Command: EXTENDED-PICTURE Type: report command

Purpose: To produce the EXTENDED-PICTURE report.

Prototype: EXTENDED-PICTURE(EP) [parameter]...

Parameters:

Input-Data: FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the comand. This file is the default PUNCH file for NAME-GEN. If an fdname is given, that file is used as the input file for the command. The format for the input file must be one name per line. When a name is given via the NAME parameter, the report is produced only for that name. Regardless of whether FILE or NAME is specified, all names used as input to this command must be PROCESS, INTERFACE, INPUT, ELEMENT, GROUP, OUTPUT, ENTITY, or SET names.

Output-Data: INDEX, NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the EXTENDED PICTURE report. This index consists of all user-defined names used in the report, in alphabetical order, along with the pages on which they appear in the report.

Output-Option: STRUCTURE(STR), DATA-FLOW(DF) Default: no default

When the STRUCTURE parameter is used, information is obtained for each input name from UTILIZES, SUBPARTS, CONSISTS, and SUBSETS statements, or their complementary statements. This information is then presented in graphical format. When the DATA-FLOW parameter is used, the graphical output shows information obtained for each input name from USED, USED TO DERIVE, USED TO UPDATE, RECEIVED, UPDATES, DERIVES, and GENERATES statements or their complementary statements. Since there is no default, either STRUCTURE or DATA-FLOW must be specified unless the THREAD parameter is used.

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

FORWARD(FWD), BACKWARD(BWD) Default: no default
DOWNWARD(DOWN), UPWARD(UP)

It is frequently convenient to think of FORWARD and BACKWARD as referring to DATA-FLOW and UPWARD and DOWNWARD as referring to STRUCTURE. However, FORWARD and DOWNWARD may be used interchangeably, as may BACKWARD and UPWARD. The FORWARD (or DOWNWARD) parameter causes retrieval of information about each input name based on UTILIZES, SUBPARTS, CONSISTS and SUBSETS statements (for STRUCTURE) or USED, USED TO DERIVE, USED TO UPDATE, RECEIVED, UPDATES, DERIVES, and GENERATES statements (for DATA-FLOW). The BACKWARD (or UPWARD) parameter causes retrieval of information about each input name based on UTILIZED, PART, CONTAINED, and SUBSET statements (for STRUCTURE) or USES, USES TO DERIVE, USES TO UPDATE, RECEIVES, UPDATED, DERIVED, and GENERATED statements (for DATA-FLOW). Since there is no default, one of the above parameters must be specified unless the THREAD parameter is used.

THREAD,NOTHREAD Default: NOTHREAD

When the THREAD parameter is used, it implies the DATA-FLOW FORWARD pair but limits its use to the USED TO DERIVE relationship.

LINKS=integer Default: LINKS=1000

The LINKS parameter specifies the maximum number of links (connections between names) to be followed in producing the report. LINKS can take on any integer value between 1 and 1000, inclusive.

Output-Format

COLUMNS(COLS)=integer Default: COLUMNS=119

The COLUMNS parameter specifies the number of columns to be used for output. The maximum value allowed is 119, and the minimum value allowed is 38.

ROWS=integer Default: ROWS=39

The ROWS parameter specifies the number of rows to be used for output. The maximum value allowed is 39, and the minimum value allowed is 14.

HORIZONTAL-BOXES(HB)=integer Default: (see text)

HORIZONTAL-BOXES specifies the maximum number of boxes containing names to be arranged across the page. The default value is the largest possible value for the given value of COLUMNS, and is computed

as the greatest integer in (COLUMNS-4)/17.

VERTICAL-BOXES(VB)=integer Default: (see text)

VERTICAL-BOXES specifies the maximum number of boxes containing names to be arranged down the page. The default value is the largest possible value for the given value of ROWS, and is computed as the greatest integer in (ROWS-2)/6.

Messages: If the HORIZONTAL-BOXES value used will not fit in the number of COLUMNS specified, the message:

HORIZONTAL-BOXES TOO LARGE FOR NUMBER OF COLUMNS ON PAGE

will be given.

If the VERTICAL-BOXES value used will not fit in the number of ROWS specified, the message:

VERTICAL-BOXES TOO LARGE FOR NUMBER OF ROWS ON PAGE

will be given.

If none of DATA-FLOW, STRUCTURE and THREAD is specified, the message:

NEITHER DATA-FLOW, STRUCTURE NOR THREAD WAS SPECIFIED

will be printed.

If the THREAD parameter is not being used and none of FORWARD, BACKWARD, UPWARD and DOWNWARD is specified, one of the following messages will be printed:

NEITHER FORWARD NOR BACKWARD WAS SPECIFIED
NEITHER UPWARD NOR DOWNWARD WAS SPECIFIED.

Examples:
```
EXTENDED-PICTURE STR DOWN N=process1
FP FILE DF BACKWARD LINKS=5
```

Command: FORMATTED-PROBLEM-STATEMENT Type: report command

Purpose: To produce the FORMATTED PROBLEM STATEMENT for a given name, or list of names and/or to produce this information in the form of PUNCH data.

Prototype: FORMATTED-PROBLEM-STATEMENT(FPS) [parameter]...

Parameters:

Input-Data

FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME=GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is given via the NAME parameter, the report is produced only for the name specified. The format of the input file must be one name per line.

Output-Data

INDEX, NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the FPS. This index consists of an alphabetical listing of all user defined names used in the FORMATTED PROBLEM STATEMENT and the page(s) on which they occur.

PRINT(P), NOPRINT(NP) Default: PRINT

The NOPRINT parameter specifies that no printed output report will be produced. The PRINT parameter specifies the production of the FORMATTED PROBLEM STATEMENT.

PUNCH[=fdname], NOPUNCH Default: NOPUNCH

The PUNCH parameter specifies that PUNCH data should be generated and written into the designated PUNCH file. When the PUNCH parameter is used and no fdname is designated, the data is written into the default PUNCH file.[1] This file is the default PUNCH file for the command. If an fdname is indicated, that file is used as the PUNCH file. With the NOPUNCH parameter in effect, no action is taken to generate PUNCH data.

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Output-Option

COMMENT(COM), NOCOMMENT(NCOM) Default: COMMENT

The COMMENT option, when in effect, specifies the inclusion of comments for undefined names. The NOCOMMENT option suppresses these comments.

DEFINE(DEF), NODEFINE(NDEF) Default: DEFINE

With the DEFINE option in effect, DEFINE sections are included in the report. The NODEFINE option specifies that no DEFINE sections are included in the FORMATTED PROBLEM STATEMENT.

DESG(DG), NODESG(NDG) Default: DESG

The DESG option, when in effect, indicates that DESIGNATE sections are provided for SYNONYM names in the FORMATTED PROBLEM STATEMENT. The NODESG option suppresses the production of such output.

EMPTY, NOEMPTY Default: (see text)

When EMPTY is in effect (the default when the PUNCH parameter is also used) the PUNCH file is emptied before PUNCH data is written into it. When NOEMPTY is in effect (the default when PUNCH is not used) no action is taken to empty the PUNCH file.

ALL-STATEMENTS(AS),NOALL-STATEMENTS(NAS)
Default: NOALL-STATEMENTS

The ALL-STATEMENTS option specifies that all legal statements for each section will be printed in the FORMATTED PROBLEM STATEMENT whether information was supplied or not.

DLC-COMMENT(DLCC), NODLC-COMMENT(NDLCC)
Default: DLC-COMMENT

When the DLC-COMMENT parameter is in effect, each name in the Formatted Problem Statement includes a comment which indicates the date and time of the last change made to that name. The NODLC-COMMENT suppresses the printing of these comments.

LINE-NUMBERS(LNS),NOLINE-NUMBERS(NLNS)
Default: LINE-NUMBERS

Specifies whether or not line numbers are to be produced in the printed output.

PRINTEOF(PEOF),NOPRINTEOF(NPEOF) Default: PRINTEOF

Specifies whether an extra line containing EOF is to

be produced at the end of the output.

COMPLEMENTARY-STATEMENTS(COMP)
NOCOMPLEMENTARY-STATEMENTS(NCOMP)

Default: COMPLEMENTARY-STATEMENTS

Specifies whether complementary statements are to be produced. If the NOCOMPLEMENTARY-STATEMENTS option is in effect, then the number of statements and lines in the output is the minimum which contains all the information in the data base.

Output-Format

AMARG(AM)=integer Default: AMARG=10

The AMARG parameter indicates the column at which the first name of a name pair is to be outputted. An example of a name pair can be found in the ATTRIBUTE statement where the syntax requires an ATTRIBUTE name and ATTRIBUTE-VALUE. AMARG must take on some value greater than SMARG and less than BMARG.

BMARG(BM)=integer Default: BMARG=25

The BMARG parameter indicates the column at which the second name of a pair is to be outputted. BMARG must take on some value greater than AMARG and less than RNMARG-30.

CMARG(CM)=integer Default: CMARG=1

The CMARG parameter specifies the number of columns from SMARG the text (comment entry) for a comment entry statement begins. CMARG must take on some value greater than 0 and less than RMARG-72.[1]

HMARG(HM)=integer Default: HMARG=40

This parameter specifies the column where the user defined name in a section header statement are to be printed on the output. HMARG must take on some value greater than SMARG and less than RMARG-30.[1]

NEW-LINE(NL), NONEW-LINE(NNL) Default: NONEW-LINE

When the NEW-LINE parameter is given, the first name of a name list associated with a statement will appear on the line succeeding the statement identifier (name of the statement). The NONEW-LINE parameter initiates the list on the same line as the statement identifier.

---

[1] RMARG has the value 119 unless changed at the installation.

NEW-PAGE(NPG), NONEW-PAGE(NNPG)
Default: NONEW-PAGE

When given, the NEW-PAGE parameter specifies that each section of the FPS be printed on a separate page. NONEW-PAGE signifies that the sections will follow one another on a page within the page size restrictions. In any case, interrupted sections will be continued on succeeding pages.

NMARG(NM)=integer Default: NMARG=20

The NMARG parameter indicates the column in which the name or first name of a name list for any statement will be outputted. NMARG must take on some value greater than SMARG and less than RNMARG-30.

ONE-PER-LINE(OPL), SEVERAL-PER-LINE(SPL)
Default: ONE-PER-LINE

The ONE-PER-LINE option indicates that the names in a name list for any statement will appear on succeeding lines. SEVERAL-PER-LINE option signifies that names in a name list will appear on the same line.

RNMARG(RM)=integer Default: RNMARG=70

Specifies the right-hand margin for names in a name list when the SEVERAL-PER-LINE parameter is in effect. RNMARG must take on some value greater than MAX(BMARG, NMARG)+29 and less than RMARG-30.[1]

SMARG(SM)=integer Default: SMARG=5

The SMARG parameter indicates the column in which the statement identifier (name of the statement) will be started. SMARG must take on some value greater than 0 and less than MIN(AMARG, NMARG).

Examples: FPS N=field-check-new

FPS FILE

---

[1] RMARG has the value 119 at the installation.

Command: FREQUENCY Type:report command

Purpose: To produce the FREQUENCY REPORT.

Prototype: FREQUENCY(FREQ) [Parameter]...

Parameters:

Output-Data INDEX,NOINDEX Default: NOINDEX

The Index parameter specifies production of an index for the frequency report. This index consists of all user defined names used in the report in alphabetical order and the pages on which they appear in the report.

Output-Data ORDER = {ALPHA } Default: ORDER=BYTYPE
{BYTYPE}

With ORDER equal to ALPHA, the report presents the names within INTERVAL in alphabetical order by name. BYTYPE signifies that the names are grouped by name type within INTERVALS with the types alphabetically ordered and names within the same type ordered alphabetically by name.

NEW-PAGE(NPG),NONEW-PAGE(NNPG) Default: NONEW-PAGE

When the NEW-PAGE parameter is in effect, each complete data structure in the report will start on a separate page. When the NONEW-PAGE parameter is in effect, the data structure will follow one another within page size restrictions. Interrupted structures will be continued on succeeding pages.

Examples: FREQUENCY ORDER=ALPHA NEW-PAGE INDEX
FREQ

Comand: HELP

Purpose: To provide the on-line user with a list of possible commands for URA or information about the parameters for a particular URA command.

Prototype: HELP [parameter]...

Parameters:

Command-name Default: (see text)

If no command-name is given, a list of currently available URA commands is given. If a command-name is given, then the parameters for that command are presented. Abbreviations for the command-name are also acceptable.

SHORT, LONG Default: SHORT

If SHORT is given, only the parameters for the given command are printed. If LONG is given, explanations of the various parameters are also printed.

Examples: HELP FPS LONG

HELP CONTENTS

Command: INPUT-PSL Type: modifier command

Purpose: To add information to the URA data base to expand or modify the problem statement. A permanent record of the change can be generated in the form of the AS-IS SOURCE LISTING and URA CROSS REFERENCE.

Prototype: INPUT-PSL(IP) [parameter]...

Parameters:

Input-Data: INPUT(I)=fdname Default: INPUT=terminal

When INPUT is specified, the contents of the designated fdname are used as input to the command. This input must be in the format of legal URL statements as specified by Part II, URL User's Manual. The EOF statement terminates input. If the INPUT parameter is not specified, input is read from the terminal so that the URL statements can be entered interactively.

Input-Control: DBREF(D), NODBREF(ND) Default: DBREF

The DBREF parameter allows the referencing of the data base by URA in its syntax and semantic analysis. When given, NODBREF allows the analyzer to only perform a syntax check of the input.

UPDATE(U), NOUPDATE(NU) Default: NOUPDATE

With the UPDATE parameter given, the input will update the URA data base. NOUPDATE indicates that the data base is not to be changed.

Output-Data: SOURCE(S), NOSOURCE(NS) Default: SOURCE

When the SOURCE parameter is in effect, AS-IS SOURCE LISTING of the input URL is produced. When the NOSOURCE parameter is given, the listing is not produced.

XREF(X), NOXREF(NX) Default: NOXREF

XREF specifies that a URA CROSS REFERENCE is to be generated for the AS-IS SOURCE LISTING. This consists of a list of all user defined names from the input file and the line numbers on which they occur in the AS-IS SOURCE LISTING.

Examples: INPUT-PSL XREF UPDATE
IP U

Command: INTERVAL-CONSISTENCY Type: report command

Purpose: To produce the INTERVAL CONSISTENCY REPORT

Prototype: INTERVAL-CONSISTENCY(IC) [parameter]...

Parameters:

Input-Data FILE(F)[=fdname],NAME(N)=user-name Default:FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is given via the NAME parameter, the report is produced only for the name specified. The format of the input file must be one name per line. The names given as input to this command must be INTERVAL names.

Output-Data INDEX,NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the report consisting of an alphabetical listing of all names used in the report and the pages on which they appear.

Output-Option LEVELS={integer} Default:LEVELS=ALL
{ALL }

The LEVELS parameter specifies the lowest level of subordinate INTERVAL names to be printed. The ALL value indicates that all subordinate names should be printed. LEVELS can take on any integer value from 1 to 100.

Examples:

```
INTERVAL-CONSISTENCY N=year

NG S="INTERVAL" NP
IC F LEVELS=3
```

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Command: KWIC Type: report command

Purpose: To produce a KWIC INDEX for a list of names.

Prototype: KWIC [parameter]...

Parameters:

Input-Data FILE(F)[=fdname] Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the comand. The format of the input file must be one name per line.

Output-Format DIF=integer Default: DIF=20

DIF is the number of spaces allowed between the keyword and the rest of the name as it appears in the output. DIF must take on some value greater than 1 and less than 53.

Examples: KWIC DIF=10

KWIC

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Command: LIST-CHANGES Type: report command

Purpose: To produce the LIST CHANGES REPORT

Prototype: LIST-CHANGES(LC) [parameter]...

Parameters:

PRINT(P), NOPRINT(NP) Default: PRINT

Output-Option

When the PRINT parameter is in effect, the list of changes is printed along with the report. This includes the change sequence number, the name of the command which changed the data base, and the date and time of the session in which the change was made.

USER, NOUSER Default: NOUSER

When the USER parameter is in effect, the list of changes is printed on the terminal (or the line printer in batch mode). This is useful when one wishes to examine the list of changes at the same time the report is being produced on the line printer, for instance.

Command: NAME-GEN Type: report command

Purpose: To produce the NAME-GEN report and/or retrieve certain names to be put in a PUNCH file and used as input to other commands.

Prototype: NAME-GEN(NG) [parameter]...

Parameters:

Output-Data

PRINT(P), NOPRINT(NP) Default: PRINT

The PRINT parameter initiates the production of the Name Generation Report: NOPRINT suppresses printing of the report.

PUNCH[=fdname], NOPUNCH Default: PUNCH

The PUNCH parameter specifies that PUNCH data should be generated and written into the designated PUNCH file. When the PUNCH parameter is used and no fdname is designated, the data is written into the default PUNCH file.[1] This file is used as the PUNCH file. With the NOPUNCH parameter in effect, no action is taken to generate PUNCH data.

Output-Option

EMPTY, NOEMPTY Default: (see text)

When EMPTY is in effect (the default when the PUNCH parameter is also used) the PUNCH file is emptied before the list of names is written into it. When NOEMPTY is in effect (the default when PUNCH is not used) no action is taken to empty the PUNCH file. When PUNCH and NOEMPTY are specified together, the punched output appears at the end of the list of names already in the file.

TIME-OF-LAST-CHANGE(TLC), NOTIME-OF-LAST-CHANGE(NTLC)
Default: NOTIME-OF-LAST-CHANGE

When this parameter is specified, the time, date and nature of the last change will appear with each name in the printed output (But not in the PUNCH file).

SELECTIONS(S)='(boolean expression)',
INPUT(I)[=fdname] Default: INPUT=terminal

The SELECTION parameter is used to retrieve names of particular name types or which meet various selection criterion. The contents of the boolean expression

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

specifies the types of names to be retrieved and how they are to be selected.

If the boolean expression (without primes) is stored in a file, the expression may be used to select names when the file is specified by the INPUT parameter.

A boolean expression consists of the following objects:

1. Operands

An explanation of each operand is given below.

NAME-TYPE

The following name types may be used as operands:

ATTRIBUTE	INTERFACE	RESOURCE
ATTRIBUTE-VALUE	INTERVAL	RESOURCE-USAGE-PARAMETER
CLASSIFICATION	KEYWORD	SECURITY
CONDITION	MAILBOX	SET
ELEMENT	MEMO	SOURCE
ENTITY	OUTPUT	SUBSETTING-CRITERION
EVENT	PROBLEM-DEFINER	SYSTEM-PARAMETER
GROUP	PROCESS	TRACE-KEY
INPUT	PROCESSOR	UNDEFINED
		UNIT

ALL

When the ALL operand is specified, the names of all name types except SYNONYM and UNDEFINED will be presented.

TOTAL

When the TOTAL operand is specified, every name in the data base will be presented.

BASIC

When the BASIC operand is specified, the basic names will be included in the output. The "Basic" names are those names which are not SYNONYMS.

UNDEFINED

When the UNDEFINED operand is specified, the undefined names will be presented.

ATTR=attr-name[,value]

When the ATTR operand is specified, those names with the given user-name as an ATTRIBUTE are selected to be part of the output. The user-name must be a name defined as an ATTRIBUTE in the data base.

If an ATTRIBUTE-VALUE is specified as part of the user-name, then only those names with the given user-name as an ATTRIBUTE-VALUE, for the ATTRIBUTE designated by the ATTR parameter, are selected to be part of the output. The user-name must be an ATTRIBUTE-VALUE name in the data base.

SUBPARTS-OF(SO)=user-name[,level]

All names which belong to the SUBPARTS structure for a given name (as would be retrieved for the STRUCTURE report) can be retrieved by specifying:

SUBPARTS-OF=name

where the name is an INPUT, OUTPUT, PROCESS or INTERFACE name which has SUBPARTS information defined for it. The number of levels to go down and retrieve names to present in the report is specified by the SUBLEVEL parameter or by attaching a command a level number after the user-name with the SUBPARTS-OF parameter.

If SUBLEVEL=ALL, then all levels of names are presented. If SUBLEVEL=1, then only those names which are PART OF the SUBPARTS-OF name are presented. The following picture may clarify the association between the value of SUBLEVEL and the names presented.

```
                S1          SUBPARTS-OF name

          S2    S3    S4    SUBLEVEL=1

   S5     S6    S7          SUBLEVEL=2

S8   S9      S10   S11      SUBLEVEL=3

                             SUBLEVEL=ALL
```

Generation of the report with SUBPARTS-OF=S1 and SUBLEVEL=3

would present S2, S3, S4, S5, S6, S7, S8, S9, S10 and S11 in the report. Generation of the report with SUBPARTS-OF=S1 AND SUBLEVEL=1 would present the names S2, S3 and S4. If either the level nor SUBLEVEL parameter are specified, the default is ALL levels.

SYNONYMS

When the SYNONYMS operand is specified, all SYNONYMS are presented for each name retrieved in the report in addition to the basic form of the name. If only the SYNONYMS are desired, the basic names may be suppressed by specifying the NOBASIC and SYNONYM parameters. With standard defaults in effect, the BASIC and NOSYNONYM parameters are used.

KEY=user-name

When the KEY operand is specified, those names with the given user-name as a KEYWORD are selected to be part of the output. The user-name must be a name defined as a KEYWORD in the data base.

MAX-CHANGE-NUMBER(MAXC)={integer|LAST|LAST-integer}

This parameter retrieves all names with a change number less than or equal to the specified integer. LAST-integer should not result in a negative value. The default if this criteria is not given is LAST.

MIN-CHANGE-NUMBER(MINC)={integer|LAST|LAST-integer}

This parameter retrieves all names with a change number greater than or equal to the specified integer. LAST-integer should not result in a negative value. The default if this criteria is not given is 1.

PD=user-namme

When the PD operand is specified those names with the given user-name as a PROBLEM-DEFINER are selected to be part of the output. The user-name must be a name defined as a PROBLEM-DEFINER in the data base.

SOURCE=user-name

When the SOURCE operand is specified, those names with given user-name as a SOURCE will be included in the output. The user-name must be defined as a SOURCE in the data base.

SECURITY=user-name

When the SECURITY operand is specified, those names with given user-name as a SECURITY will be included. The user-name must be defined as SECURITY name in the data base.

USAGE={ID|IDENTIFIER}

When the USAGE operand is specified, those names which are used as IDENTIFIERS in the data base are selected to be part of the output. The syntax of the Language only allows ELEMENT, GROUP and UNDEFINED names to be IDENTIFIERS.

2. Operators

An explanation of each operator is given below.

NOT, ¬

The NOT operator placed before an operand specifies that the names associated with that operand will not be retrieved. For example, a boolean expression of the form NOT PROCESS means that all names in the data base except for PROCESS names will be retrieved.

AND,& ,*

The AND operator specifies that any name retrieved from the data base must meet the criterion designated before and after the AND operator. For example, a boolean expression of the form PROCESS AND KEY=level-1 means that any name retrieved must be a PROCESS name as well as have the KEYWORD "level-1" attached to it.

OR,|,+

The OR operator specifies that any name retrieved from the data base must either meet the criterion designated before the OR operator, or after the operator, or both. For example, a boolean expression of the form PROCESS OR KEY=level-1 means that any name retrieved must be either a PROCESS name, or have the KEYWORD "level-1", or be both a PROCESS and have the KEYWORD "level-1".

3. Other Notations

{ }

Braces may be used to group operands and operators in a boolean expression.

The following rules apply to the formation of boolean expressions to be used with the SELECTION parameter of the NAME-GEN command.

The following notation is used to define a boolean expression:

exp - boolean expression
opd - operand
opr - operator

1) A boolean expression (exp) can only be in one of the following forms:

a) opd
b)[1] ¬ exp
c) {exp}
d) exp opr exp

2) A boolean operator (opr) must be one of the following (equivalent operators are listed in parentheses):

a) & (AND,*)
b) | (OR,+)

3) A boolean operand (opd) must be one of the allowable options for the SELECTION parameter as listed below:

a) name-type
b) KEY=user-name
c) PD=user-name
d) SOURCE=user-name
e) SECURITY=user-name
f) USAGE={ID|IDENTIFIER}
g) ATTR=user-name
h) ATTR=user-name,user-name
i) ATTR=user-name,integer
j) SUBPARTS-OF(SO)=user-name
k) SUBPARTS-OF(SO)=user-name,ALL
l) SUBPARTS-OF(SO)=user-name,integer
m) SUBLEVEL(SL)={ALL|integer}
n) MAX-CHANGE-NUMBER(MAXC)={integer|LAST|LAST-integer}
o) MIN-CHANGE-NUMBER(MINC)={integer|LAST|LAST-integer}

---

[1] The form "¬ exp" can also be written as "not exp" or "¬exp".

A name-type option can be any of the following:

ATTRIBUTE(ATTR)	PROCESSOR(PRCR,PROCR)
ATTRIBUTE-VALUE(ATTV)	REAL-WORLD-ENTITY(RWE)
CLASSIFICATION(CLS)	RELATION(RLN)
CONDITION(COND)	RESOURCE(RSC)
ELEMENT (ELE)	RESOURCE-USAGE-PARAMETER(RUP)
ENTITY(ENT)	SECURITY(SEC)
EVENT(EV)	SET
GROUP (GR)	SOURCE(SRC)
INPUT(INP)	SUBSETTING-CRITERION(SSCN)
INTERFACE(INTF)	SYSTEM-PARAMETER(SYSP)
INTERVAL(INT)	TRACE-KEY(TK)
KEYWORD(KEY)	UNDEFINED
MAILBOX(BOX)	UNIT
MEMO	ALL
OUTPUT(OUT)	TOTAL
PROBLEM-DEFINER(PD)	BASIC
PROCESS(PROC)	SYNONYM(SYN)
PROCESS(PROC)	

The rules which must be followed in specifying these boolean expressions are as follows:

1) Any number of blanks in a boolean expression may occur:

a) on either side of an operand
b) before and after the symbol "¬"
c) before and after the symbols "(" and ")"
d) on either side of an operator

2) No blanks may occur within an operator and no substitutes, other than the specified symbols are allowed to represent operators.

3) No blanks may occur within an operand and no operands other than the specified operands may be used.

4) Blanks must delimit the operators "AND", "OR", and "+".

5) Assume that AND has precedence over OR when parentheses are not given. For example, the expression ELEMENT AND GROUP OR KEY=low is interpretted as (ELEMENT AND GROUP) OR KEY=low rather than ELEMENT AND (GROUP OR KEY=low).

6) A "¬" is assumed to belong to the immediately following operand unless specified otherwise. For example, the expression ¬ PROCESS OR ELEMENT would be interpretted as (¬ PROCESS) OR ELEMENT rather than ¬ (PROCESS OR ELEMENT).

7) A boolean expression may be continued over several lines when the last character on the line is a dash (-), when it appears in the ordinary command stream. When INPUT= is specified, the boolean expression must appear in card image

format, with no operands broken between lines and no dashes for continuation.

The following boolean expressions are illegal for the NAME-GEN command:

1) PROCESS OR { GROUP KEYWORD=level-1}

No operator between operands GROUP and KEYWORD

The following boolean expressions are legal:

1) ELEMENT OR GROUP OR ENTITY

2) PROCESS AND KEYWORD=s1 OR KEYWORD=level-1

3) { GROUP | ELEMENT } AND ATTR=type,character

Output-Format

ORDER={BYTYPE|ALPHA|attr-name|TIME-OF-LAST-CHANGE}
Default: ORDER=BYTYPE

The ORDER parameter specifies how the names retrieved are to be ordered (in the PUNCH file and the report).

When ORDER=ALPHA, all names retrieved are presented in alphabetical order by name. When ORDER=BYTYPE, all names retrieved are grouped by the name types associated with them. The names types are ordered alphabetically as are the names within each name type group. When ORDER=attr-name or ORDER=attr-name-synonym, all names retrieved are presented in alphabetical order of the values they have for the specified ATTRIBUTE name. Names which do not have the specified ATTRIBUTE are placed at the beginning of the list of names.

When ORDER=TIME-OF-LAST-CHANGE, all names retrieved are sorted on the date and time of last change. In addition to the four different orderings that may be specified, an ordering list may be given which allows up to five levels of ordering on the retrieved names. All options in the list must be separated by commas. No blanks may appear in the list. The names are ordered first on the first option in the ordering list; within that ordering, on the second option in the ordering list, etc. Some examples of using the ordering list are:

ORDER=BYTYPE,length,type
ORDER=level,BYTYPE
ORDER=BYTYPE,TIME-OF-LAST-CHANGE

Examples

```
NG S='PROCESS AND KEY=level-2'

NG S='(NOT PROCESS) * KEY=level-2'

NG S='ATTR=occurrence,unscheduled'

NG S='SO=Security-control-input'

NG S='SO=security-control-input,1'
                          ORDER=BYTYPE,occurrences
```

Command: NAME-LIST Type: report command

Purpose: To produce the NAME LIST report.

Prototype: NAME-LIST(NL) [parameter]

Parameters:

Output-Format ORDER={ALPHA } {BYTYPE} Default: ORDER=BYTYPE

If ORDER=ALPHA is specified, the list is ordered by the name of the object. If ORDER=BYTYPE is specified, the order is alphabetical by name type, with objects of the same type being order by name.

Output-Format COLUMN(COL)={SYN } {TYPE} Default: COLUMN=TYPE

If COLUMN=TYPE, the TYPE column will be printed before the SYNONYM column. If COLUMN=SYNONYM, the SYNONYM column will be printed before the TYPE column.

Output-Option TYPE,NOTYPE Default: TYPE

With the TYPE parameter in effect, the name-type for each name in the list will be presented. NOTYPE suppresses the printing of the TYPE column.

SYNONYM(SYN), NOSYNONYM(NSYN) Default: SYNONYM

With the SYNONYM parameter in effect, the SYNONYMS for each name in the list will be presented. NOSYNONYM suppresses the printing of the SYNONYM column.

DATE-LAST-CHANGED(DLC),NODATE-LAST-CHANGED(NDLC)
Default: DATE-LAST-CHANGED

When the DATE-LAST-CHANGED parameter is in effect, the date of last change of each name is printed out on the same line as the name. The NODATE-LAST-CHANGED parameter causes these dates to be omitted from the report.

Examples: NAME-LIST

NL ORDER=ALPHA NSYN

Command: PICTURE Type: report command

Purpose: To produce the PICTURE report.

Prototype: PICTURE(PIC) [parameter]...

Parameters:

Input-Data FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is given via the NAME parameter, the report is produced only for that name. In any case, the names used as input to this command must be INTERFACE, PROCESS, SET, INPUT, OUTPUT, ENTITY, GROUP and/or ELEMENT names. The format of the input file must be one name per line.

Output-Data INDEX, NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the PICTURE report. This index consists of all user defined names used in the report, in alphabetical order and the pages on which they appear in the report.

Output-Option DATA(D), NODATA(ND) Default: DATA

With the DATA parameter in effect, information applicable and available for the given name, or list of names other than structure or flow data is printed on the output. NODATA inhibits such action.

FLOW, NOFLOW Default: FLOW

This parameter presents flow information in the PICTURE report. It presents RECEIVES and GENERATES information between INPUTS and OUTPUTS with PROCESSES and INTERFACES. It also presents USES and DERIVES information between PROCESSES and data (such as SETS, ENTITIES, GROUPS and ELEMENTS).

STRUCTURE(STR), NOSTRUCTURE(NSTR) Default: STRUCTURE

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

When the STRUCTURE parameter is in effect, the information available in the SUBPARTS, CONSISTS and/or SUBSETS statements and their complementary statements for the input name(s) appears in the report.

Examples: PICTURE N=paycalc-updating

PIC N=payroll-processing NODATA NOFLOW

Command: PRINT-ATTRIBUTE-VALUES Type: report command

Purpose: To produce the ATTRIBUTE REPORT.

Prototype: PRINT-ATTRIBUTE-VALUES(PAV) [parameter]...

Parameters:

Input-Data FILE(F)[=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. The input file format must be one ATTRIBUTE name per line. When a name is specified by the NAME parameter, the report is generated for that name only. In any case, only ATTRIBUTE names may be used as input to this command.

Examples: PRINT-ATTRIBUTE-VALUES FILE

PAV N=TYPE

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

Command: PROCESS-CHAIN Type: report command

Purpose: To produce the PROCESS CHAIN report.

Prototype: PROCESS-CHAIN(PC) [parameter]...

Parameters:

Input-Data

FILE(F)[=fdname],NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is given, that file is used as the input file for the command. The format for the input file must be one name per line. When a name is given via the NAME parameter, the report is produced only for that name. Regardless of whether FILE or NAME is specified, all names used as input to this command must be EVENT or PROCESS names.

Output-Data

INDEX, NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the PROCESS CHAIN report. This index consists of all user-defined names used in the report, in alphabetical order, along with the pages on which they appear in the report.

Output-Option

LINKS=integer Default: LINKS=1000

The LINKS parameter specifies the maximum number of links (connections between names) to be followed in producing the report. LINKS can take on any integer value between 1 and 1000, inclusive.

DEPENDING-ON (DEP), NODEPENDING-ON (NDEP)
Default: NODEPENDING-ON

When the DEPENDING-ON parameter is used, the report indicates whether a DEPENDING-ON clause is in effect for a given relationship.

FOR-EACH (FEA), NOFOR-EACH (NFEA)
Default: NOFOR-EACH

When the FOR-EACH parameter is used, the report indicates whether a FOR-EACH clause is in effect for a given relationship.

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Output-Format

COLUMNS(COLS)=integer Default: COLUMNS=119

The COLUMNS parameter specifies the number of columns to be used for output. The maximum value allowed is 119, and the minimum value allowed is 38.

ROWS=integer Default: ROWS=39

The ROWS parameter specifies the number of rows to be used for output. The maximum value allowed is 39, and the minimum value is 14.

HORIZONTAL-BOXES(HB)=integer Default: (see text)

HORIZONTAL-BOXES specifies the maximum number of boxes containing names to be arranged across the page. The default value is the largest possible value for the given value of COLUMNS, and is computed as the greatest integer in (COLUMNS-4)/17.

VERTICAL-BOXES(VB)=integer Default: (see text)

VERTICAL-BOXES specifies the maximum number of boxes containing names to be arranged down the page. The default values is the largest possible value for the given value of ROWS, and is computed as the greatest integer in (ROWS-2)/6.

Messages: If the HORIZONTAL-BOXES value used will not fit in the number of COLUMNS specified, the message:

HORIZONTAL-BOXES TOO LARGE FOR NUMBER OF COLUMNS ON PAGE

will be given.

If the VERTICAL-BOXES value used will not fit in the number of ROWS specified, the message:

VERTICAL-BOXES TOO LARGE FOR NUMBER OF ROWS ON PAGE

will be given.

Examples: PROCESS-CHAIN N=event1

PC FILE LINKS=4 INDEX

Command: PROCESS-INPUT-OUTPUT Type: report command

Purpose: To produce the PROCESS INPUT/OUTPUT report.

Prototype: PROCESS-INPUT-OUTPUT(PRIO) [parameter]...

Parameters:

Input-Data FILE(F)=[fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and the report is produced using all the names in the file. When a single name is specified by the NAME parameter, the report is produced for that name alone. Either FILE or NAME can be used but not both. In any case, all the names used as input to this command must be PROCESS names. The input file format is one PROCESS name per line.

Output-Data INDEX, NOINDEX Default: NOINDEX

When given, the INDEX parameter specifies the production of an index into the report. The index consists of all input and output names in the report, in alphabetical order and the page(s) on which they occur in the report.

PRINT(P), NOPRINT(NP) Default: PRINT

The NOPRINT parameter specifies that no printed output report will be produced. The PRINT parameter specifies the production of the PROCESS INPUT/OUTPUT report.

Output-Option DESCRIPTION(DESC), NODESCRIPTION(NDESC) Default: DESCRIPTION

When the DESCRIPTION parameter is in effect, the comment-entry associated with the DESCRIPTION statement, for all PROCESS used as input, is retrieved and printed on the report. NODESCRIPTION specifies that this information is not to be retrieved.

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

PROCEDURE(PRCD), NOPROCEDURE(NPRCD)
Default: NOPROCEDURE

When the PROCEDURE parameter is specified, the comment entry associated with the PROCEDURE statement, for each PROCESS name used as input, is retrieved and printed on the report. With the NOPROCEDURE parameter in effect, this information is not retrieved.

INPUT(INP), NOINPUT(NINP) Default: INPUT

When the INPUT parameter is in effect, all the names of objects used as input to each PROCESS (i.e., names associated with the RECEIVES and USES statements) are retrieved and printed on the report. The NOINPUT parameter specifies that this information is not to be retrieved.

OUTPUT(OUT), NOOUTPUT(NOUT) Default: OUTPUT

When the OUTPUT parameter is in effect, all the names of objects designated as output from each PROCESS (i.e., names associated with the GENERATES, DERIVES, and UPDATES statements) are retrieved and printed on the report. The NOOUTPUT parameter specifies that this information is not to be retrieved.

Output-Format

NEW-PAGE(NPG), NONEW-PAGE(NNNPG)
Default: NONEW-PAGE

When given, the NEW-PAGE parameter specifies that each section of the PROCESS INPUT/OUTPUT report be printed on a separate page. NONEW-PAGE signifies that the sections will follow one another on a page within the page size restrictions. In any case, interrupted sections will be continued on succeeding pages.

Examples: PRIO N=payroll-processing

PRIO F NDESC NPG PRCD

Command: PROJECTED-COST-REPORT Type: report command

Purpose: To produce the PROJECTED COST REPORT using the value of user-defined system-parameters and attributes in a URA data base.

The equation which will be evaluated is input by the user.

Prototype: PROJECTED-COST-REPORT (PCR)
{ RSC=resource-name UNITS=unit-name }
[parameter]...

Parameters:

Input-Data FILE (F)[=fdname], NAME(N)=user-name Default:FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is given via the NAME parameter, the report is produced only for the name specified. The format of the input file must be one name per line.

EXPRESSION
(E)='arithmetic expression',INPUT(I)[=fdname]
Default:INPUT=terminal

The EXPRESSION parameter is used to designate an equation to evaluate projected cost. The operands of the arithmetic expression are integers, user-defined system-parameters and user-defined attributes. INPUT parameter can be used to designate a file which contains an arithmetic expression. If the INPUT parameter is used and no fdname is specified, its value defaults to the terminal.

The operators of the arithmetic expression are *,+,-,/ with the usual interpretation. To distinguish operators from the characters used in user-name, all the operators must be delimited by blanks.

In addition, the function modifiers LN, LOG, and EXP may be applied to any part of the expression by prefacing that part with the desired modifier and enclosing the part in braces ({}). These function modifiers have the following interpretation:

LN - modifies the expression within the braces by taking the natural logarithm of the expression value.

LOG - modifies the expression within the braces by taking the base 10 logarithm of the expression value.

EXP - modifies the expression within the braces by raising its value to the power e, where e is the base of the natural logarithms.

DEFAULT(DEF)=integer Default: DEFAULT=0

This parameter gives the default value to be used if some system parameter occurs in the expression but does not have a numerical value assigned to it. If no default is given, a value of zero is assumed for such cases.

Output Data

INDEX, NOINDEX Default: NOINDEX

The INDEX parameter speifies the production of an index for the Projected Cost Report. This index consists of an alphabetical listing of all user defined names used in the report and the page(s) on which they occur.

RESOURCE(RSC)=resource-name Default: no default

The RESOURCE parameter must specify the name to be included on the report as the resource for which the usage is being computed, for example, money, cpu-time, and man-power.

UNITS(U)=unit-name Default: no default

This parameter must give the name of the units in which the usage is measured, for example, dollars, seconds, man-hours.

Examples

```
PCR N=hired-employee-report DEF=10 RSC=money
                                U=$ E='copies * many'
```

Command: PUNCH-COMMENT-ENTRY Type: report command

Purpose: To produce the PUNCHED-COMMENT-ENTRIES report and/or punch the specified comment entries into a PUNCH file.

Prototype: PUNCH-COMMENT-ENTRY(PCOM) [parameter]...

Parameter:

Input-Data FILE(F)[=fdname], NAME(N)=user-name
Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file[1] are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command. When a name is specified by the NAME parameter, the output is produced for that name alone. The format of the input file must be one name per line.

Output-Data PRINT(P), NOPRINT(NP) Default: PRINT

The PRINT parameter initiates the production of printed output for the report. When the NOPRINT parameter is given, the PUNCH COMMENT ENTRIES report is not produced.

PUNCH[=fdname], NOPUNCH Default: PUNCH

The PUNCH parameter specifies that PUNCH data should be generated and written into the designated PUNCH file. When the PUNCH parameter is used and no fdname is designated, the data is written into the default PUNCH file.[1] This file is the default PUNCH file for the command. If an fdname is indicated, that file is used as the PUNCH file. With the NOPUNCH parameter in effect, no action is taken to generate PUNCH data.

Output-Option EMPTY, NOEMPTY Default: (see text)

When EMPTY is in effect (the default when the PUNCH parameter is also used) the PUNCH file is emptied before PUNCH data is written into it. When NOEMPTY is in effect (the default when PUNCH is not used) no action is taken to empty the PUNCH file.

The comment entries associated with the following

---

[1] The name of the default file is installation dependent and consequently is given in Appendix F.

types of comment entry statements are retrieved when given as parameters.

	Default:
DERIVATION(DER), NODERIVATION(NDER)	NODERIVATION
DESCRIPTION(DESC), NODESCRIPTION(NDESC)	NODESCRIPTION
FALSE-WHILE(FW), NOFALSE-WHILE(NFW)	NOFALSE-WHILE
PROCEDURE(PRCD), NOPROCEDURE(NPRCD)	NOPROCEDURE
TRUE-WHILE(TW), NOTRUE-WHILE(NTW)	NOTRUE-WHILE
VOLATILITY(VOL), NOVOLATILITY(NVOL)	NOVOLATILITY
VOLATILITY-MEMBER(VOLM), NOVOLATILITY-MEMBER(NVOLM)	NOVOLATILITY-MEMBER
VOLATILITY-SET(VOLS), NOVOLATILITY-SET(NVOLS)	NOVOLATILITY-SET

Examples: PCOM N=payroll-processing DESC

PCOM F DESC PRCD

Command: RENAME Type: modifier command

Purpose: To change the name of some object in the data base and to produce the RENAME REPORT as a permanent record of the change.

Prototype: RENAME(REN) {OLD(O)=user-name NEW(N)=user-name}
{INPUT(I)=fdname }

Parameters:

Input-Data INPUT(I)=fdname Default: no default

For multiple name changes, an input file can be used. Each line of the file must consist of the old name followed by the new name. The two names must be separated by one or more blanks.

OLD(O)=user-name Default: no default

The user-name specified here is the name that is to be changed. This name must be defined in the data base.

NEW(N)=user-name Default: no default

The user-name specified here is the name to replace the old name. If the new name is already in the data base, the name will not be changed.

For a single change, both OLD and NEW must be given with legal values.

Messages: If neither INPUT nor the OLD and NEW parameters are specified the message:

MUST GIVE OLD AND NEW, OR INPUT

will be given.

Examples: RENAME OLD=employee-code NEW=employee-number

Command: REPLACE-COMMENT-ENTRY Type: modifier command

Purpose: To replace, for a given name, specific comment entries associated to it. A REPLACED COMMENT ENTRIES report is also printed as a permanent record of the change.

Prototype: REPLACE-COMMENT-ENTRY(RCOM) [parameter]...

Parameters:

Input-Data INPUT(I)=fdname Default: (see text)

The designated fdname contains the new comment entries that will replace specified old comment entries in the data base. The required format of the file is the same as that punched by PUNCH-COMMENT-ENTRY. If INPUT is not given, the input will be taken from the default file.[1] This file is the default PUNCH file for PCOM. For each comment entry to be replaced, the following format must be given in the input file:

```
name

comment-entry type;
   .
   .
   .
comment entry text
   .
   .
   .                    ;
```

Where name is a name defined in the data base, the comment-entry-type (e.g., DESCRIPTION, VOLATILITY, etc.) must be followed by a semicolon. The text following this must also be followed by a semicolon. This sequence of lines can be repeated as many times as necessary in the input file.

Output-Data PRINT(P), NOPRINT(NP) Default: PRINT

The PRINT parameter initiates the production of the REPLACED COMMENT ENTRIES report; NOPRINT suppresses printing. The report, if produced, contains both the old and new comment entries.

Examples: RCOM NOPRINT

---

[1] The name of the default file is installation dependent and consequently is given in Appendix E.

Command: RESOURCE-CONSUMPTION-ANALYSIS Type: report command

Purpose: To produce the RESOURCE-CONSUMPTION REPORT

Prototype: RESOURCE-CONSUMPTION-ANALYSIS(RCA)
INTERVAL=user-name [parameters]

Parameters:

Input-Data

FILE(F)[=fdname],NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and the report is produced using all the names in the file. When a single name is specified by the NAME parameter, the report is produced for that name alone. Either FILE or NAME can be used but not both. In any case, all the names used as input to this command must be PROCESS names. The input file format is one PROCESS name per line. The given process-name is used as the name of the root process from which all subsequent analysis proceeds. The report will be produced only for consumption of resources in performing this process and its component processes as determined by the PROCESS-LEVEL parameter.

Analysis-Control

PROCESS-LEVEL(PL)={ALL / number} Default: ALL

This parameter specifies the lowest level of the component PROCESSES relative to the root name whose information is used in the analysis. In short, it corresponds to the "depth" of UTILIZES and SUBPARTS connections that will be probed from the root-process. If ALL is in effect, probing continues until the lowest level processes are reached.

INTERVAL(INT)=user-name Default: none

This specifies the interval in terms of which the analysis and report production is done. The user-name must be an INTERVAL name. All necessary HAPPENS statements that are used by the Analyzer must be in terms of this INTERVAL, or must be convertible to it (through CONSISTS OF statements in the INTERVAL section).

Output-Data

BYPROCESSOR(BP),NOBYPROCESSOR(NBP)
Default: BYPROCESSOR

When the BYPROCESSOR parameter is in effect, the Resource Consumption Report arranged by PROCESSOR

name is presented. When NOBYPROCESSOR is in effect, it is not presented.

BYRESOURCE(BR),NOBYRESOURCE(NBR)
Default: BYRESOURCE

When the BYRESOURCE parameter is in effect, the Resource Consumption Report arranged by RESOURCE name is presented. When NOBYRESOURCE is in effect, it is not presented.

INDEX,NOINDEX Default: NOINDEX

The INDEX parameter specifies the production of an index for the Resource Consumption Report. This index consists of an alphabetical listing of all URL user-names included in the report and the page(s) on which they occur.

PROCESSOR-KEYWORD(PK)=
{ALL } Default: ALL
{user-name}

This parameter specifies that only those processors with a given key will have processor-resource utilization reports produced. The user-name must be a KEYWORD name. If ALL is in effect, all PROCESSORs that are used to perform the given process will have this report produced.

Example:
```
RESOURCE-CONSUMPTION-ANALYSIS
                    N=main-processing INTERVAL=year

RCA INTERVAL=month INDEX PL=1 PK=hardware
```

Command: SECURITY-ANALYSIS Type: report command

Purpose: To produce the SECURITY ANALYSIS report.

Prototype: SECURITY-ANALYSIS(SECA) [parameters]

Parameters:

Input-Data FILE(F) [=fdname], NAME(N)=user-name Default: FILE

When the FILE parameter is used and no fdname is designated, the contents of the default file are used as input to the command. This file is the default PUNCH file for NAME-GEN. If an fdname is indicated, that file is used as the input file for the command and the report is produced using all the names in the file. When a single name is specified by the NAME parameter, the report is produced for that name alone. Either FILE or NAME can be used but not both. In any case, all the names must be data types (SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS, ELEMENTS) or types which potentially access data types (PROCESSES, INTERFACES, PROCESSORS). The input file format is one user name per line. The report will be produced for each name in the input file.

Analysis-Control PRINT-NULL-SECURITY-INFORMATION(PNSI)
NOPRINT-NULL-SECURITY-INFORMATION(NPNSI)
Default: NPNSI

If this parameter is specified, a list is produced of names in the data base for which security information could be defined but for which security information has not been defined.

PRINT-MATRIX(PMAT), NOPRINT-MATRIX(NPMAT)
Default: PMAT

If this parameter is specified the security conflicts matrix is printed. Otherwise, the matrix is not printed.

Output-Data INDEX, NOINDEX Default: NOINDEX

The index parameter specifies the production of an index for the Security Analysis Report. This index consists of an alphabetical listing of all user-names included in the report and the page(s) on which they occur.

Examples: SECURITY-ANALYSIS NAME=hourly-employee-processing
PNSI

SECA INDEX

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

Command: STRUCTURE Type: report command

Purpose: To produce a STRUCTURE report for INPUTS, OUTPUTS, PROCESSES, INTERFACES or PROCESSORS.

Prototype: STRUCTURE(STR) [parameter]...

Parameters:

Output-Data INDEX, NOINDEX Default: NOINDEX

The INDEX parameter, when given, specifies the production of an index to the report, giving the pages on which each undefined name used in the report occurs. NOINDEX specifies that no index should be generated.

Output-Option

URA will produce structure reports for the following name types when given as parameters. (Only one may be given for each report.)

INPUT(INP) Default: PROCESS
OUTPUT(OUT)
PROCESS (PROC)
INTERFACE(INTF)[1]
PROCESSOR(PRCR)

Output-Format INDENT(IND)=integer Default: INDENT=3

The number is the number of spaces to indent each succeeding level in the report. INDENT must take on some value greater than 0 and less than 11.

Examples:
```
STRUCTURE
STR   INPUT
```

---

[1] REAL-WORLD-ENTITY (RWE) may be used in place of INTERFACE.

Command: SUMMARY Type: report command

Purpose: To produce the DATA BASE SUMMARY output.

Prototype: SUMMARY(SUM)

Parameters:
no parameters

Examples: SUMMARY

SUM

AD-A060 517 MICHIGAN UNIV ANN ARBOR DEPT OF INDUSTRIAL AND OPERA--ETC F/G 9/2
USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
JUL 78 F19628-76-C-0197

UNCLASSIFIED ESD-TR-78-131 NL

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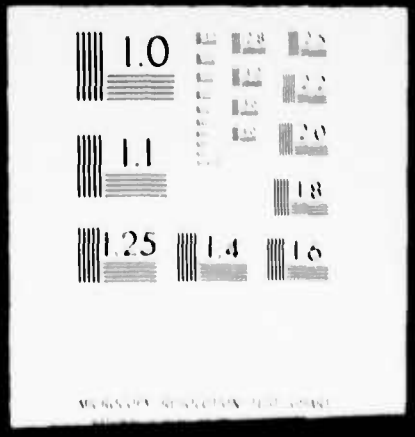


PART V

AUTOMATED DOCUMENTATION SYSTEM

USER'S MANUAL

1. INTRODUCTION

Whenever an organization develops an information system, one of the major problems is maintaining it over its life. The developers of the system are rarely around, or available to help the maintenance group in their task. A frequent result of this situation is a complete redesign and redevelopment of the system to make relatively minor modifications to the system. Such practice is an obvious waste of resources that could have been avoided with proper documentation. While the above is a strong motivator for the need for documentation standards, there are other advantages involved, namely, better communication between developers of the system, easier training of new employees, etc. Hence, most organizations have developed their own standards which must be adhered to for documenting the system. Examples of such standards are MILITARY standards 483 and 490 and Department of Defense Manual 4120.17-M.

Much of the information that is needed in the final document describing the system may be obtained during the system's analysis, design, and construction phases of the development life cycle. Therefore, what is needed is a mechanism that will allow the capture of the information as and when it becomes available and storing it in a readily usable data base. This is where the UBL/UBA data base comes into the picture.

The Automated Documentation System provides the means of easily producing a document according to a specific standard. The process of creating the document is a three step procedure. A table of contents or structured outline for the desired document must be completed. This information must be stated in a prescribed format (see Section 1). This part of the process is referred to as the creation of the documentation schema. The Analyzer data base is used to store and easily keep current the information about the system being documented. The Analyzer data base is created by an analyst or documentor who is concerned with capturing an up-to-date and complete description of the system. There is no ordering to these steps. The analyst or documentor must insure that all information required by the documentation standard is in the Analyzer data base. The third part of the documentation procedure is to describe the document body in a prescribed format (see Section 2). The process is referred to as the creation of the documentation source. Consistency and coordination between the documentation schema, documentation source and Analyzer data base is required to automatically generate a good document.

The three components of the Automatic Documentation System are the documentation schema, the documentation source and the Analyzer. These components are discussed in this Part of the Manual. To clarify the usage of these terms and other terms in this Part of the Manual, a glossary is included.

2. DOCUMENT INITIALIZATION

The initialization for the Automated Documentation System must be performed for each project to be documented. This task may be performed by the project leader. It involves taking the Military Standard and deriving from them relevant headings for the particular project in mind. For this paper Military Standard 4120.17-M will be used as the basis (template) for the generation of the document. Portions of this document are shown in the example of Appendix B. The initialization allows the project director to identify the major and detailed areas of documentation to be produced by the project team members. It can be most succinctly expressed as the table of contents to be shown in the final documentation. Hence, the documentation schema is equivalent to a listing of the entries in the table of contents or structured outline of the desired document. The details of the schema syntax will be discussed in Section 1.2. Development of a documentation schema is discussed in Section 4.1. Section 1.1 will discuss some of the strategy to be followed, and the general initialization process. The end result of the initialization process is a documentation object schema.

2.1 The Documentation Schema - Strategy for the Document Initialization

There are basically four types of entries that may be entered into the documentation schema. Any entry line is a maximum of 80 characters. The entries may be typed in on cards, or other media; in this form they are known as the documentation source schema. When these same entries have been entered into a file on the target computer which also has the Analyzer data base, the entries are known as the documentation object schema. The process of converting the source schema into the object schema would generally involve nothing more than reading in the cards, etc., into a file. The source schema is external to the computer while the object schema is stored in a file. One of the most common ways of doing this is by a local text editor, or some other file populating mechanism. This processor (editor, etc.) is known as the documentation initializer (Figure 77).

The four types of entries that may be entered into the documentation schema are:

- the table of contents (SECTION ENTRIES)
- formatting commands (TEXT FORMATTING ENTRIES)
- comments (COMMENT-ENTRIES)
- host formatting commands (HOST-FORMATTING-ENTRIES)

The table of contents entries are all preceded by a distinguishing character, "@" which must be entered on every heading to appear in the table of contents. Formatting commands

are proceeded by the distinguishing character "*". Any formatting command will be executed directly before the next section header is printed in the document (this characteristic will be discussed in section 4.1).

The manager may want to insert into the documentation schema, personal comments which are not to appear in the final table of contents. These may be specified by a "&" followed by a comment of up to 79 characters. Should the comment be longer, it may be continued on the next line but preceded by another "&". Comments may be used to guide the documentors, to assign specific portions of the documentation to particular individuals, etc.

The formatting command of the host installation text formatting facility may be included in the schema. However caution should be taken to set the *FORMAT command properly (refer to section 4.2.4.1 for detailed description). In any case, the host formatting commands are not processed by the Automated Documentation System.

A line starting with "%" in column 1 is interpreted by the Automated Documentation System as an Analyzer command. If such a line is found in the schema, it will be ignored and a warning message to this effect will be given.

Although a rare situation, it may be necessary on some installations to have different distinguishing characters to indicate a special line to the Automated Documentation System. For example, Multics installations must use the "=" character instead of the "#" character. This is the only installation that must use this convention.

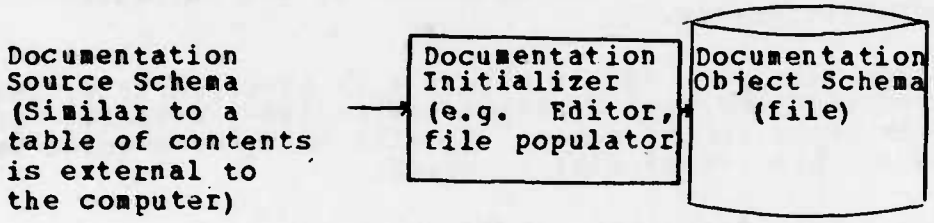


Figure 77
Documentation Initializer

2.2 Syntax for Entries in the Documentation Schema

SECTION-ENTRIES have the following syntax:

#SECTION-IDENTIFIER [HEADING-ENTRY]

The section-identifier must be preceded by a "#" in column 1. The section-identifier is the unique string corresponding to that section of the documentation schema (e.g., 2.2.3). This string may be made up of numbers, characters and/or special characters. No particular restrictions are placed on the format of the identifier (except for those placed or by a specific installation's control characters); for example, an identifier of 1.2s.1.b is a perfectly legitimate identifier. The section entry may not exceed 80 characters. It is important to note that there must be at least one space between the identifer and the heading entry. The final documentation will be produced in the order that the identifiers were entered in the documentation schema. Hence, it is the responsiblity of the individual preparing the documentation schema to enter them in the proper order. The documentation generator will not check to see that these entries are sorted. The heading-entry is the title to be given to the section. This is the title that will appear in the final document.

TEXT-FORMATTING-ENTRIES have the following syntax:

*CONTROL-INFORMATION-ENTRY

The text formatting commands may also be interspersed anywhere in the schema but must be preceded by a "*" in column 1. A detailed description of the formatting commands is given in section 4.2.4.1.

COMMENT-ENTRIES have the following syntax:

& COMMENT

Comments may be interspersed anywhere in the documentation schema. They will not appear in the final output. The "&" must appear in column 1. The comment on a given line can be a maximum of 79 characters.

HOST-FORMATTING-ENTRIES:

If the final document is to be produced by the host installation formatting facility, the host formatting facility commands should be included wherever necessary. It is recommended in this situation that the formatting command *FORMAT IGNORED (See section 4.2.4.1) be specified as the first line in the schema. There is no limit to the number of comment entries, header entries, and formatting entries in a documentation source schema. An example of a documentation source schema is:

#2. PROJECT DEVELOPMENT ENVIPONMENT/DOCUMENTATION SYSTEM

#2.1 DEVELOPMENTAL PHASES

#2.1.1 INITIATION

&THERE SHOULD BE NO NEED TO HAVE ANY OTHEP LISTS FOR US.

(A larger example is in Appendix F.)

3. DOCUMENTATION SOURCE POPULATION

The actual documentation to be written would probably be done by more than one individual. These individuals may enter the documentation of the areas they are responsible for, into different files, or into one common file assigned to be shared by them. In the former case, the documentation manager must merge the different pieces of the documentation into a single file. The order of this file is not important, as the final documentation will be produced in the order specified by the documentation schema (see Section 1). The input for the documentation source is referred to as the documentation source input.

The documentation source contains the information on the contents of the document body. This information is expressed by various types of entries. There are six entry types: Section-entries, analyzer-command-entries, text-formatting-entries, host-formatting-entries, comment-entries, and text entries.

3.1 Strategy for the Documentation Source Population

It is important that the individuals who are going to document the system know what is in the Analyzer data base. They should be given a complete NAME-LIST[1] or NAME-GEN[1] of names in the Analyzer data base. They should have a FORMATTED-PROBLEM-STATEMENT[1] of all these names, or have access via a terminal, to the Analyzer data base to query the information within it. For example, it the documentation calls for the description of a particular input, say TEST-RESULTS, this should be in the Analyzer data base, and the documentor should be required to invoke its description from the Analyzer data base rather than to have to retype it. This has two obvious advantages: the one mentioned above (reduction of redundant work), and the other one of always having an up-to-date description of the item of interest. It is the duty of the project manager to see that all Analyzer entries have been made, and do exist. The above also implies that the documentor be quite familiar with the use of the Analyzer.

The individuals populating the documentation source must also have access to or a copy of the documentation schema, and must use the same section-identifiers as used in the schema. It is also feasible to have a limited amount of text formatting capability such as getting to the top of the next page, or skipping to next half page, etc. This capability would be used

---

[1] Part IV, "User Requirements Analyzer Command Descriptions" and Part III, "URA Outputs" for an explanation of these commands and corresponding outputs.

where a diagram, or table which could not be drawn by the documentation generator had to be inserted, and space had to be left for it. An entry line for the documentation source is a maximum of 120 characters.

To distinguish between the various kinds of entries in the documentation source, section entries are preceded by a "#" in column 1, Analyzer command entries are preceded by a "%" in column 1, text-formatting entries are preceded by a "*" in column 1, and the actual text itself has nothing preceding it, and may begin in column 1. If host-formatting entries are being used, the proper syntax of the particular formatting processor should be applied. Preceding blanks are considered part of the text. An entry line for the documentation source is a maximum of 120 characters. Text entries have no specific format.

The documentation source may be populated by the documentors in much the same way as the documentation schema (Figure 78), i.e., any processor such as the text editor, file populator, etc., may be used to store the source in the documentation data base which must be a file. If several documentors are working simultaneously, different files may be assigned to individual documentors. These portions of the documentation data base can then be merged at documentation generation time. The order of the section entries is unimportant.

3.2 Syntax for the Documentation Source

SECTION-ENTRIES have the following syntax:

#SECTION-IDENTIFIER [HEADING-COMMENT]

The section entries are the same as in the documentation schema. However, the text portion (heading-comment) in the documentation source is ignored. Only the section-identifier is used to match against the documentation schema. The "#" must be in column 1.

ANALYZER-COMMAND-ENTRIES have the following syntax:

%ANALYZER-COMMAND

Analyzer commands may be interspersed anywhere in the source with the provision that they be preceded by a "%" in column 1. Any Analyzer commands from Part IV[1] are allowed except the STOP command and the SET command with the parameter PROMPT=ON (by default, this is not in effect). The Analyzer commands are not executed immediately . They are just stored as is until the documentation generation process.

TEXT-FORMATTING-ENTRIES have the following syntax:

---

[1] Part IV, "User Requirements Analyzer Command Description."

*CONTROL-INFORMATION-ENTRY

The same text formatting commands available for use in the schema are also available for use in the source. These commands are explained in Section 4.2.4.1. They may be interspersed anywhere in the documentation source. The "*" must be in column 1.

COMMENT-ENTIRES have the following syntax:

&COMMENT

Comments may be interspersed anywhere in the documentation source. They will not appear in the final output. The "&" must be in column 1.

HOST-FORMATTING-ENTRIES:

If used, the host formatting facility entries should follow the syntax of the particular processor and may appear anywhere in the documentation source. The Automated Documentation System text formatting commands should not be used when utilizing another text formatting facility unless the *FORMAT IGNORE command has been given.

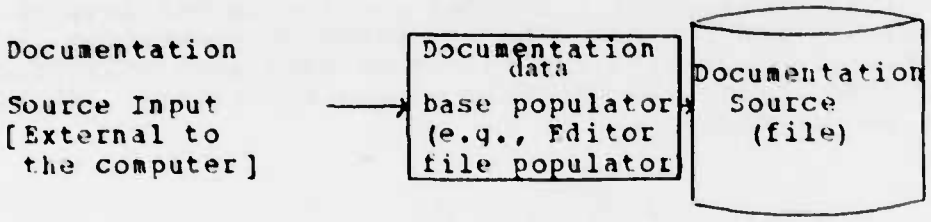


Figure 78

Documentation Data Base Populator

4. THE DOCUMENTATION GENERATION

The documentation generation may be performed by the project manager when one wishes to have the completed documentation. The manager may first wish to ascertain that the documentation is indeed complete. It is possible for the manager to find this out. However, the extent of checking is limited to the absence, or presence of an entry in the documentation data base corresponding to every entry in the schema. There is no check to find out if the corresponding Analyzer data base entries also exist.

If the project manager finds that all entries in the schema have corresponding entries in the source, one can now go ahead and initiate the generator to produce the final documentation as per the specification in the documentation schema. The manager must realize that this will be a lengthly process, as it involves the invocation of analyzer commands, the generation of intermediate files, and the merging of several files to produce the final documentation (Figure 79). Hence, it is recommended that this be done in batch mode. Because the Analyzer processor is being run when the documentation is desired, it will be using the latest version of the system description.

The process that the Documentation Generator goes through is shown in Figure 79. It involves two steps. Phase I (CHECK) checks to see what Section Entries in the schema are present in the documentation source. It also extracts all Analyzer commands from the source and writes them into a separate file to be used as input to the Analyzer. Phase II (UFA) executes the Analyzer using each command in the documentation source. Phase III (MERGE) merges the output from the Analyzer with the documentation source and produces the document. It is at this point that the text-formatting commands are processed. The documentation may be further processed by the text formatting facility of the host installation to produce the final document. Phase IV is optional.

The procedure for documentation generation is dependent on the operating system under which the Automated Documentation System is installed. Hence, there is no one standard way to invoke the Automated Documentation System. Appendix H will include the system dependent information required to execute the Automated Documentation System and generate a document.

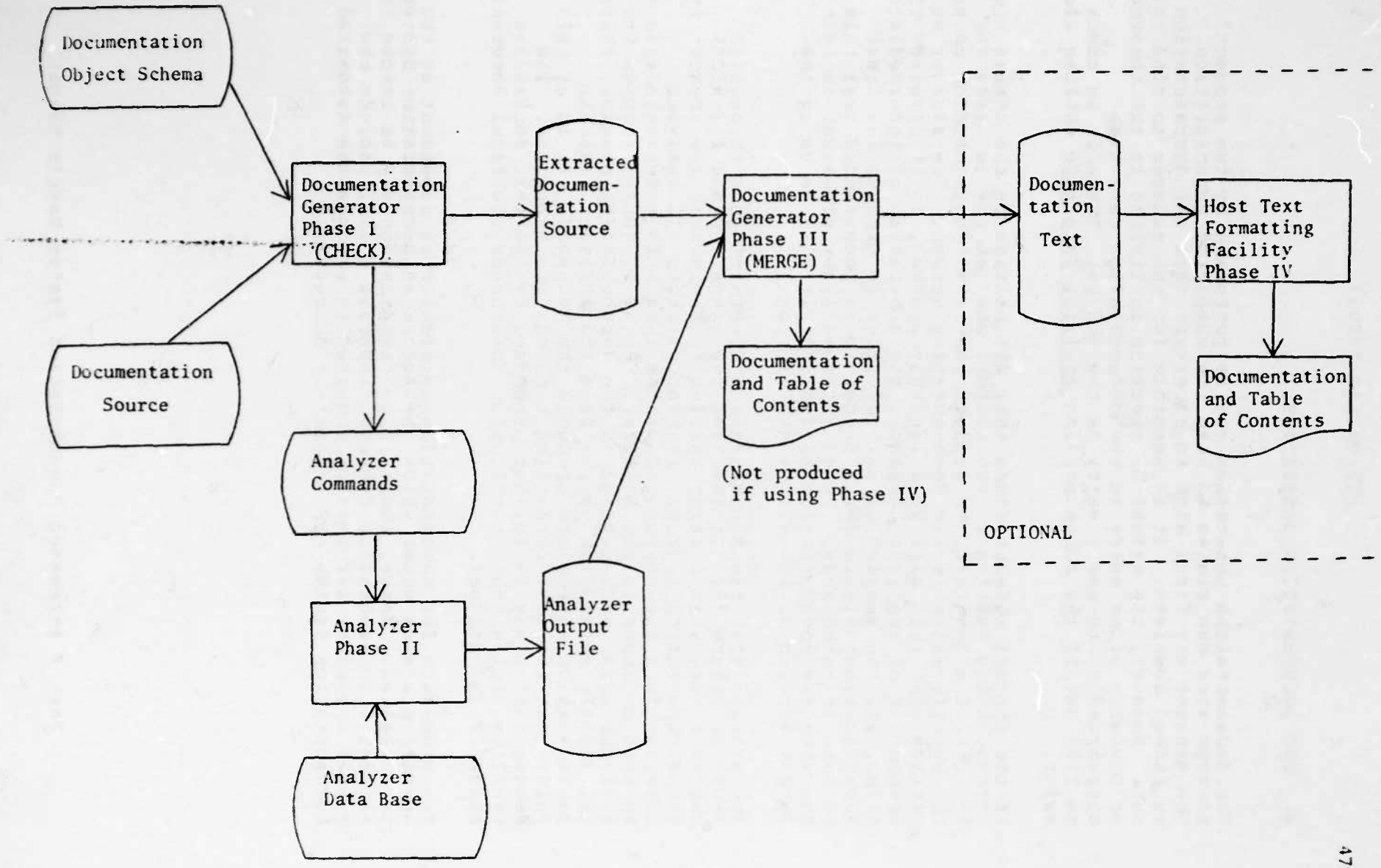


Figure 79

Documentation Generator

5. USAGE OF THE DOCUMENTATION GENERATOR

In using the documentation generator, there are several areas that need to be considered in order to achieve a desired quality level. Coordination between the schema, documentation data source base, and the Analyzer data base are mandatory in order to develop a document which will contain complete information. Development of the methods to produced these three inputs into the system so that they can be used in an ongoing operation (camera-ready documentation) is the topic of this section. Considerations as to what should be included in each component, what pitfalls should be watched out for, and what variations might arise in usage of the documentation generator will be discussed. It is important for the reader to realize at this point that while this system has been developed to provide a generalized format for producing documents under a set of standards, the system still allows a great deal of flexibility to the user.

Department of Defense Manual 4120.17-M along with MIL Standard 483 will be used as example documentation standards in this discussion. Development of a Functional Description and Data Requirements Document of the Pay System Analyzer data base (W.P. 74)[1] will be used as a specific example (Appendix F).

5.1 Development of the Documentation Schema

The documentation schema consists of a structural outline or table of contents of the particular document being produced. From this schema a table of contents for the document being generated will be produced. Hence, it is important that the user include enough section levels in order to make the table of contents meaningful. It is also important to note that the final documentation will be produced in the order stated in the documentation schema, so the schema should be set up appropriately.

The format and syntax for the schema is discussed in Section 1. The documentation initializer produces the documentation and schema which is stored permanently on file after any required editing is done.

Within the schema, comments and formatting commands are allowed. The schema is checked to see if it contains any formatting commands. If it does, each formatting command goes into effect prior to the printing of the next section header and immediately following the formatting command, provided that *FORMAT ON is in effect. This is also true for commands at the beginning of the schema.

---

[1] "An Example of the Use of PSL Using Top-Down Analysis."

Although it is suggested that the table of contents of a particular document or standard be used as the schema, many times a more detailed schema is warranted. Situations where more or less detail might be deemed necessary are in the following subsections.

5.1.1 Where Less Detail Might Be Necessary

The table of contents of a certain standard is a skeleton type set up, giving suggestions on how the documents should be developed, but leaving room for variances in structure from one document to another written according to the standard. In this case it might be wise to use less detail in the schema and keep it as general as possible.

An example of this situation arises in MIL standard 483. In Section 3.2 of the desired document, the standard sets up the criteria for describing each separate function of a system. Since there is going to be a varying number of functions in different systems, the standard sets up the description as follows:

```
3.2.X      Function X
3.2.X.1    INPUTS
3.2.X.2    PROCESSING
3.2.X.3    OUTPUTS
```

Thus, this basic structure is repeated for every function in the system. This causes a definite problem when using the document generator. Since it is desirable to have one schema for all documents produced, it can be seen that since the number of functions will vary from one system to the next, the standard's table of contents cannot be followed strictly.

Three options are open to the documentor in cases like this.

a) Include in the schema only the section header (#3.2 DETAILED FUNCTIONAL REQUIREMENTS) and leave the rest to be described in the source. Comment entries could be included in the schema to describe what should be included with these. The advantage of this option is that the schema will be constant and independent of each instance of this document. The disadvantage is that the schema will now lack information and the table of contents will be somewhat incomplete.

```
#3.2 DETAILED FUNCTION REQUIREMENTS
&  PARAGRAPH 3.2X FUNCTION X.
&     THE BASIC PARAGRAPH FOR EACH FUNCTION SHALL BEGIN WITH
&     DESCRIPTIVE AND INTRODUCTORY MATERIAL WHICH DEFINES
&     THE FUNCTION AND ITS RELATIONSHIP TO OTHER FUNCTIONS.
&     THEN, THE FOLLOWING THREE SUBPARAGRAPHS SHALL SPECIFY
&     THE QUALITATIVE REQUIREMENTS CONCERNING THE FUNCTION.
```

& PARAGRAPH 3.2.X.1 INPUTS.
& PARAGRAPH 3.2.X.2 PROCESSING.
& PARAGRAPH 3.2.X.3 OUTPUTS.

b) Set up the schema for an arbitrary number of functions. An example of this would be:

```
#3.2.1     FUNCTION ONE
#3.2.1.1   INPUTS
#3.2.1.2   PROCESSING
#3.2.1.3   OUTPUTS
#3.2.2     FUNCTION ONE
#3.2.2.1   INPUTS
#3.2.2.2   PROCESSING
#3.2.2.3   OUTPUTS
      .
      .
      .
#3.2.12    FUNCTION TWELVE
#3.2.12.1  INPUTS
#3.2.12.2  PROCESSING
#3.2.12.3  OUTPUTS
```

The advantage of this option is that the table of contents is complete. The disadvantage is that the entries in the table are not meaningful.

c) Include in the schema the actual function names for each system. An example of this would be:

```
#3.2       DETAILED FUNCTION REQUIREMENTS
#3.2.1     SENSOR CALIBRATION (INITIAL) FUNCTION
#3.2.1.1   INPUTS
#3.2.1.2   PROCESSING
#3.2.1.3   OUTPUTS
#3.2.2     ELEMENT CORRECTION (INITIAL) FUNCTION
#3.2.2.1   INPUTS
#3.2.2.2   PROCESSING
#3.2.2.3   OUTPUTS
#3.2.3     MANEUVER DETERMINATION CONTROL FUNCTION
#3.2.3.1   INPUTS
#3.2.3.2   PROCESSING
#3.2.3.3   OUTPUTS
#3.2.4     SIMULTANEOUS SOLUTION OF MANEUVER AND ELEMENT
           FUNCTIONS
#3.2.4.1   INPUTS
#3.2.4.2   PROCESSING
#3.2.4.3   OUTPUTS
#3.2.5     ELEMENT MAINTENANCE CONTROL FUNCTION
#3.2.5.1   INPUTS
#3.2.5.2   PROCESSING
#3.2.5.3   OUTPUTS
#3.2.6     ELEMENT CORRECTION (ROUTINE) FUNCTION
#3.2.6.1   INPUTS
```

#3.2.6.2 PROCESSING
#3.2.6.3 OUTPUTS
#3.2.7 OBSERVATION EDITING FUNCTION
#3.2.7.1 INPUTS
#3.2.7.2 PROCESSING
#3.2.7.3 OUTPUTS
#3.2.8 SENSOR CALIBRATION (ROUTINE) FUNCTION
#3.2.8.1 INPUTS
#3.2.8.2 PROCESSING
#3.2.8.3 OUTPUTS
#3.2.9 ELEMENT RECOVERY CONTROL FUNCTION
#3.2.9.1 INPUTS
#3.2.9.2 PROCESSING
#3.2.9.3 OUTPUTS
#3.2.10 ELEMENT CORRECTION (RECOVERY) FUNCTION
#3.2.10.1 INPUTS
#3.2.10.2 PROCESSING
#3.2.10.3 OUTPUTS
#3.2.11 MANEUVER DETECTION FUNCTION
#3.2.11.1 INPUTS
#3.2.11.2 PROCESSING
#3.2.11.3 OUTPUTS
#3.2.12 MANUAL INTERACTIVE DIFERRENTIAL CORRECTION FUNCTION
#3.2.12.1 INPUTS
#3.2.12.2 PROCESSING
#3.2.12.3 OUTPUTS

The advantage of this method is that the schema is complete and descriptive. The disadvantage is that the schema will have to be changed for each application document.

The decision as to which one of these options should be used is up to the discretion of the user.

5.1.2 Where More Detail Might Be Necessary

If within the standard, references are made to information that is deemed necessary to include within a certain section, it might be advisable to include this information in the schema. An example of this would be in the Data Requirements Document of D.O.D. Manual 4120-17-M. In this document, the table of contents looks as follows:

1. GENERAL DATA REQUIREMENTS
1.1 PURPOSE OF DATA REQUIREMENTS
1.2 PROJECT REFERENCES
1.3 MODIFICATION OF DATA REQUIREMENTS
2. DATA DESCRIPTION
2.1 LOGICAL ORGANIZATION OF STATIC SYSTEM DATA
2.2 LOGICAL ORGANIZATION OF DYNAMIC INPUT DATA
2.3 LOGICAL ORGANIZATION OF DYNAMIC OUTPUT DATA
2.4 INTERNALLY GENERATED DATA

2.5 SYSTEM DATA CONSTRAINTS
3. USER SUPPORT FOR DATA COLLECTION
3.1 DATA COLLECTION REQUIREMENTS AND SCOPE
3.2 RECOMMEND SOURCE OF INPUT DATA
3.3 DATA COLLECTION AND TRANSFER PROCEDURES
3.4 DATA BASE IMPACTS

Within Section 3.1, the standard refers to nine areas of supplementary information. If this information is considered to be of such a nature that it will or should be included in most all the documents being produced, the user might want to include the information in the schema (therefore in the table of contents of the document). The schema would then look like:

#1. GENERAL DATA REQUISEMENTS
#1.1 PURPOSE OF DATA REQUIREMENTS
#1.2 PROJECT REFERENCES
#1.3 MODIFICATION OF DATA REQUIREMENTS
#2. DATA DESCRIPTION
#2.1 LOGICAL ORGANIZATION OF STATIC SYSTEM DATA
#2.2 LOGICAL ORGANIZATION OF DYNAMIC INPUT DATA
#2.3 LOGICAL ORGANIZATION OF DYNAMIC OUTPUT DATA
#2.4 INTERNALLY GENERATED DATA
#2.5 SYSTEM DATA CONSTRAINTS
#3. USER SUPPORT FOR DATA COLLECTIONS
#3.1 DATA COLLECTION REQUIREMENTS AND SCOPE
#3.1.1 INPUT SOURCE(S) OF THE DATA ELEMENT
#3.1.2 INPUT MEDIUM
#3.1.3 RECIPIENTS
#3.1.4 CRITICAL VALUE
#3.1.5 SCALES OF MEASUREMENT
#3.1.6 CONVERSION FACTORS
#3.1.7 OUTPUT FORM/DEVICE
#3.1.8 EXPANSION FACTORS
#3.1.9 FREQUENCY OF UPDATE
#3.2 RECOMMEND SOURCE OF INPUT DATA
#3.3 DATA COLLECTION AND TRANSFER PROCEDURES
#3.4 DATA BASE IMPACTS

It might be that the documentor just needs to be reminded of the supplementary information. In this case it might be appropriate just to include an appropriate comment.

#1. GENERAL DATA REQUIREMENTS
#1.1 PURPOSE OF DATA REQUIREMENTS
#1.2 PROJECT REFERENCES
#1.3 MODIFICATION OF DATA REQUIREMENTS
#2 DATA DESCRIPTION
#2.1 LOGICAL ORGANIZATION OF STATIC SYSTEM DATA
#2.2 LOGICAL ORGANIZATION OF DYNAMIC INPUT DATA
#2.3 LOGICAL ORGANIZATION OF DYNAMIC OUTPUT DATA
#2.4 INTERNALLY GENERATED DATA
#2.5 SYSTEM DATA CONSTRAINTS
#3. USER SUPPORT FOR DATA COLLECTION

```
#3.1  DATA COLLECTION REQUIREMENTS AND SCOPE
&     AT THIS POINT IT SHOULD BE NOTICED THAT THERE ARE NINE
      AREAS TO BE CONCERNED WITH IN THIS SECTION.  THEY ARE:
&     A.  INPUT SOURCE(S) OF THE DATA ELEMENT
&     B.  INPUT MEDIUM
&     C.  RECIPIENTS
&     D.  CRITICAL VALUE
&     E.  SCALES OF MEASUREMENT
&     F.  CONVERSION FACTORS
&     G.  OUTPUT FORM/DEVICE
&     H.  EXPANSION FACTORS
&     I.  FREQUENCY OF UPDATE
#3.2  RECOMMEND SOURCE OF INPUT DATA
#3.3  DATA COLLECTION AND TRANSFER PROCEDURES
#3.4  DATA BASE IMPACTS
```

The decision as to what should be in the schema is based primarily on how much detail is wanted and/or expected in the table of contents.

5.2 Development of the Documentation Source

The required format of the documentation source input and a description of how it is transformed into the documentation source is in Section 2. There are several areas that the user need be aware of when developing the documentation source. Proficiency in these areas is necessary if the documentor is to attain full range capabilities of the document generator.

5.2.1 Knowledge of the Analyzer Data Base

It is of utmost importance that the documentor have a thorough knowledge of the information in the Analyzer data base as well as the Analyzer command language. The documentor must be able to pick out the information needed for the document. When it is known that a system will have to be documented using a certain standard, it is also important that the person developing the Analyzer data base have a full understanding of what information is needed to fulfill the standard's documentation requirements. Since the standard usually requires complete information about the system, writing the Analyzer data base with the standard in mind will usually serve to insure a complete system description.

5.2.2 Text Material

The documentation source for various projects written under a certain standard should be developed in such a way as to minimize the differences in the various Documentation sources. This can cut down substantially on the documentor's time spent on each system. Another advantage of doing this is that once a certain combination of commands has been determined as the best

way to convey certain information required by a particular standard, then that combination can be repetitively used for all projects documented under this particular standard.

With this in mind, the documentor should try to include in the source only such text that will be present in every instance of the document being produced. Examples of such text are in paragraphs found in both the Functional Description and Data Requirements Documents. These paragraphs describe the purpose of each of the documents:

Section 1.1

> This Functional Description for (Project Name) (Project Number) is written to provide:
>
> a) The system requirements to be satisfied which will serve as a basis for mutual understanding between the user and the developer.
>
> b) Information on performance requirements, preliminary design, and user impacts, including fixed and continuing costs.
>
> c) A basis for the development of system tests.

Section 1.2

> The objectives of this Data Requirements Document for (Project Name) (Project Number) are to list and define data elements which the system must handle and to communicate data collection requirements to the user.

Another examples of where text should be used is when a common portion of the document is being described. An example of this is Section 3.3 of the Functional Description. Here is an example of how the source might look:

```
#3.3 INPUTS/OUTPUTS
     INPUTS:
%NG  S='INPUT'
%FPS
*SKIP 2
     OUTPUTS:
%NG  S='OUTPUT OR INPUT'
%FPS
%STR OUTPUT
```

Since the documentation source data base will be different for each project documented, it is not necessary that the text be constant. However, this practice reduces redundancy in work done by the documentor.

5.2.3 Analyzer Commands

As mentioned before, the documentor must have a full understanding of the Analyzer command capabilities (described in Part IV[1]) including all possible options. Thus knowledge is essential for the document generator to produce complete information in a readable form. Some of the commands and options that might be useful are listed below:

PCOM	Options:	DESCRIPTION NOPUNCH
NG	Options:	NOPRINT,PRINT KEY=keyword-name S= TLC,NTLC
CONTENTS		
PICTURE	Options:	NODATA NOFLOW NOSTRUCTURE
FPS	Options:	TLCC,NDLCC COMMENT,NOCOMMENT DEFINE,NODEFINE DESG,NODESG ALL-STATEMENTS,NAS LINE-NUMBERS,NLNS
COMPLEMENTARY-STATEMENTS,NCOMP		
		PRINT-EOF,NPEOF
EXTENDED-PICTURE		
	Options:	DATA FLOW,STRUCTURE BACKWARD,FORWARD
PROCESS-CHAIN		

The Data Process Report could be very beneficial, especially since it produces a very complete description of data flow and process functions. It can be used when an overall interaction description is needed. This report also shows if consistency is present as well as showing completeness (or incompleteness).

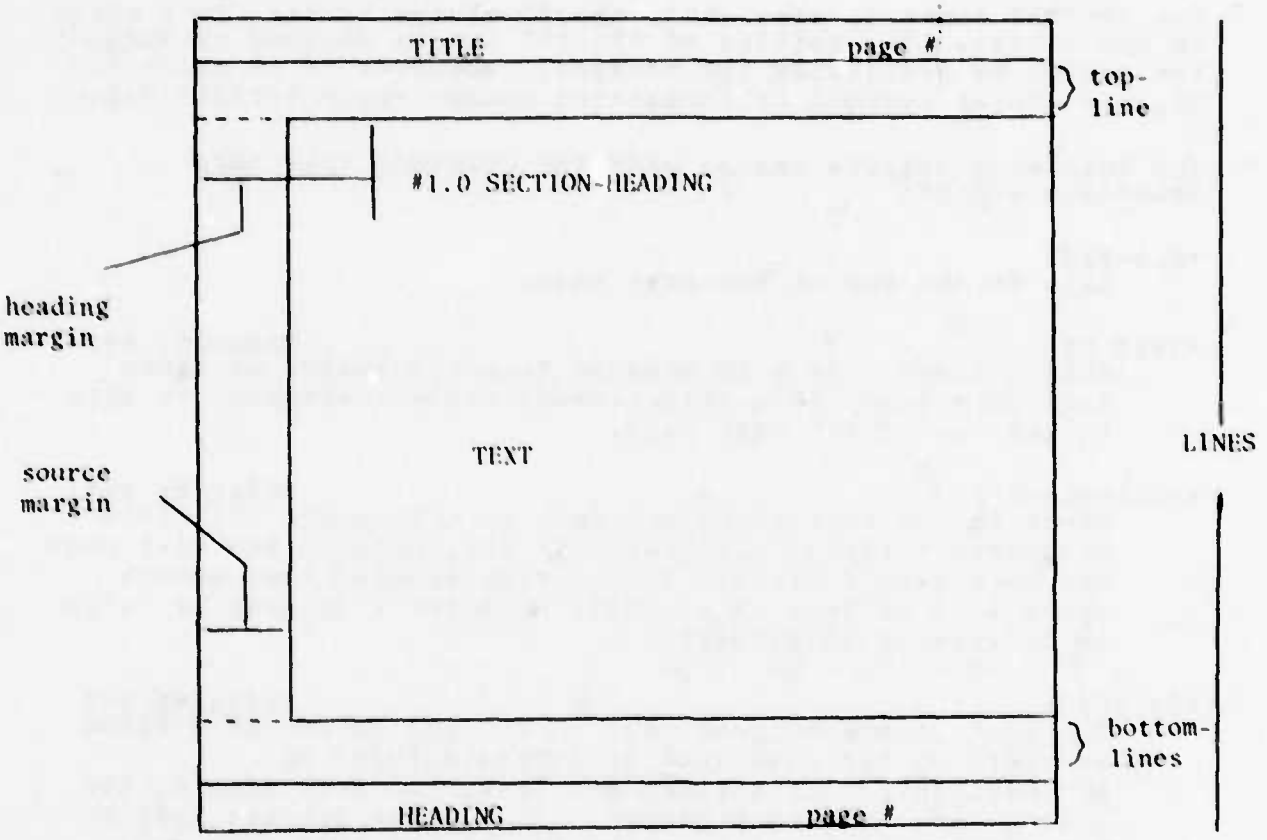
The STOP command should not be used. There are three options of the SET command that should not be used: PROMPT=ON will virtually destroy the document being produced. It is also recommended that OUTPUT=XXX, HEADING=ON, and PARM=ON not be used. All four of these options default to OFF.

---

[1] Part IV, "User Requirements Analyzer Command Description."

5.2.4 Formatting Entries

The text formatting entries allow the user a great deal of maneuverability in regards to the final document format. At this point, a diagram might help to show just what is going on a page of a document.



5.2.4.1 Summary of Formatting Commands

There are three kinds of formatting commands: those that have effect on other formatting commands, those that have immediate effect on the document and those that have a global or continuous effect. For the first kind, the following option can be used:

```
*FORMAT     {ON     }          Default:ON
            {OFF    }
            {IGNORED}
```

If ON is specified, all commands preceded by "*" are treated as documentation generator formatting commands and are executed accordingly by the Automated Documentation System.

If OFF is specified, all commands preceded by "*" are treated as

text lines and will appear in the final output without further consideration.

If IGNORED is specified, all commands preceded by "*" are treated as comment entries and will not be executed nor will they appear in the final output.

The *FORMAT command, when used, should always be the first entry in the schema. The setting of *FORMAT can be changed throughout the source by specifying the command. Whenever it is reset to ON, the global options of formatting assume their DEFAULT value.

The following options can be used for commands that have immediate effect:

*NEW-PAGE
Skip to the top of the next page.

*SKIP [N] Default: N=1
Skip N lines. If N is greater than the number of lines left on a page, then this command causes carriages to skip to the top of the next page.

*HOLD-BLANK [N] Default: N=1
Check to see if N lines are left on this page. If there are, skip N lines. If there are not, skip to the next page and then skip N lines. This option insures that enough space will be left on a single page for a diagram or table to be written in manually.

*HOLD[N] Default: N=1
The rest of the current page is checked to see if N lines are left on the page (not including HEADING or BOTTOM-LINES). If N lines are left, the next line of the source data base is produced. If N lines are not left on the current page, skip to the top of the next page and produce the next line of source.

These options are present at the commencement (under their default conditions and can be changed throughout the source) and have a global effect:

*TITLE {OFF} Default: OFF
{Title}
If a title is given, this title is put on the top of each page. If OFF is given, no title is printed on each page.

*HEADING {OFF} Default: ON
{ON}
If ON is specified, the HEADING-ENTRY for the last section printed is put at the bottom of each page. If OFF is specified, the HEADING-ENTRY is not put at the bottom of each page.

*TOP-LINES [N] Default: N=3
Skip N lines at the bottom of each page. Range is from 0 to 10.

*BOTTOM-LINES [N] Default: N=2
Skip N lines at the bottom of each page. Range is from 0 to 10.

*LINES [N] Default: N=60
N is the number of lines to be printed on a page, including Title and Heading. Range is from 5 to 60.

*SOURCE-MARGIN [N] Default: 5
N is the number of spaces to indent the actual text material. This does not affect Analyzer report indentation. Range is from 1 to 40.

*HEADING-MARGIN [N] Default: N=10
N is the number of spaces to indent a section heading. Range is from 1 to 40.

*HEADING-SKIP [N] Default N=2
N is the number of lines to skip before printing a section-header. The amount skipped will at most be to the top of the next page. Range is from 0 to 60.

*REPORT-CC {OFF} Default: ON
{ON}
When set to ON, the Analyzer report carriage control is engaged when outputting Analyzer reports. This affects page feeding of the document produced. When OFF, the line skipping and page feeding is controlled by only formatting commands.

It is important for the documentor to understand the formatting commands. There are several points that should be remembered when using the commands. These are covered in the following subsections.

5.2.4.2 Defaults of Formatting Commands

The formatting options can be changed at any time in the Source. The formatting commands defaults affect how the document will appear. If one does not specify a value for these commands, then the default will be used. When the documentor does not specify these command values, then the final document will appear as if the defaults were included in the Source data base. The formatting command defaults depending on whether *FORMAT is ON or OFF are:

*FORMAT ON	*FORMAT OFF or IGNORE
*REPORT-CC ON	*REPORT-CC OFF
*TITLE OFF	*TITLE OFF
*HEADING ON	*HEADING OFF
*TOP-LINES 3	*TOP-LINES 0
*BOTTOM-LINES 2	*BOTTOM-LINES 0
*LINES 60	
*SOURCE-MARGIN 5	*SOURCE-MARGIN 1
*HEADING-MARGIN 5	*HEADING-MARGIN 1
*HEADING-SKIP 2	*HEADING-SKIP 0

The last occurrence of each option is the one in effect. The formatting commands in the Source logically succeed the commands in the Schema and, thus, override Schema commands at the time they are encountered in the Source. The *FORMAT ON command always resets the other formatting parameters to their default values. When the *FORMAT OFF command is in effect, no formatting is performed in Phase III of the Automated Documentation System for that portion of the document affected.

5.2.4.3 Analyzer Report Indentation

Analyzer report identation is not affected by either *HEADING-MARGIN or *SOURCE-MARGIN. Care must be taken in setting these two options so the document being produced is in a logical readable format and fits on the size of paper desired.

5.2.4.4 LINE SKIPPING

*HEADING-SKIP reacts the same way as *SKIP does when an end of page is encountered. Also, the documentor should be careful when trying to set up a section-header so it starts on a new page. If the value of *SKIP or *HEADER-SKIP is more than the current LINES values then the generator automatically skips to the top of the next page.

5.2.4.5 Usage of *REPORT-CC

The *REPORT-CC command specifies whether to use the Analyzer REPORT Carriage Control symbols or to suppress them. *REPORT-CC ON means that the normal carriage control for the Analyzer reports will be used. OFF means that they will be suppressed and the usual paging sequence for the document will be used.

Usage of the *REPORT-CC command will have a direct bearing on the paging of the document being processed. Since when *REPORT-CC is ON, analyzer reports will be produced according to their normal paging sequence. This is helpful when a PICTURE Report is being produced and more than one name is input or the PICTURE must be continued on the next page. Other reports where

this option is helpful are the DATA-PROCESS Report and the CONSISTS-COMPARISON Report. In cases where a report will be taking up more than one page, it is important to start the report at the top of a fresh page so that the Analyzer paging will match the documentation generator's paging. There are cases, though, where the documentor will wish to set *REPORT-CC OFF, such as where several names are being entered into the FPS Report or CONTENTS Report.

5.2.4.6 The *HOLD and *HOLD-BLANK Commands

The documentor should understand the usefulness of the HOLD and HOLD-BLANK commands. If a diagram, table or figure must be drawn manually, the HOLD-BLANK command should always be used. This will insure enough space is saved on one complete page to insert the figure. If an analyzer report or some text material is going to be produced and the documentor wishes that this material be contained on one page, the HOLD command should be used. An example of where it would be used is with the PICTURE Report. Since the PICTURE Report uses 41 lines, the documentor should place a *HOLD 41 preceding the PICTURE command to insure that it is produced on a single page.

5.2.5 Usage of Analyzer SYNONYMS

A SYNONYM is a short abbreviation form of a name that can be stored in the Analyzer data base. A SYNONYM is a reserved word of the Analyzer.

In order to generalize the documentation Source data base, SYNONYMS should be used whenever possible to describe certain items, such as main functions, master files, etc. The implication of this practice on the Analyzer data base formulation is discussed in section 4.3.2.

By using SYNONYMS, the documentor is relieved of changing even more of the Source data base from one project to the next. An example of how this can be done is in section 3.2 of the Functional Description. The Source data base will look as follows:

```
#3.2 SYSTEM FUNCTIONS
%NG  S='MAIN-PROCESS AND SL=1' NOPRINT
       THE VARIOUS SUB-FUNCTIONS OF THE SYSTEM ARE:
%PCOM DESC PRCD NOPUNCH
```

In this example MAIN-PROCESS is a SYNONYM.

Section 2.4.2.4 is another example.

```
#2.4.2.4 OPERATIONAL IMPACTS
     A.  OPERATIONAL STRUCTURE
```

```
%STR
*SKIP 2
     B.  TIMELINESS(OPERATIONS AND DATA)
%FREQ
*SKIP 2
     C.  INPUTS
%STR INPUT
*SKIP 2
     D.  DATA RETENTION
         1.  MASTER FILE
%PCOM N=MASTER-FILE DESC DEP NOPUNCH
*NEW-PAGE
%PIC N=MASTER-FILE NODATA NOFLOW
```

Here, MASTER-FILE is a SYNONYM.

5.3 Development of the Analyzer Data Base with the Document Generator in Mind

There are two situations that can occur in relation to the Analyzer data base when using the Document Generator.[1]

The Analyzer data base has either been written with the document to be produced in mind, or it has not been. In any case, it is going to be beneficial for the documentor to write or update the Analyzer data base in such a way as to facilitate ease of production of the document using the generator. Various practices can be used by the documentor to accomplish this. These practices are explained in the following subsections.

5.3.1 Usage of MEMO

When it is necessary to describe certain aspects of a propsed system that are general in nature but do not apply directly to the structural, functional, or data flow of the system, then the usage of MEMOs in the Analyzer data base can be very helpful. When objectives, background material, requirements, impacts, etc., are needed, a MEMO is the obvious answer. Hence, simple PUNCH-COMMENT-ENTRY is all that is needed in the documentation source. An example of a typical MEMO is shown below. This MEMO relates the objectives required for Section 2.2 of the Functional Description:

```
MEMO                                          OBJECTIVES-MEMO;
   DESCRIPTION;
     THIS PROJECT HAS BEEN AUTHORIZED TO DEVELOP A PAY SYSTEM
     FOR THIS ORGANIZATION.  THIS PAY SYSTEM WILL PERFORM
```

---

[1] Note: All capitalized names in this section refer to URL Reserved Words. For a more detailed explanation, refer to Parts I and II of the URL User's Manual.

PAYROLL PROCESSING USING EMPLOYEE INFORMATION COMING FROM DEPARTMENTS AND EMPLOYEES AND WILL PRODUCE OUTPUTS WHICH WILL GO TO THE DEPARTMENTS AND EMPLOYEES. THE SYSTEM WILL ALSO MAINTAIN THE PAYROLL MASTER INFORMATION.

5.3.2 Usage of NAMES and SYNONYMS

When the documentor or analyst is constructing Analyzer data bases, one should keep in mind what Analyzer NAMES and SYNONYMS have been used in previous documentation source data bases. The documentor's work can be reduced if common names are used to describe similar sections of Analyzer data bases which are describing systems that will have to be documented under the same standard. For instance, a documentor might want to include sections called BACKGROUND-MEMO and OBJECTIVE-MEMO when developing Analyzer data bases to be documented using the Functional Description Standards. The documentor might also want to have an ATTRIBUTE named DEVELOPMENT-TIMES in these Data Bases. An example of ATTRIBUTE usage follows:

```
DEFINE                                  DEVELOPMENT-TIMES
     AS A ATTRIBUTE;
/*  VALUES ARE:
          MAN-HOURS-120
     FOR                          PROGRAMMING,
          PLENTY FOR              COMPUTER-TIME,
          MAN-HOURS-100
     FOR                          DATA-BASE-DEVELOPMENT,
          MAN-HOURS-20
     FOR                          PAYROLL-CLERICAL,
          MAN-HOURS-30
     FOR                          OPERATIONS,
     */
```

SYNONYMS can be used in similar fashion. If the documentor uses similar synonyms in each data base, his editing can be reduced. Examples of this are using MASTER-FILE as a SYNONYM for the main file of the system and using MAIN-PROCESS as a synonym for the highest level function in the system.

5.3.3 Completeness

There are three areas in which the documentor or analyst should strive to achieve completeness in the Analyzer data base. These areas are data flow, system structure, and functional flow.

Data flow should be complete in that all files or data sets are accounted for. This means that data definition should be included. Elements of data sets need be defined only to the level of description required. The CONTENTS Report is a good means of checking data description completeness. Usage of UPDATES, DERIVES, GENERATES, RECEIVES, and USES statements is

the vehicle by which data flow information is presented.

System structure must be complete for obvious reasons. The STRUCTURE Report is helpful in checking and representing the information.

Functional flow is perhaps the trickiest facet in the development of the Analyzer data base. Care must be taken to insure that a functional chain of EVENTS, CONDITIONS and PROCESSES exists in a meaningful fashion. Usage of TRIGGERS, ON TERMINATION OF, ON INCEPTION OF, CAUSES, MAKES, HAPPENS, and WHEN statements is suggested.[1]

5.3.4 DESCRIPTIONS

The documentors should keep in mind that, in many cases, descriptions in the form of text on different aspects of systems will be needed. The DESCRIPTION statement can be used by the documentor to meet these text requirements. The documentor should include a DESCRIPTION with all major sections of an Analyzer data base, as well as any other descriptive statements that are deemed necessary (i.e., PROCEDURE, VOLATILITY-SET, etc.).

5.3.5 Usage of KEYWORDS

When one or more objects in a system description need to be identified for selection and analysis purposes, KEYWORDS should be attached to each of the objects. By doing this, the documentor has a link between related objects. For example, if all functions (PROCESSES) described as being manual procedures in a system description were to be listed and analyzed together, the KEYWORD "manual" could be attached to each PROCESS for this purpose. By doing a NAME-GEN with the option KEY= MANUAL, a list of these PROCESSES could then be produced.

---

[1] See Part I of the URL Manual for an explanation of these terms.

Appendix A

UBA COMMAND ABBREVIATIONS

This appendix presents all URA commands, with their parameters and defaults. It also presents the acceptable abbreviations for these commands and parameters. There are several conventions in choosing these abbreviations that may aid the user:

1. For command names that consist of only one word, for example, CONTENTS or PICTURE, the first three or four letters of the name are used as their abbreviation. CONT is the abbreviation for CONTENTS and PIC is the abbreviation for PICTURE.

2. For most command names that consist of more than one word, e.g., CONSISTS-MATRIX or FORMATTED-PROBLEM-STATEMENT, the abbreviation is derived by using the first letter from each word in the command name. This gives CM for CONSISTS-MATRIX and FPS for FORMATTED-PROBLEM-STATEMENT. This convention is not strictly followed however, so that the abbreviations may be more meaningful. For example, DCOM is the abbreviation for DELETE-COMMENT-ENTRY which is more mnemonic than DCE.

3. Abbreviations for parameters used in the same way by several commands are the same. The FILE parameter then, always has an abbreviation, F, no matter which command is using it. Some of the more common parameters are listed below:

Parameter	Abbreviation
FILE	F
NAME	N
INPUT	I
NOPRINT	NP
PUNCH	P

4. Whenever an abbreviation exists for a parameter that has a "NO" prefix, such as NOPRINT, the abbreviation is always prefixed with "N". For example, NP is the abbreviation for NOPRINT.

A blank entry in the "Parameters" column for a command designates that there are no parameters for the command. A blank entry in the "Abbreviations" column designates that there is no abbreviation for the command or parameter name. A blank entry in the "Defaults" column designates that there is no default for this parameter for the given command.

Command Name	Parameters	Abbreviations	Defaults
CHANGE-TYPE		CT	
	FILE	F	
	NAME	N	
	TYPE	T	
CONSISTS-COMPARISON		CNC	
	FILE	F	FILE
CONSISTS-MATRIX		CM	
	FILE	F	FILE
	NAME	N	
	CONTAINED	CNTD	
	CONSISTS	CSTS	
CONTENTS		CONT	
	FILE	F	FILE
	NAME	N	
	INDEX		
	NOINDEX		NOINDEX
	LEVELS		LEVELS=ALL
	NCFLAG		
	NONCFLAG		NONCFLAG
	PRINT-SECURITY-INFORMATION	PSI	PRINT-SECURITY-INFORMATION
	NOPRINT-SECURITY-INFORMATION	NPSI	
DATA-PROCESS		DP	
	FILE	F	FILE
	NAME	N	
	DATA	D	
	PROCESS	P	
	DPMAT		DPMAT
	NODPMAT		
	DPANL		DPANL
	NODPANL		
	PMAT		PMAT
	NOPMAT		
	PANL		PANL
	NOPANL		
DELETE		DEL	
	FILE	F	
	NAME	N	
DELETE-COMMENT-ENTRY		DCOM	
	DESCRIPTION	DESC	
	NODESCRIPTION	NDESC	NODESCRIPTION
	DERIVATION	DER	
	NODERIVATION	NDER	NODERIVATION

	FALSE-WHILE	FW	
	NOFALSE-WHILE	NFW	NOFALSE-WHILE
	PROCEDURE	PRCD	
	NOPROCEDURE	NPRCD	NOPROCEDURE
	TRUE-WHILE	TW	
	NOTRUE-WHILE	NTW	NOTRUE-WHILE
	VOLATILITY	VOL	
	NOVOLATILITY	NVOL	NOVOLATILITY
	VOLATILITY-MEMBER	VOLM	
	NOVOLATILITY-MEMBER	NVOLM	NOVOLATILITY-MEMBER
	VOLATILITY-SET	VOLS	
	NOVOLATILITY-SET	NVOLS	NOVOLATILITY-SET
	FILE	F	
	NAME	N	
	PRINT	P	PRINT
	NOPRINT	NP	
DELETE-PSL		DPSL	
	INPUT	I	INPUT=term
	SOURCE	S	SOURCE
	NOSOURCE	NS	
	XREF	X	
	NOXREF	NX	NOXREF
DICTIONARY		DICT	
	FILE	F	FILE
	NAME	N	
	INDEX		
	NOINDEX		NOINDEX
	NUM-SPACE	NS	NUM-SPACE=2
	DESCRIPTION	DESC	DESCRIPTION
	NODESCRIPTION	NDESC	
	KEYWORDS	KEY	KEYWORDS
	NOKEYWORDS	NKEY	
	RESPONSIBLE-PD	RPD	RESPONSIBLE-PD
	NORESPONSIBLE-PD	NRPD	
	SYNONYMS	SYN	SYNONYMS
	NOSYNONYMS	NSYN	
DYNAMIC-ANALYSIS		DA	
	FILE	F	FILE
	FILE	N	
	DYNAMIC-ANALYSIS-MATRIX	DAMAT	DAMAT
	NODYNAMIC-ANALYSIS-MATRIX	NDAMAT	
	DYNAMIC-ANALYSIS	DANL	DANL
	NODYNAMIC-ANALYSIS	NDANL	
	ORDER		ORDER=BYTYPE
	UTILIZES		UTILIZES
	NOUTILIZES		

	LINKS		LINKS=1000
ENTITY-IDENTIFIER		EI	
	FILE	F	FILE
	NAME	N	
	IDENTIFIER	I	
	ENTITY	E	
EXTENDED-PICTURE		EP	
	FILE	F	FILE
	NAME	N	
	INDEX		
	NOINDEX		NOINDEX
	STRUCTURE	STR	
	DATA-FLOW	DF	
	FORWARD	FWD	
	BACKWARD	BWD	
	DOWNWARD	DOWN	
	UPWARD	UP	
	THREAD		
	NOTHREAD		NOTHREAD
	LINKS		LINKS=1000
	COLUMNS	COLS	COLUMNS=119
	ROWS		ROWS=39
	HORIZONTAL-BOXES	HB	
	VERTICAL-BOXES	VB	
FORMATTED-PROBLEM-STATEMENT		FPS	
	ALL-STATEMENTS	AS	NAS
	NOALL-STATEMENTS	NAS	
	AMARG	AM	AMARG=10
	BMARG	BM	BMARG=25
	COMMENT	COM	COMMENT
	NOCOMMENT	NCOM	
	COMPLEMENTARY-STATEMENTS	COMP	COMP
	NOCOMPLEMENTARY-STATEMENTS	NCOMP	
	CMARG	CM	CMARG=1
	DEFINE	DEF	DEFINE
	NODEFINE	NDEF	
	DESG	DG	DESG
	NODESG	NDG	
	DLC-COMMENT	DLCC	DLC-COMMENT
	NODLC-COMMENT	NDLCC	
	EMPTY		
	NOEMPTY		
	FILE	F	FILE
	NAME	N	
	HMARG	HM	HMARG=40
	INDEX		
	NOINDEX		NOINDEX
	LINE-NUMBERS	LNS	LNS
	NOLINE-NUMBERS	NLNS	

	NEW-LINES	NL	
	NONEW-LINES	NNL	NONEW-LINES
	NEW-PAGE	NPG	
	NONEW-PAGE	NNPG	NONEW-PAGE
	NMARG	NM	NMARG=20
	ONE-PER-LINE	OPL	ONE-PER-LINE
	SEVERAL-PER-LINE	SPL	
	PRINT	P	PRINT
	NOPRINT	NP	
	PRINTEOF FOF		PEOF
	NOPRINTEOF	NPEOF	
	PUNCH	P	
	NOPUNCH		NOPUNCH
	RNMARG	RM	RNMARG=70
	SMARG	SM	SMARG=5
FREQUENCY		FREQ	
	INDEX		
	NOINDEX		NOINDEX
	ORDER		ORDER=BYTYPE
	NEW-PAGE	NPG	
	NONEW-PAGE	NNPG	NONEW-PAGE
HELP			
	command-name		
	SHORT		SHORT
	LONG		
INPUT-PSL		IP	
	DBREF	D	DBREF
	NODBREF	ND	
	INPUT	I	INPUT=term
	SOURCE	NS	SOURCE
	NOSOURCE	S	
	UPDATE	U	
	NOUPDATE	NU	NOUPDATE
	XREF	X	
	NOXREF	NX	NOXREF
INTERVAL-CONSITENCY		IC	
	FILE	F	FILE
	NAME	N	
	INDEX		
	NOINDEX		NOINDEX
	LEVELS		LEVELS=ALL
KWIC			
	FILE	F	FILE
	DIF		DIF=2
LIST-CHANGES		LC	

	PRINT	P	PRINT
	NOPRINT	NP	
	USER		
	NOUSER		NOUSER
NAME-GEN		NG	
	EMPTY		
	NOEMPTY		
	ORDER		ORDER=BYTYPE
	PRINT	P	PRINT
	NOPRINT	NP	
	PUNCH		PUNCH
	NOPUNCH		
	SELECTION	S	
	INPUT	I	INPUT=term
	TIME-OF-LAST-CHANGE	TLC	
	NOTIME-OF-LAST-CHANGE	NTLC	NTLC
NAME=LIST		NL	
	ORDER		ORDER=BYTYPE
	COLUMN	COL	COLUMN=TYPE
	TYPE		TYPE
	NOTYPE		
	SYNONYM	SYN	SYNONYM
	NOSYNONYM	NSYN	
	DATE-LAST-CHANGED	DLC	DLC
	NODATE-LAST-CHANGED	NDLC	
PICTURE		PIC	
	DATA	D	DATA
	NODATA	ND	
	FILE	F	FILE
	NAME	N	
	FLOW		FLOW
	NOFLOW		
	INDEX		
	NOINDEX		NOINDEX
	STRUCTURE	STR	STRUCTURE
	NOSTRUCTURE	NSTR	
PRINT-ATTRIBUTE-VALUES		PAV	
	FILE	F	FILE
	NAME	N	
PROCESS-CHAIN		PC	
	FILE	F	FILE
	NAME	N	
	INDEX		
	NOINDEX		NOINDEX
	LINKS		LINKS=1000
	DEPENDING-ON	DEP	

	NODEPENDING-ON	NDEP	NODEPENDING-ON
	FOR-EACH	FEA	
	NOFOR-EACH	NFEA	NOFOR-EACH
	COLUMNS	COLS	COLUMNS=119
	ROWS		ROWS=39
	HORIZONTAL-BOXES	HB	
	VERTICAL-BOXES	VB	
PROCESS-INPUT-OUTPUT		PRIO	
	FILE	F	FILE
	NAME	N	
	DESCRIPTION	DESC	DESCRIPTION
	NODESCRIPTION	NDESC	
	PROCEDURE	PRCD	
	NOPROCEDURE	NPRCD	NOPROCEDURE
	INPUT	INP	INPUT
	NOINPUT	NINP	
	OUTPUT	OUT	OUTPUT
	NOOUTPUT	NOOUT	
	NEW-PAGE	NPG	
	NONEW-PAGE	NNPG	NONEW-PAGE
	PRINT	P	PRINT
	NOPRINT	NP	
	INDEX		
	NOINDEX		NOINDEX
PROJECTED-COST-REPORT		PCR	
	FILE	F	FILE
	NAME	N	
	EXPRESSION	E	
	INPUT	I	INPUT=term
	DEFAULT	DEF	DEFAULT=0
	INDEX		
	NOINDEX		NOINDEX
	RESOURCE	RSC	
	UNITS	U	
PUNCH-COMMENT-ENTRY		PCOM	
	DERIVATION	DER	
	NODERIVATION	NDER	NODERIVATION
	DESCRIPTION	DESC	
	NODESCRIPTION	NDESC	NODESCRIPTION
	FALSE-WHILE	FW	
	NOFALSE-WHILE	NFW	NOFALSE-WHILE
	PROCEDURE	PRCD	
	NOPORCEDURE	NPRCD	NOPROCEDURE
	TRUE-WHILE	TW	
	NOTRUE-WHILE	NTW	NOTRUE-WHILE
	VOLATILITY	VOL	
	NOVOLATILITY	NVOL	NOVOLATILITY
	VOLATILITY-MEMBER	VOLM	
	NOVOLATILITY-MEMBER	NVOLM	NOVOLATILITY-MEMBER
	VOLATILITY-SET	VOLS	

	NOVOLATILITY-SET	NVOLS	NOVOLATILITY-SET
	EMPTY		
	NOEMPTY		
	FILE	F	FILE
	NAME	N	
	PRINT	P	PRINT
	NOPRINT	NP	
	PUNCH		
	NOPUNCH		NOPUNCH
RENAME		REN	
	INPUT	I	
	OLD	O	
	NEW	N	
REPLACE-COMMENT-ENTRY		RCCM	
	INPUT	I	INPUT
	PRINT	P	PRINT
	NOPRINT	NP	
RESOURCE-CONSUMPTION-ANALYSIS		RCA	
	FILE	F	FILE
	NAME	N	
	PROCESS-LEVEL	PL	PL=ALL
	INTERVAL	INT	
	BYPROCESSOR	BP	BYPROCESSOR
	NOBYPROCESSOR	NBP	
	BYRESOURCE	BR	BYRESOURCE
	NOBYRESOURCE	NBR	
	INDEX		
	NOINDEX		NOINDEX
	PROCESSOR-KEYWORD	PK	ALL
SECURITY-CONSISTENCY ANALYSIS		SECA	
	FILE	F	FILE
	NAME	N	
	PRINT-NULL-SECURITY-INFORMATION	PNSI	
	NOPRINT-NULL-SECURITY-INFORMATION	NPSI	NPSI
	PRINT-MATRIX	PMAT	PMAT
	NOPRINT-MATRIX	NPMAT	
	INDEX		
	NOINDEX		NOINDEX
STRUCTURE		STR	
	INDENT	IND	INDENT=3
	INDEX		
	NOINDEX		NOINDEX
	INPUT	INP	
	INTERFACE	INTF	

OUTPUT PROCESS REAL-WORLD-ENTITY[1]	OUT PROC RWE	PROCESS
PROCESSOR	PRCR	
SUMMARY	SUM	

[1] REAL-WORLD-ENTITY is synonymous with INTERFACE (INTF).

Appendix B

CREATING AND INITIALIZING URA DATA BASES

Before the user can add information to a URA data base, the data base must exist and be initialized properly. Creating an initialized data base in the user's working directory is a simple one-step process. The user should type

```
ec >ml>CARA>initdb (name) (size)
```

The size parameter is optional and, if given, should be the desired size of the data base, chosen from those sizes presently available (i.e., 20, 50, 100, 130). The default size if not given is 20. The name parameter is also optional and, if given, is the name that URA will use to reference the data base. Note, a suffix of .dbf should not be given by the user. The default name used if name is not given is ura. If the size parameter is to be used, then the name must also be given.

Appendix C

UTILITIES

DATA BASE DUMP PROGRAM (PDUM)

Purpose

The purpose of the data base dump program is to produce a file of sequential card images consisting of all names and relationships stored in a UBA data base. The file is in a format suitable as input to the Data Base Restore Program.

Information Presented

The data base dump program, PDUM, produces a report in the standard UBA format and dumps the contents of the entire UBA data base in eighty-column card-image format with a sequence number in columns 73-80.

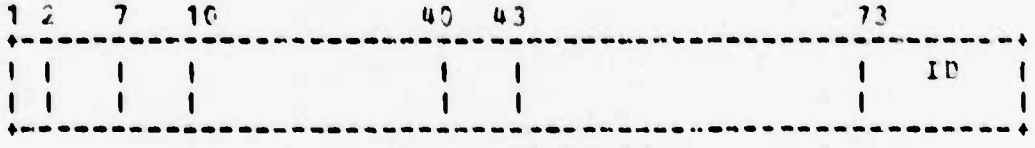
The report shows the contents of the card images. The data base dump program probes every possible UBA data base connection and encodes this information in the output it produces.

Format

Despite the many different types of possible relationships in the data base, the information it contains is written using only two record formats. This flexibility is achieved by using particular fields of a record to indicate the form and type of information in the other fields of the record.

The two basic formats are the following:

NAME FORMAT (80 Characters)

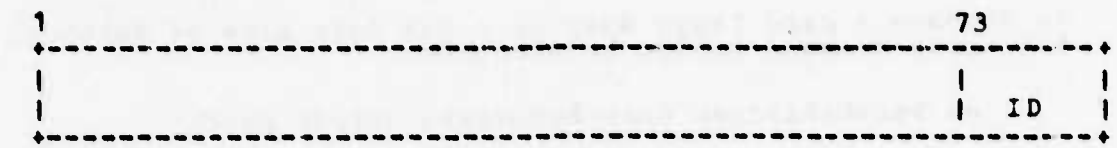


N2 [holds a second name or number]
T2 [indicates type of information in N2]
N1 [holds a name or a number]
T1 [indicates the type of information stored in N1]
TYP [holds numeric name or relation type]
CODE [indicates type of relation from 1-6 described above]

Numeric codes in T1 and T2:

0: field not applicable
1: field contains a name
2: field contains a number

COMMENT-ENTRY FORMAT (80 Characters)



Comment line directly from data base

The sequence of these card-images in the output file is important since more than one record is often required to describe a single structure in the data base.

Analysis

The data base dump program, reproduces the contents of the data base in six steps, to process the six general forms of relations. The six categories of relations are as follows:

1. The set called ALLNAM, which owns (consists of) all names in the data base.

2. The SYNFOR relation which links synonyms to the basic names.

3. Comment entries associated with a NAMREC record (a particular name) via set RELA and ALINE records.

4. Simple RELA-RELB set relations (two-name connections) conected by NUBA records.

5. Complex RELA-RELB relations connected by NUBB records which may or may not own a NUBC record via RELC (three and four name connections).

6. Complex RELA-RELB relations connected via NUBC records (four name connections).

Usages

The data base dump program provides a means, along with the Data Base Restore Program, to move a URA data base from one system to another system, regardless of differences in system hardware and software.

This program is also useful for saving the current status of a data base at a given checkpoint in time on some off-line medium such as magnetic tape. If the data base is subsequently damaged or destroyed, one can recover by restoring the data base to its condition at the time of the dump.

The only restriction on the dump program is that the data base must be a URA data base.

To produce a card image dump of a URA data base on Multics, the following command should be executed:

```
ec >ml>CARA>dump data-base-name output punch
```

where:

data-base-name is the name of URA data base to be dumped (the ".dbf" qualifier is automatically added).

output is the name of the segment (file) that will contain the printed listing of the dump.

punch is the name of the segment (file) that will contain the card-image dump of the data base.

Example

Figure 80 shows a portion of the report produced by the data base dump program.

- ANALYZER UTILITY PROGRAM -

DATA BASE DUMP

PARAMETERS FOR: PDUM

```
   PRINT SEQID

   CDIYPET1 N1                              I2 N2                          ID FIELD

   DATA BASE DUMP VERSION  3.3OCT 17, 1977  12:30:08                       00000010
    1    1 2 6                               1 OCT 17, 1977 12:21:09       00000020
    2   16 1 departments-and-employees       2 1                           00000030
    2    8 1 employee-information            2 1                           00000040
    2   19 1 payroll-master-information      2 1                           00000050
    2   15 1 payroll-processing              2 1                           00000060
    2   13 1 paysystem-outputs               2 1                           00000070
    6   16 1 departments-and-employees       1 employee-information         00000080
    6   27 1 departments-and-employees       1 paysystem-outputs           00000090
    6   35 1 payroll-master-information      1 payroll-processing          00000100
    6   16 1 payroll-processing              1 paysystem-outputs           00000110
    6   27 1 payroll-processing              1 employee-information         00000120
```

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DATA BASE RESTORE PROGRAM (PRES)

Purpose

The purpose of the Data Base Restore Program, is to restore a URA data base, accepting the card-image format output generated by the Data Base Dump Program. The sequence numbers on the input records are also checked for consistency.

Information Presented

The data base restore program, PRES, produces a report in the standard URA format of the card images that are input to Restore Program. The program also prints out messages concerning the outcome of the restore process.

Format

The format of the output of this utility is similar to the format of the report produced by the Dump Program.

Analysis

The URA data base is restored in seven steps in a manner corresponding to that utilized by the Dump Program. There are eleven subroutines which handle such tasks as the interpretation of the input records, initialization, Input/Output, errors and number conversion.

Usages

The data base restore program provides a means, along with the data base dump program, to move a URA data base from one system to another system regardless of differences in hardware and software, and to provide back-up should the data base become damaged or destroyed.

The only restriction is that the data base must be a URA data base.

To restore a previously dumped URA data base the following Multics command should be executed:

```
ec >ml>CARA>restore data-base-name output input
```

where:

data base-name is the name of an empty initialized data base where the restorationn is going to be performed (the ".dbf" qualifier is automatically added).

output is the segment (file) that will contain the printed listing of the input.

input is the segment (file) that is the punch segment from the Dump Program.

Example

Figure 81 shows a portion of the report produced by the Restore Program.

- ANALYZER UTILITY PROGRAM -

DATA BASE RESTORE

```
PARAMETERS FOR: PRES

   PRINT SEQCHK MOD-DIC

   CDTYPE1 N1                    T2 N2                    ID FIELD

   -OUT
   UBA297:INPRES  : NULL OR INVALID FIRST CARD
   UBA296:ABPRES  : ****** RUN ABORTED *****
```

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- ANALYZER UTILITY PROGRAM -

DATA BASE ELSTOFF

PARAMETERS FOR: PRES

PRINT SEQCHK MOD-DIC

```
CDIYPET1 N1                          T2 N2                          ID FIELD

DATA BASE DUMP VERSION  3.3OCT 17, 1977  12:30:06                   00000010
 1   1 2 6                            1 OCT 17, 1977 12:21:09        00000020
 2  16 1 departments-and-employees     2 1                           00000030
 2   8 1 employee-information          2 1                           00000040
 2  19 1 payroll-master-information    2 1                           00000050
 2  15 1 payroll-processing            2 1                           00000060
 2  13 1 paysystem-outputs             2 1                           00000070
 6  16 1 departments-and-employees     1 employee-information         00000080
 6  27 1 departments-and-employees     1 paysystem-outputs           00000090
 6  35 1 payroll-master-information    1 payroll-processing          00000100
 6  16 1 payroll-processing            1 paysystem-outputs           00000110
 6  27 1 payroll-processing            1 employee-information        00000120
```

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RESTORE VERSION 3.2 to 3.3 (PR23)

Purpose

The purpose of the Data Base Restore Version 3.2 to 3.3 program is to restore a 3.2 Version URA data base to a 3.3 Version, accepting the card-image format output generated by the Version 3.2 Database Dump program. The sequence numbers on the input records are also checked for consistency.

Information Presented

The Data Base Restore Program, PR23, produces a report in the standard URA format of the card-images that are input to PR23. The program also prints out messages concerning the outcome of the restore process.

Format

The format of the output of this utility is similar to the format of the report produced by the DUMP program.

Analysis

The Version 3.2 URA data base is restored in six steps in a manner corresponding to that utilized by the version 3.2 Dump program. There are thirteen subroutines which handle such tasks as the interpretation of the input records, initialization, Input/Output, errors and number conversion.

There is one subroutine dealing particularly with the HAPPENS statement which has been changed to a new structure in version 3.3. Another subroutine handles the GENERATES and RECEIVES statements which have also been changed internally. The Program generates a data base with new structures that are compatible with the version 3.3 URL/URA software.

Usages

The Data Base Restore Version 3.2 to 3.3 program provides a means to revise a 3.2 data base to be compatible with the 3.3 URL/URA sofware.

The only restrictions are that the data base must be a URA 3.2 data base and that the data base has been dumped by a URA 3.2 Dump program.

To restore the previously dumped URA data base the following Multics command should be executed:

```
ec >ml>CARA>pr23 data_base_name output input
```

where:

data_base_name is the name of an empty initialized 3.3 data base where the restoration is going to be performed (the ".dbf" qualifier is automatically added).

Output is the segment (file) that will contain the printed listing of the input

input is the segment (file) that is the punch segment from the 3.2 Dump Program.

Example

Figure 82 shows a portion of the report produced by the PR23 program.

- ANALYZER UTILITY PROGRAM -

Restore Version 3.2 to 3.3

PARAMETERS FOR: PF22

PRINT SEQCHK MOD-DLC

CDIYPET1 N1				T2 N2		ID FIELD
DATA BASE DUMP VERSION 2 OCT 17, 1977 12:41:31						00000010
1	16	1	departments-and-employees			00000020
1	8	1	employee-information			00000030
1	19	1	payroll-master-information			00000040
1	15	1	payroll-processing			00000050
1	13	1	paysystem-outputs			00000060
4	19	1	employee-information	1	departments-and-employees	00000070
4	16	1	payroll-processing	1	paysystem-outputs	00000080
4	27	1	payroll-processing	1	employee-information	00000090
4	19	1	paysystem-outputs	1	departments-and-employees	00000100
5	35	1	payroll-master-information	1	payroll-processing	00000110

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USAGE MONITOR BY COMMAND REPORT

Purpose

The purpose of the Usage Monitor by Command report is to produce a summary report of all Analyzer commands used during a certain period of time.

Information Presented

The Usage Monitor by Command report, UMC, produces a list of all Analyzer commands given the number of times each was used, and the percentage of the total nuber of commands for each command. The same information is presented for the parameters given with each command. A summary of the total number of commands and parameters for each command is also given.

Format

The information is listed in a table. The command and its usage statistics are on the left side of the report. The parameters and their statistics are presented on the right side of the report beside the corresponding command. The summary totals appear at the bottom of their respective lists.

Analysis

The UMC program utilizes a file maintained by the Analyzer called the Statistics File. Each time as user issues a command to the Analyzer, this command and statistics about its execution are appended to the Statistics File. The UMC program reads the commands and parameters from this file, checks their legality (assigning non-legal commands and parameters to the "INVALID OR OTHER" category), and counts the number of each command and parameter. After the entire file has been processed, the percentages and summary statistics are computed, and the report is produced.

Usages

The Usage Monitor by Command report provides a means to monitor the use of the individual Analyzer commands and parameters. Of particular interest would be those commands and parameters used the most and those used the least. The number of each command is an indication of the kinds of analyses being performed. It might show, for example, that insufficient analysis commands are being used.

Example

Figure 83 presents an example of the Usage Monitor by Command report.

DATE: SEP 30, 1977
TIME: 15:59:49

Figure 83

Usage Monitor by Command Report

URA COMMAND USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

COMMAND	COUNT	PERCENT	COUNT	PERCENT	PARAMETERS
CHANGE-TYPE	12	2.17	10	45.45	FILE
			2	9.09	NAME
			10	45.45	INVALID OR OTHER
			22	100.00	
CONSISTS-MATRIX	4	0.72	4	100.00	INVALID OR OTHER
			4	100.00	
CONTENTS	5	0.90	3	60.00	NAME
			2	40.00	INVALID OR OTHER
			5	100.00	
DATA-PROCESS	4	0.72	4	100.00	INVALID OR OTHER
			4	100.00	
DELETE-COMMENT-ENTRY	4	0.72	2	20.00	FILE
			2	20.00	NAME
			6	60.00	INVALID OR OTHER
			10	100.00	
DELETE	4	0.72	2	50.00	FILE
			2	50.00	NAME
			4	100.00	
DICTIONARY	4	0.72	2	100.00	NAME
			2	100.00	
ENTITY-IDENTIFIER	2	0.36	2	100.00	INVALID OR OTHER
			2	100.00	
FORMATTED-PROBLEM-STATEMENT	8	1.44			

Figure 83

DATE: SEP 30, 1977
TIME: 15:59:45

Usage Monitor by Command Report

URA COMMAND USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

COMMAND	COUNT	PERCENT	COUNT	PERCENT	PARAMETERS
			4	100.00	NAME
			4	100.00	
FREQUENCY	4	0.72	4	100.00	INVALID OR OTHER
			4	100.00	
INPUT-PSL	12	2.17	12	36.36	INPUT
			21	63.64	INVALID OR OTHER
			33	100.00	
KWIC	2	0.36			
			0	100.00	
MIS	88	15.88			
			0	100.00	
NAME-GEN	59	10.65	1	0.75	PUNCH
			39	29.32	NOPRINT
			93	69.92	INVALID OR OTHER
			133	100.00	
NAME-LIST	4	0.72	10	100.00	INVALID OR OTHER
			10	100.00	
PICTURE	6	1.08	6	100.00	NAME
			6	100.00	
PRINT-ATTRIBUTE-VALUES	2	0.36			
			0	100.00	
PROCESS-INPUT-OUTPUT	6	1.08	4	50.00	NAME
			2	25.00	INDEX
			2	25.00	INVALID OR OTHER
			8	100.00	
PUNCH-COMMENT-ENTRY	8	1.44	4	22.22	FILE

DATE: SEP 30, 1977
TIME: 15:59:45

Figure 83

Usage Monitor by Command Report

URA COMMAND USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

COMMAND	COUNT	PERCENT	COUNT	PERCENT	PARAMETERS
			4	22.22	NAME
			10	55.56	INVALID OR OTHER
			18	100.00	
RENAME	5	0.90	3	42.86	INPUT
			4	57.14	INVALID OR OTHER
			7	100.00	
REPLACE-COMMENT-ENTRY	2	0.36	2	100.00	INPUT
			2	100.00	
LIST-CHANGES	5	0.90	3	50.00	NOPRINT
			3	50.00	INVALID OR OTHER
			6	100.00	
SET	194	35.02	8	2.54	OUTPUT
			22	6.98	DATA-BASE
			2	0.63	LINES
			138	43.81	PROBLEM-NAME
			76	24.13	HEADING
			68	21.59	PARAMETERS
			1	0.32	INVALID OR OTHER
			315	100.00	
STOP	24	4.33			
			0	100.00	
STRUCTURE	10	1.81	2	20.00	INPUT
			8	80.00	INVALID OR OTHER
			10	100.00	
SUMMARY	3	0.54			

DATE: SEP 30, 1977
TIME: 15:59:45

Figure 83

Usage Monitor by Command Report

URA COMMAND USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

COMMAND	COUNT	PERCENT	COUNT	PERCENT	PARAMETERS
			0	100.00	
CONSISTS-COMPARISON	2	0.36			
			0	100.00	
HELP	13	2.35	1	7.14	FREQUENCY
			1	7.14	NAME-GEN
			1	7.14	PROCESS-INPUT-OUTPUT
			1	7.14	EXTENDED-PICTURE
			1	7.14	PROCESS-CHAIN
			1	7.14	SECURITY-ANALYSIS
			1	7.14	INTERVAL-CONSISTENCY
			1	7.14	PROJECTED-COST-REPORT
			6	42.86	INVALID OR OTHER
			14	100.00	
DELETE-PSL	3	0.54	3	100.00	INPUT
			3	100.00	
EXTENDED-PICTURE	8	1.44	8	22.86	NAME
			27	77.14	INVALID OR OTHER
			35	100.00	
PROCESS-CHAIN	3	0.54	3	60.00	NAME
			2	40.00	INVALID OR OTHER
			5	100.00	
DISPLAY	3	0.54	1	100.00	INVALID OR OTHER
			1	100.00	
RESOURCE-CONSUMPTION-ANALYSIS	8	1.44	6	17.65	FILE

DATE: SEP 30, 1977
TIME: 15:59:45

Figure 83

Usage Monitor by Command Report

URA COMMAND USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

COMMAND	COUNT	PERCENT	COUNT	PERCENT	PARAMETERS
			2	5.88	NAME
			2	5.88	INDEX
			24	70.59	INVALID OR OTHER
			34	100.00	
SECURITY-ANALYSIS	2	0.36	2	25.00	NAME
			6	75.00	INVALID OR OTHER
			8	100.00	
INTERVAL-CONSISTENCY	5	0.90	3	37.50	FILE
			2	25.00	NAME
			1	12.50	INDEX
			2	25.00	INVALID OR OTHER
			8	100.00	
DYNAMIC-ANALYSIS	8	1.44	1	7.14	FILE
			2	14.29	NAME
			11	78.57	INVALID OR OTHER
			14	100.00	
PROJECTED-COST-REPORT	5	0.90	3	13.04	NAME
			20	86.96	INVALID OR OTHER
			23	100.00	
INVALID OR OTHER	13	2.35			
			0	100.00	
TOTALS	554	100.00			

USAGE MONITOR BY USER REPORT

Purpose

The purpose of the Usage Monitor by User program is to produce a report on the usage of the Analyzer by various persons and projects during a certain period of time.

Information Presented

For each Account.Project id. the number of sessions, the number of commands and the amount of cpu and real time consumed by the Analyzer is given. A summary for all users of the Analyzer is also given.

Format

The heading of the report shows the date and time span that the report covers and the date and time of the report generation. The body of the report consists of five columns. The left most column, "ACCOUNT PROJECT" identifies the account number or computer center id of the user and the project identification. The number of times the person used the analyzer is given under the SESSIONS column. The percent of total sessions for each user is also displayed. The next column, COMMANDS, presents the total number and the percent of grand total of Analyzer commands issued by the user. The last two columns show the amount of CPU and real time used by the Analyzer in performing the commands. The last line of the report shows the grand totals of the sessions, commands, CPU, and real time.

Analysis The UMU Program utilizes a file kept by the Analyzer called the Statistics File. Each time a command is given to the Analyzer, this command and various statistics about its execution are recorded in the Statistics file. The UMU program processes the Statistics File sequentially, accumulating the number of sessions, commands, CPU, and real time for each user encountered. The Statistics File is sorted by user identification prior to the execution of the UMU module. When the end of the file has been reached, the percentages and totals are computed and the report is produced.

Usages

The Usage Monitor by User report provides a means to monitor the usage of the Analyzer by various Account.Project id's. This information may be useful to project management to determine who is using the Analyzer, and how much each person is using it.

Example

Figure 94 presents an example of the Usage Monitor by User report.

DATE: SEP 30, 1977
TIME: 16:00:50

Figure 84

Usage Monitor by User Report

URA USAGE STATISTICS FROM 08-31-77 22:58:41 TO 09-19-77 12:51:07

ACCOUNT.PROJECT	SESSIONS		COMMANDS		CPU (SEC)	REAL (SEC)
SEJI SEDH	8	25.00	40	7.22	1.1140	42.1070
SELU SEDH	12	37.50	449	81.05	167.1414	4852.2617
SE14 SEDH	12	37.50	65	11.73	58.3359	1457.9905
TOTALS	32	100.00	554	100.00	226.5914	6352.3555

DATA BASE STATISTICS PROGRAM (DBS)

Purpose

The purpose of the Data Base Statistics Program is to generate a URA Data Base Statistics Report. This report is rather technical and is intended for users familiar with the operations of the data base system.

Information Presented

The URA data base statistics report consists of three different tables, which show how many set occurrences of different sets and how many record occurrences of different records have taken place, and how they are related.

Format

The format of the Data Base Statistics Report is similar to the format of the URA reports. For a large data base, this report can be rather voluminous.

Analysis

The data base statistics program prints out three tables:

For the first table, the program checks for the value of several internal switches. If the NAME switch is true, the name and information about each record is printed; if it is false no information is printed. If the NAME NUB switch is true, the code number for the relation type between different records and other relevant information is printed. If the SYNONYM switch is true, synonyms and their code number are printed.

For the second table, the program prints the total number of occurrences of different sets and total number of record occurrences of different records.

For the third table the program prints out the code numbers of different relation types with the sets RELA and RELB.

Usages

When a URA data base is being initially populated, sometimes is useful to know how many different relationships are stored in the data base. The different relation types are represented in the sets RELA and RELB. The DBS program may be used to print this information.

This program is not at all similar to the SUMMARY command in URA nor the Data Base Summary Program. The SUMMARY command presents a summary of the number of each type of URL object contained in the URA data base. The Data Base Summary Program (DBSM) displays the physical utilization summary such as the number of data base records (pages) used, the number of name records, nubb records, and set statistics.

To produce a DBS report of a URA data base the following Multics command should be executed:

```
ec >ml>CARA>dbs data-base output
```

where:

data-base is the name of the URA data base for which the statistics report is desired (the .dbf suffix is automatically added).

output is the name of a segment (file) that will contain the printed listing of the statistics report.

Examples

Figure 85 contains a portion of the Data Base Statistics Report.

- ANALYZER UTILITY PROGRAM -

Data Base Statistics

PARAMETERS FOR: DBS

NAMES NUBS SYNONYMS NAMNUBS

SEQ	NAME		NUBA	NUBB	NUBC	COM	OTH	RELA	NUBA	NUBB	NUBC	COM	OTH	RELB	TOT
1	departments-and-employees	16	0	2	0	0	0	2	0	0	0	0	0	0	2
		16 (1, 0)	27 (1, 0)												
2	employee-information	8	0	0	0	0	0	0	0	2	0	0	0	2	2
		16 (0, 1)	27 (0, 1)												
3	payroll-master-information	19	0	1	0	0	0	1	0	0	0	0	0	0	1
		35 (1, 0)													
4	payroll-processing	15	0	2	0	0	0	2	0	1	0	0	0	1	3
		16 (1, 0)	27 (1, 0)				35 (0, 1)								
5	paysystem-outputs	13	0	0	0	0	0	0	0	2	0	0	0	2	2
		16 (0, 1)	27 (0, 1)												
***	TOTALS		0	5	0	0	0	5	0	5	0	0	0	5	10

Figure 85
- ANALYZER UTILITY PROGRAM -

Data Base Statistics

TYPE	(RELA,RELB)	TYPE	(RELA,RELB)	TYPE	(RELA,RELB)	TYPE	(RELA,RELB)	TYPE	(RELA,RELB)
1	(0, 0)	21	(0, 0)	41	(0, 0)	61	(0, 0)	81	(0, 0)
2	(0, 0)	22	(0, 0)	42	(0, 0)	62	(0, 0)	82	(0, 0)
3	(0, 0)	23	(0, 0)	43	(0, 0)	63	(0, 0)	83	(0, 0)
4	(0, 0)	24	(0, 0)	44	(0, 0)	64	(0, 0)	84	(0, 0)
5	(0, 0)	25	(0, 0)	45	(0, 0)	65	(0, 0)	85	(0, 0)
6	(0, 0)	26	(0, 0)	46	(0, 0)	66	(0, 0)	86	(0, 0)
7	(0, 0)	27	(2, 2)	47	(0, 0)	67	(0, 0)	87	(0, 0)
8	(0, 0)	28	(0, 0)	48	(0, 0)	68	(0, 0)	88	(0, 0)
9	(0, 0)	29	(0, 0)	49	(0, 0)	69	(0, 0)	89	(0, 0)
10	(0, 0)	30	(0, 0)	50	(0, 0)	70	(0, 0)	90	(0, 0)
11	(0, 0)	31	(0, 0)	51	(0, 0)	71	(0, 0)	91	(0, 0)
12	(0, 0)	32	(0, 0)	52	(0, 0)	72	(0, 0)	92	(0, 0)
13	(0, 0)	33	(0, 0)	53	(0, 0)	73	(0, 0)	93	(0, 0)
14	(0, 0)	34	(0, 0)	54	(0, 0)	74	(0, 0)	94	(0, 0)
15	(0, 0)	35	(1, 1)	55	(0, 0)	75	(0, 0)	95	(0, 0)
16	(2, 2)	36	(0, 0)	56	(0, 0)	76	(0, 0)	96	(0, 0)
17	(0, 0)	37	(0, 0)	57	(0, 0)	77	(0, 0)	97	(0, 0)
18	(0, 0)	38	(0, 0)	58	(0, 0)	78	(0, 0)	98	(0, 0)
19	(0, 0)	39	(0, 0)	59	(0, 0)	79	(0, 0)	99	(0, 0)
20	(0, 0)	40	(0, 0)	60	(0, 0)	80	(0, 0)	100	(0, 0)

Appendix D

REPORTING PROBLEMS WITH URA

Any problems arising from the use of UBA software should be reported.

Problems may be reported while using Multics interactively by issuing:

```
mail * Wizard CABA

     message
```

The message should contain:

1. your name
2. your person id
3. your project id
4. the date
5. the data base you were working with
6. the command you were using
7. a short explanation of what happened
8. the names of any segments used (be certain that read access be given to *.CABA.*)

The user organization should complete a CABA PROBLEM REPORT/CHANGE REQUEST FORM and forward it to ESD. Copies of this form are available from ESD.

Appendix E

FOR USING THE URA COMMAND LANGUAGE WITH MULTICS

(Version 3.3 of URA)

(Version 3.3 of URA)

This appendix summarizes the specific information that a user must have in order to use the Analyzer in a Multics environment.[1] This appendix consists of several sections:

1) URA Control Commands for Multics

   DISPLAY command
   HELP command

   The HELP command has been expanded and improved for Multics users. The revised command description is included here.

   MTS command
   SET command
   STOP command

   These commands can be used when using URA under Multics (in addition to the other commands presented in Section IV of this manual).

2) Data Set Naming Conventions for Multics

   2.1 Naming the Data Base File
   2.2 Naming Temporary Data Sets

   This section describes what naming conventions should be followed, and what the Analyzer does to enforce the conventions.

3) Notes on Executing URA under Multics

   3.1 Creating and Initializing URA Data Bases
   3.2 Executing the Analyzer under Multics
   3.3 Example URA session

4) Multics Default Data Set Names

This part presents the default data set names used by the URA commands.

5) Multics Glossary

This section explains some of the terminology used in this appendix.

---

[1] For a better understanding of Multics see the Multics Programmer's Manuals.

A Note on Version 3.3 of URA

There are several important charges that have been made in UFA which make Version 3.3 different from Version 3.2. These are listed below.

1) Several interval modifications (which are transparent to the user) have been made to make URA more efficient in the Multics environment.

2) A few errors in Version 3.2 have been corrected.

3) There are four new commands - DYNAMIC-ANALYSIS, INTERVAL-CONSISTENCY, LIST-CHANGES, PROJECTED-COST-REPORT.

4) Several commands have new parameters - FORMATTED-PROBLEM-STATEMENT, EXTENDED-PICTURE, PROCESS-CHAIN, NAME-GENERATION, NAME-LIST.

5) There are three new utilities - USAGE-MONITOR-USER, USAGE-MONITOR-COMMAND, PR23.

6) The Automatic Documentation System can now be used in conjunction with the Multics runoff text editing processor.

7) The HELP instructions have been revised and expanded.

8) Abbreviations for the PRINT NOPRINT parameters have been standardized as P and NP respectively. There is no abbreviation for the PUNCH parameter.

Command: DISPLAY Type: control command

Purpose: To display the current settings of the global switches and parameters.

Prototype: DISLAY(DIS)[parameter]...

Parameters:

ALL Default: ALL
others (see below)

When the ALL parameter is given, the values of all the global switches and parameters are printed at the terminal (in interactive mode), or on the line printer (in batch mode). The parameters printed are those given in the set command description.

When any of the following parameters are given, the current value associated with it is given. This command only displays the value of the parameters: the SET command is used to change their values. The function of each parameter is given in the SET command description.

data-base(db)
echo(e)
heading(h)
lines(l)
output(o)
parameters(parm)
problem-name(pnam)
prompt(p)

Examples:
```
DISPLAY ALL
DIS DB ECHO O
```

Command: HELP[1]

Purpose: To provide the on-line user with a list of possible commands for URA or information about the parameters for a particular URA command.

Prototype: HELP [parameter]...

Parameters:

Command-name Default: (See text)

If no command-name is given, a list of currently available URA commands and utilities is given. If a command-name is given, then the parameters for that command are presented. Abbreviations for the command-name are also acceptable.

If a utility name is given, such as DUMP or RESTORE, then the description of the Multics commands necessary to execute the utility is presented. Abbreviations are PDUM and PRES.

FILES Default: (See text)

If this parameter is given, a list of the default data set names for the Multics installation is given.

SHORT, LONG Default: SHORT

If SHORT is given, only the parameters for the given command are printed. If LONG is given, explanations of the various parameters are also printed.

Examples: HELP FPS LONG

HELP FILES SHORT

---

[1] This command has been improved and expanded for the Multics installation; hence the description is included in this appendix.

Command: MTS

Purpose: To execute a Multics command(s) and return control to the Analyzer.

Prototype: MTS Multics-command

Parameters:
Multics-command line

Only the Multics-command line is executed and then control is returned to URA. All Multics conventions apply to this command line. Multiple commands must be separated by comas. User abbreviations are permitted. Any Multics command is allowed.

Examples: MTS LIST *.URATEMP -BR -NHE ; PWD

MTS QEDX

Notes for running under Multics:

For any single terminal session under Multics, the MTS command has the effect of exiting from the Analyzer and issuing the Multics command. This differs from the STOP command as the STOP terminates the URA session, and requires the exec-com command to return to URA mode. Not only does the MTS command save money (URA is not terminated), but it also retains the parameters set in the SET command and contents of the NAME-GEN default file, etc. A STOP would require that these parameters be restated.

The Multics change-working-directory (cwd) command must be used with caution. The Analyzer must always be running from the working directory in which it was initially invoked. The user must not perform any exec_com command that will alter the I/O attach units.

Command: SET Type: control command

Purpose: To set various global switches and parameters.

Prototype: SET [parameter]...

Parameters:

DATA-BASE(DB)=dataset-name Default: ura

The data base is the file in which the data base information is assembled and stored. This facility allows the user to change the data base being used in the middle of an Anaylzer session. The suffix .dbf should not be given. The full relative or absolute pathname should be used. No abbreviations are recognized.

ECHO(E) = {ON} Default: ECHO=OFF
{OFF}

With "ECHO" set equal to ON, the commands are printed on the current output device as they are encountered. This is more desirable in batch (command is printed on line printer) than in on-line mode (the command is echoed back at the terminal).

HEADING(H) = {ON} Default: HEADING=ON
{OFF}

With "HEADING" set OFF, printing of headings (date, title, page number, etc.) of each report will be suppressed. Headings will be printed when the switch is set ON.

LINES(L)=integer Default: LINES=46

The number of lines printed per report page is set to the indicated number. The default number fits the output to an 8-1/2 x 11 inch page for convenient binding. "LINES" may take on any value between 1? and 500.

MODE= {BATCH(B)} Default: mode=terminal
{TERMINAL(T)}

This switch sets other switches particular to the mode of operation such as "prompt" and "echo".

OUTPUT(O)=dataset-name Default: term

This parameter specifies the data set into which all subsequent UPA reports are written. If no OUTPUT file is specified, all output is written on the terminal data set.

PARAMETERS(PARM) = {ON} Default: ON
{OFF}

With "PARAMETERS" set OFF, the printing of the parameters in effect for the production of each URA report will be suppressed. Parameters will be printed when the switch is set ON.

PROBLEM-NAME(PNAM)=user-name Default: Air Force
ESD/RADC
Multics

The "PROBLEM-NAME" is the title that goes on each page of the output. It must be a UFL name, that is, it must begin with a code 3 character, be no more than 30 characters in length, and be composed of code 3 and 4 characters with no intervening blanks.

PROMPT(P) = {ON} Default: PROMPT=ON
{OFF}

If "PROMPT" is set to ON, URA will prompt the user for the correct command or parameters when an error is encountered. With "PPOMPT" set to OFF, URA will ignore invalid commands and parameters and proceed to the next command or parameter.

Examples: SET DB=WP74 PNAM=W.P.74_EXAMPLE O=PRINT.FILE

Command: STOP Type: control command

Purpose: To terminate execution of the URA software and return control to Multics.[1]

Prototype: STOP

Parameters:
None

Example: STOP

---

[1] Issuing this command returns all storage used by URA for tables, buffers, parameters, scratch files, etc. All files having the suffix .uratemp are deleted. To restart execution of URA the user must give the Multics command:

```
exec_com >ml>CARA>ura
```

If the user interrupts (breaks) URA mode or enters Multics command mode without the use of the "STOP" command, the user should issue the Multics "start" command to return to URA.

2. Data Set Naming Conventions for URA in Multics

2.1 Naming the Data Base File

The user need not commit to memory the several files associated with each data base, the tables and index, nor the suffix on the names of each file. The data base name is the name that the user wishes to use to refer to his data base. The Analyzer will attach any necessary suffix to refer to actual Multics segments. The data base may have any valid Multics segment name.

2.2 Naming Temporary Data Sets

All temporary files maintained by the Analyzer have the suffix .uratemp attached to their name. When the Analyzer is terminated, two-component segments with .uratemp as the suffix are deleted. Some PUNCH files are considered to be temporary unless the user supplies a name with a different suffix (see section 4).

Example:

The commands:

```
NAME-GEN PUNCH=MYPUNCH S="ALL"

NAME-GEN PUNCH=MYPUNCH.URATEMP S="ALL"
```

cause names to be written in the data set MYPUNCH and to MYPUNCH.URATEMP respectively. The latter data set will be deleted at the end of the session.

3. Notes on Executing URA under Multics

When creating a data base, executing the Analyzer, running URA utilities, or using the specification generator, your Multics search rules must have >ml>CARA in its list. This can be effected with the following command:

```
asr >ml>CARA
```

3.1 Creating and Initializing URA Data Bases

Before the user can add information to a URA data base, the data base must exist and be initialized properly. Creating an initialized data base in the user's working directory is a simple one-step process. The user should type:

```
ec >ml>CARA>initdb (name) (size)
```

The size parameter is optional and, if given, should be the desired size of the data base, chosen from those sizes presently available(i.e., 20, 50, 100, 130). The default size if not given is 20. The name parameter is also optional and, if given, is the name that URA will use to reference the data base. Note, a suffix of .dbf should not be given by the user. The default name used if name is not given is "ura." If the size parameter is to be used, then the name must also be given.

3.2 Executing the Analyzer under Multics

To initialize the Analyzer and enter URA mode, the following command should be given:

```
ec >ml>CARA>ura
```

The Analyzer will respond "Enter command (and any parameters)" when it is ready to accept each command. Ignore any "No I/O switch" messages.

If the user issues an interrupt to the Analyzer, then the execution may be resumed at the point of interruption by issuing the command:

```
start
```

The user should not interrupt the Analyzer during a data base update or modification command as this could leave the data base in an inconsistent state.

If the user interrupts the Analyzer during a report command or while URA is idle and wishes to prematurely terminate the Analyzer and begin again, the Multics commands are:

```
close_file  -all
release     -all
closeit
```

The user must use the SFT command to reset any parameters for each Analyzer session.

Example URA sessions

login Userid	[login to Multics]
password	[user password to Multics]
ec >ml>CARA>initdb mydb	[create and initialize an empty data base]
ec >ml>CARA>ura	[enter URA mode]
set db=mydb o=temp.print	[set control information]
input-psl input=afile.url update	[update URA data base using contents of afile.url in current working directory]
mts print temp.print	[looks at as-is source listing stored in segment temp.print]
name-gen s='all'	[get list of all names]
fps	[get FPS for all names]
stop	[leave URA mode]
dprint temp.print	[print output - line printer]
logout	[logout of Multics]

A subsequent session may enter more input and generate some reports.

login Userid	[login to Multics]
password	[user password to Multics]
ec >ml>CARA>ura	[enter URA mode]
set db=mydb pnam=Multics-example	[set control information]
input-psl input=somefile.url update	[update the data base using the contents of somefile.url]
name-gen s='process'	[get list of process names]
picture	[get Picture report for each process name]
name-gen s='all'	[get list of all names]
fps	[get FPS for all names]
stop	[leave URA mode]
logout	[logout of Multics]

4. Multics Default Segment Names

Table E.1 presents a summary of Multics default segment names used in conjunction with each UBA command. The "Default Input File" is the default segment used as input to the command if no other segment set has been specified (i.e., via, the "INPUT=" or "FILE=" parameter.) A dash in the entry designates that the command has no Input data parameters.

The "Default PUNCH File" is the default segment used to store PUNCH data from the command if no PUNCH segment is designated via the "PUNCH=" parameter. A dash in the entry designates that no PUNCH data can be obtained directly from the command. (PUNCH data is data that is directly acceptable as input to a UBA command.)

Multics Default Segment Names

Command	Default Input File	Default PUNCH File
CHANGE-TYPE	uraname.uratemp	---
CONSISTS-COMPARISON	uraname.uratemp	---
CONSISTS-MATRIX	uraname.uratemp	---
CONTENTS	uraname.uratemp	---
DATA-PROCESS	uraname.uratemp	---
DELETE	uraname.uratemp	---
DELETE-COMMENT-ENTRY	uraname.uratemp	---
DELETE-PSL	term	---
DICTIONARY	uraname.uratemp	---
DYNAMIC-ANALYSIS	uraname.uratemp	---
ENTITY-IDENTIFIER	uraname.uratemp	---
EXTENDED-PICTURE	uraname.uratemp	---
FORMATTED-PROBLEM-STATEMENT	uraname.uratemp	urafps.url
FREQUENCY	---	---
INPUT-PSL	term	---
INTERVAL-CONSISTENCY	rename.uratemp	---
KWIC	uraname.uratemp	---
LIST-CHANGE	---	---
NAME-GEN	term	uraname.uratemp
NAME-LIST	---	---
PICTURE	uraname.uratemp	---
PRINT-ATTRIBUTE-VALUES	uraname.uratemp	---
PROCESS-CHAIN	uraname.uratemp	---
PROCESS-INPUT-OUTPUT	uraname.uratemp	uraname.uratemp
PROJECTED-COST-REPORT	FILE=uraname.uratemp	---
	INPUT=term	term
PUNCH-COMMENT-ENTRY	uraname.uratemp	urapcom.comment
RENAME	no default	---
REPLACE-COMMENT-ENTRY	urapcom.comment	---
RESOURCE-CONSUMPTION-ANALYSIS	uraname.uratemp	---
SECURITY-ANALYSIS	uraname.uratemp	---
STRUCTURE	---	---
SUMMARY	---	---

TABLE E.1

MULTICS GLOSSARY

code 3 character	A character allowed in any position in a URL name. See Appendix B.
data set	A synonym for segment.
exec_com segment	A segment with a '.ec' suffix which contains Multics commands. These commands may be initiated by the command: exec_com segment_name where the segment name does not need to have the suffix appended.
file	A segment or multi-segment file.
multi-segment file	A file composed of multiple page units.
pathname (absolute)	The connotation of a segment's entry-name with all superior directories leading back to the storage system root.
pathname (relative)	The pathname that uniquely names a segment relative to the working directory.
quit signal	The means by which users may interrupt Multics from processing a program or command lines.
segment	The basic unit of information within the Multics storage system. Each segment has access attributes and a name, and may contain data, programs, or be null.
UPA session	An interactive session between the Multics command "ec >ml>CARA>ura" and the UPA command "stop."
working directory	The directory under which the user is doing his work.

Appendix F

EXAMPLE OF DOCUMENT SCHEMA AND SOURCE

This appendix consists of two examples, a Fuctional Description and a Data Requirements Document. Each example consists of a schema and a corresponding source. The examples are presented in the following order:

Schema for the Functional Description

Source for the Functional Description

Schema for the Data Requirements

Source for the Data Requirements

```
 1 *TITLE FUNCTIONAL DESCRIPTION
 2 *HEADING-MARGIN 3
 3 #1.  FUNCTIONAL DESCRIPTION - GENERAL
 4 & THIS IS AN EXAMPLE DOCUMENTATION SCHEMA OF THE FUNCTIONAL
 5 & DESCRIPTION FOUND IN DOD MANUAL 4120.17-M.
 6 #1.1 PURPOSE OF FUNCTIONAL DESCRIPTION
 7 #1.2 PROJECT REFERENCES
 8 #2.  SYSTEM SUMMARY
 9 #2.1 BACKGROUND/PURPOSES
10 #2.2 OBJECTIVES
11 #2.3 EXISTING METHODS AND PROCEDURES
12 #2.4 PROPOSED METHODS AND PROCEDURES
13 #2.4.1 SUMMARY OF IMPROVEMENTS
14 #2.4.2 SUMMARY OF IMPACTS
15 #2.4.2.1 EQUIPMENT IMPACTS
16 #2.4.2.2 SOFTWARE IMPACTS
17 #2.4.2.3 ORGANIZATIONAL IMPACTS
18 #2.4.2.4 OPERATIONAL IMPACTS
19 #2.4.2.5 DEVELOPMENT IMPACTS
20 #2.5 EXPECTED LIMITATIONS
21 #3.  DETAILED CHARACTERISTICS
22 #3.1 SPECIFIC PERFORMANCE REQUIREMENTS
23 #3.1.1 ACCURACY AND VALIDITY
24 #3.1.2 TIMING
25 #3.2 SYSTEMS FUNCTIONS
26 #3.3 INPUTS/OUTPUTS
27 #3.4 DATA CHARACTERISTICS
28 #3.5 FAILURE CONTINGENCIES
29 #4.  ENVIRONMENT
30 #4.1 EQUIPMENT ENVIRONMENT
31 #4.2 SUPPORT SOFTWARE ENVIRONMENT
32 #4.3 INTERFACES
33 #4.4 SECURITY
34 #5.  COST FACTORS
35 #6.  DEVELOPMENT PLAN
```

```
 1 #1.  FUNCTIONAL DESCRIPTION
 2 %SET DB=SPGEX
 3 *HEADING-SKIP 3
 4 *TOP-LINES 2
 5 *BOTTOM-LINES 2
 6 & THIS IS AN EXAMPLE DOCUMENTATION SOURCE OF THE FUNCTIONAL
 7 & DESCRIPTION STANDARDS FOUND IN DOD MANUAL 4120.17-M.
 8 & IT IS WRITTEN IN CONJUNCTION THE EXAMPLE DATA BASE FOUND
 9 & IN ISDOS WP 74.
10 *SKIP 1
11 #1.1 PURPOSE OF FUNCTIONAL DESCRIPTION
12 *SKIP 1
13 THIS FUNCTIONAL DESCRIPTION FOR THE PAYSTATEMENT EXAMPLE,
   PROJECT #1
14 IS WRITTEN TO PROVIDE:
15 A.  THE SYSTEM REQUIREMENTS TO BE SATISFIED WHICH WILL SERVE
   AS A
16 BASIS FOR MUTUAL UNDERSTANDING BETWEEN THE USER AND THE
   DEVELOPER.
17 B.  INFORMATION ON PERFORMANCE REQUIREMENTS, PRELIMINARY
   DESIGN, AND
18 USER IMPACTS, INCLUDING FIXED AND CONTINUING COSTS.
19 C.  A BASIS FOR THE DEVELOPMENT OF SYSTEM TESTS.
20 #1.2 PROJECT REFERENCES
21 *SKIP 1
22 THE PAYROLL DEPARTMENT IS THE SPONSOR AND USER OF THIS
   MANAGEMENT
23 INFORMATION SYSTEM.  THE ACTUAL OPERATION OF THIS SYSTEM
   WILL BE
24 HANDLED BY BOTH THE PAYROLL DEPARTMENT AND THE DATA
   PROCESSING
25 DEPARTMENT.
26 *SKIP 1
27 A.  A COPY OF THE PROJECT REQUEST IS IN THE APPENDIX.
28 B.  STANDARDS AND REFERENCE DOCUMENTATION
29 1.ISDOS WORKING PAPERS 74,86,90
30 2.DOD ADS DOCUMENTATION STANDARDS MANUAL 4120.17-M
31 *HEADING-SKIP 61
32 #2.  SYSTEM SUMMARY
33 *SKIP 1
34 THIS SECTION SHALL PROVIDE A GENERAL DESCRIPTION, WRITTEN IN
35 NON-ADP TERMINOLOGY, OF THE PROPOSED ADS.
36 *HEADING-SKIP 3
37 #2.1 BACKGROUND/PURPOSES
38 *SKIP 1
39 %PCOM N=BACKGROUND-MEMO DESC NOPUNCH
40 #2.2 OBJECTIVES
41 *SKIP 1
42 %PCOM N=OBJECTIVES-MEMO DESC NOPUNCH
43 #2.3 EXISTING METHODS AND PROCEDURES
44 *SKIP 1
45 SINCE THIS IS A NEW COMPANY, THERE IS NO APPLICABLE EXISTING
46 PROCEDURE FOR DOING THE PAYROLL.
47 #2.4 PROPOSED METHODS AND PROCEDURES
```

```
48 *SKIP 1
49 %PCOM N=PROCESS-MEMO DESC NOPUNCH
50 *HOLD 43
51 %PIC N=MAIN-PROCESS NOSTRUCTURE
52 *HEADING-SKIP 2
53 #2.4.1 SUMMARY OF IMPROVEMENTS
54 *SKIP 1
55 A.  STAFFING
56 *SKIP 1
57 %PCOM N=PAYROLL-DEPT-EMPLOYEES DESC NOPUNCH
58 *SKIP 1
59 B.  TIMELINESS
60 *SKIP 1
61 %FPS NLNS NPEOF N=ONE
62 #2.4.2 SUMMARY OF IMPACTS
63 *SKIP 1
64 #2.4.2.1 EQUIPMENT IMPACTS
65 *SKIP 1
66 A LINE PRINTER CAPABLE OF PRINTING CHECKS IS NECESSARY.
67 EQUIPMENT CAPABILITIES ARE DISCUSSED IN PARAGRAPH 4.1.
68 #2.4.2.2 SOFTWARE IMPACTS
69 *SKIP 1
70 THERE ARE FIVE BASIC SOFTWARE AREAS WITHIN THE PAYROLL
   SYSTEM.
71 *SKIP 1
72 %NG S='SO=MAIN-PROCESS,1'
73 *HOLD 43
74 %PIC N=MAIN-PROCESS NODATA NOFLOW
75 #2.4.2.3 ORGANIZATIONAL IMPACTS
76 *SKIP 1
77 %FPS NLNS NPEOF N=RESPONSIBILITIES
78 *HEADING-SKIP 50
79 #2.4.2.4 OPERATIONAL IMPACTS
80 *HEADING-SKIP 2
81 *REPORT-CC OFF
82 *SKIP 1
83 A.  OPERATIONAL STRUCTURE
84 %STR PROCESS
85 *NEW-PAGE
86 B.  TIMELINESS(OPERATIONS AND DATA)
87 *SKIP 1
88 HERE IS A SUMMARY OF FREQUENCY DATA.
89 *SKIP 1
90 %NG S='INTERVAL' NOPRINT
91 %FREQ ORDER=BYTYPE INTERVAL
92 *NEW-PAGE
93 C.  INPUTS
94 %STR INPUT
95 *SKIP 2
96 D.  DATA RETENTION
97 *SKIP 1
98 %PCOM N=MASTER-FILE DESC DFP NOPUNCH
99 *HOLD 43
100 %PIC N=MASTER-FILE NODATA NOFLOW
```

```
101 *HEADING-SKIP 59
102 #2.4.2.5 DEVELOPMENT IMPACTS
103 *REPORT-CC ON
104 *SKIP 1
105 %FPS NLNS NPEOF N=COMPLEXITY-LEVEL
106 *SKIP 2
107 %FPS NLNS NPEOF N=DEVELOPMENT-NEEDS
108 *HEADING-SKIP 3
109 #2.5 EXPECTED LIMITATIONS
110 *SKIP 1
111 ERRORS WILL BE NECESSARY FOR BAD DATA INPUT
112 *SKIP 1
113 %PCOM N=ERROR-LISTING DESC NOPUNCH
114 *HOLD 43
115 %PIC N=ERROR-LISTING
116 *HOLD 43
117 %PIC N=ERROR-LISTING-ENTRY
118 *HEADING-SKIP 59
119 #3.  DETAILED CHARACTERISTICS
120 *HEADING-SKIP 3
121 *SKIP 1
122 #3.1 SPECIFIC PERFORMANCE REQUIREMENTS
123 *SKIP 1
124 (SEE SECTION 2)
125 *SKIP 1
126 %FPS NLNS NPEOF N=PAYROLL-PROCESSING
127 *SKIP 2
128 DATA RECEIVED:
129 %NG S='INPUT OR SET' ORDER=BYTYPE
130 *SKIP 2
131 OUTPUTS GENERATED:
132 *SKIP 2
133 %NG S='OUTPUT'
134 #3.1.1 ACCURACY AND VALIDITY
135 *SKIP 1
136 %PCOM N=ACCURACY-MEMO DESC NOPUNCH
137 *SKIP 2
138 %FPS NLNS NPEOF N=VALIDITY-CHECK
139 *HOLD 43
140 %PIC N=HOURLY-PAYCHECK-VALIDATION
141 *NEW-PAGE
142 %PIC N=SALARIED-PAYCHECK-VALIDATION
143 #3.1.2 TIMING
144 *SKIP 1
145 THE FOLLOWING IS A DESCRIPTION OF THE FUNCTIONAL FLOW.
146 *SKIP 1
147 FOR SALARIED EMPLOYEES -
148 *SKIP 1
149 %FPS NLNS NPEOF N=SALARIED-EMP-PROCESSING-INIT
130 %FPS NLNS NPEOF N=VALIDITY-CHECK
131 %FPS NLNS NPEOF N=PASSED-ERROR-CHECKS
132 %FPS NLNS NPEOF N=SALARIED-PAYCHECK-PROD-INIT
133 *SKIP 2
134 FOR HOURLY EMPLOYEES -
```

```
135 *SKIP 1
136 %FPS NLNS NPEOF N=HOURLY-EMP-PROCESSING-INIT
137 %FPS NLNS NPEOF N=VALIDITY-CHECK
138 %FPS NLNS NPEOF N=TIME-CARD-MISSING
139 %FPS NLNS NPEOF N=PASSED-ERROR-CHECKS
160 %FPS NLNS NPEOF N=HOURLY-PAYCHECK-PROD-INIT
161 %FPS NLNS NPEOF N=NEW-EMPLOYEE-PROCESSING-INIT
162 %FPS NLNS NPEOF N=TERMINATION-PROCESSING-INIT
163 *HEADING-SKIP 59
164 #3.2 SYSTEM FUNCTIONS
165 *HEADING-SKIP 3
166 *REPORT-CC OFF
167 *SKIP 1
168 %NG S='SO=MAIN-PROCESS,1' NOPRINT
169 *SKIP 1
170 THE VARIOUS SUB-FUNCTIONS OF THE SYSTEM ARE:
171 *SKIP 1
172 %PCOM DESC PRCD NOPUNCH
173 #3.3 INPUTS/OUTPUTS
174 *SKIP 1
175 INPUTS:
176 *SKIP 1
177 %NG S='INPUT' NOPRINT
178 %FPS NLNS NPEOF
179 *SKIP 2
180 OUTPUTS:
181 *SKIP 1
182 %NG S='OUTPUT' NOPRINT
183 %FPS NLNS NPEOF
184 *SKIP 2
185 %STR OUTPUT
186 #3.4 DATA CHARACTERISTICS
187 *REPORT-CC ON
188 *SKIP 1
189 %FPS NLNS NPEOF N=PAYROLL-MASTER-INFORMATION
190 *SKIP 2
191 & THE FOLLOWING LINES ARE EXCLUSIVE TO THIS DOCUMENT
192 %PCOM N=DEPARTMENT-FILE DESC DER VOLS NOPUNCH
193 *SKIP 1
194 %PCOM N=HOURLY-EMPLOYEE-FILE DESC DER VOLM NOPUNCH
195 *HOLD 43
196 %PIC N=HOURLY-EMPLOYEE-FILE
197 *NEW-PAGE
198 %PCOM N=SALARIED-EMPLOYEE-FILE DESC DER VOLM NOPUNCH
199 *HOLD 43
200 %PIC N=SALARIED-EMPLOYEE-FILE
201 #3.5 FAILURE CHARACTERISTICS
202 *SKIP 1
203 %PCOM N=BACKUP-MEMO DESC NOPUNCH
204 *HEADING-SKIP 61
205 #4.  ENVIRONMENT
206 *HEADING-SKIP 3
207 *SKIP 1
208 #4.1 EQUIPMENT ENVIRONMENT
```

```
209 *SKIP 1
210 %PCOM N=EQUIPMENT-MEMO DESC NOPUNCH
211 #4.2 SUPPORT SOFTWARE ENVIRONMENT
212 *SKIP 2
213 %PCOM N=SOFTWARE-MEMO DESC NOPUNCH
214 #4.3 INTERFACES
215 *SKIP 1
216 %STR RWE
217 *HOLD 43
218 %PIC N=ACCOUNTING-SYSTEMS
219 *NEW-PAGE
220 %PIC N=PAYROLL-DEPARTMENT
221 #4.4 SECURITY
222 *REPORT-CC OFF
223 *SKIP 1
224 %PCOM N=SECURITY-MEMO DESC NOPUNCH
225 %NG S='SECURITY' NOPRINT
226 %FPS NLNS NPEOF
227 *HEADING-SKIP 61
228 #5.  COST FACTORS
229 %PCOM N=COSTS-MEMO DESC NOPUNCH
230 #6.  DEVELOPMENT PLAN
231 *SKIP 1
232 %PCOM N=DEVOLPMENT-MEMO DESC NOPUNCH
233 *SKIP 2
234 %FPS NLNS NPEOF N=DEVELOPMENT-TIMES
```

```
 1 *TITLE DATA REQUIREMENTS DOCUMENT
 2 *HEADING-MARGIN 3
 3 *LINES 50
 4 #1.  GENERAL DATA REQUIREMENTS
 5 & THIS IS AN EXAMPLE DOCUMENTATION SCHEM OF THE DATA
 6 & REQUIREMENTS DOCUMENT FOUND IN DOD MANUAL 4120.17-M
 7 #1.1 PURPOSE OF DATA REQUIREMENTS
 8 #1.2 PROJECT REFERENCES
 9 #1.3 MODIFICATION OF DATA REQUIREMENTS
10 #2.  DATA DESCRIPTION
11 #2.1 LOGICAL ORGANIZATION OF STATIC SYSTEM DATA
12 #2.2 LOGICAL ORGANIZATION OF DYNAMIC INPUT DATA
13 #2.3 LOGICAL ORGANIZATION OF DYNAMIC OUTPUT DATA
14 #2.4 INTERNALLY GENERATED DATA
15 #2.5 SYSTEM DATA CONSTRAINTS
16 #3.  USER SUPPORT FOR DATA COLLECTION
17 #3.1 DATA COLLECTION REQUIREMENTS AND SCOPE
18 #3.2 RECOMMEND SOURCE OF INPUT DATA
19 #3.3 DATA COLLECTION AND TRANSFER PROCEDURES
20 #3.4 DATA BASE IMPACTS
```

```
 1 #1.  GENERAL DATA REQUIREMENTS
 2 & THIS IS AN EXAMPLE DOCUMENTATION SOURCE OF THE DATA
 3 & REQUIREMENTS DOCUMENT FOUND IN DOD MANUAL 4120.17-M
 4 #1.1 PURPOSE OF DATA REQUIREMENTS
 5 *SKIP 1
 6 *SOURCE-MARGIN 1
 7 THE OBJECTIVES OF THIS DATA REQUIREMENTS DOCUMENT FOR THE
 8 PAYSTATEMENT EXAMPLE, PROJECT #1 ARE TO LIST AND DEFINE DATA
 9 ELEMENTS WHICH THE SYSTEM MUST HANDLE AND COMMUNICATE DATA
10 COLLECTION REQUIREMENTS TO THE USER.
11 #1.2 PROJECT REFERENCES
12 *SKIP 1
13 %SET DB=SPGEX
14 %PCOM N=OBJECTIVES-MEMO DESC NOPUNCH
15 *SKIP 1
16 %PCOM N=PAYROLL-DEPARTMENT DESC NOPUNCH
17 #1.3 MODIFICATION OF DATA REQUIREMENTS
18 *SKIP 1
19 NOT APPLICABLE TO THIS PROJECT.
20 *HEADING-SKIP 61
21 #2.  DATA DESCRIPTION
22 *SKIP 1
23 *SOURCE-MARGIN 5
24 *HEADING-SKIP 2
25 THE DATA DESCRIBED IN THIS SECTION SHALL BE SEPERATED INTO
   TWO
26 CATEGORIES, STATIC DATA AND DYNAMIC DATA.  STATIC DATA IS
   DEFINED
27 AS THAT DATA WHICH IS USED MAINLY FOR REFERENCE DURING
   SYSTEM OP-
28 ERATION AND IS USUALLY GENERATED OR UPDATED IN WIDELY
   SEPERATED
29 TIME FRAMES INDEPENDENT OF NORMAL SYSTEM RUNS.  DYNAMIC DATA
   IN-
30 CLUDES ALL DATA WHICH IS INTENDED TO BE UPDATED AND WHICH IS
31 INPUT TO A SYSTEM DURING A NORMAL RUN (INCLUDING "REAL TIME"
   DATA
32 SUCH AS TARGETING DATA) OR IS OUTPUT BY THE SYSTEM.  STATIC
   DATA
33 AS DESCRIBED ABOVE IS FREQUENTLY REFERRED TO AS PARAMETRIC
   DATA
34 AND DYNAMIC DATA AS NON-PARAMETRIC DATA.  BOTH, HOWEVER, ARE
   COM-
35 POSED OF DATA ELEMENTS.  THE DATA ELEMENT NAMES LISTED IN
   PARA-
36 GRAPHS 2.1,2.2, AND 2.3 SHALL BE THOSE CONTAINED IN STANDARD
37 DATA ELEMENT LIBRARIES, WHENEVER APPLICABLE.
38 #2.1 LOGICAL ORGANIZATION OF STATIC SYSTEM DATA
39 *SKIP 1
40 %CONTENTS N=MASTER-FILE
41 *SKIP 1
42 %CONTENTS N=DEPT-FILE
43 *SKIP 1
44 %CONTENTS N=H-EMP-FILE
```

```
45 *SKIP 1
46 %CONTENTS N=S-EMP-FILE
47 #2.2 LOGICAL ORGANIZATION OF DYNAMIC INPUT DATA
48 *SKIP 1
49 *REPORT-CC OFF
50 %NG S='SO=EMP-INFO,1' NOPRINT
51 %CONTENTS
52 #2.3 LOGICAL ORGANIZATION OF DYNAMIC OUTPUT DATA
53 *REPORT-CC ON
54 *SKIP 1
55 %CONTENTS N=PAY-STATEMENT
56 *SKIP 1
57 %CONTENTS N=HOURLY-EMPLOYEE-REPORT
58 *SKIP 1
59 %CONTENTS N=SALARIED-EMPLOYEE-REPORT
60 *SKIP 1
61 %CONTENTS N=HIRED-EMPLOYEE-REPORT
62 *SKIP 1
63 %CONTENTS N=TERMINATED-EMPLOYEE-REPORT
64 #2.4 INTERNALLY GENERATED DATA
65 *SKIP 1
66 %CONTENTS N=ERROR-LISTING
67 #2.5 SYSTEM DATA CONSTRAINTS
68 *SKIP 1
69 %FPS N=I-O-CONSTRAINTS-MEMO
70 *HEADING-SKIP 61
71 #3.  USER SUPPORT FOR DATA COLLECTION
72 *HEADING-SKIP 2
73 %NG S='INPUT OR OUTPUT' ORDER=BYTYPE NOPRINT
74 %CNC
75 *NEW-PAGE
76 INFORMATION IN REGARDS TO DATA FLOW
77 %DP D
78 %NG S='ENTITY' NOPRINT
79 *NEW-PAGE
80 INFORMATION ON RECORDS KEPT
81 %CNC
82 *HOLD 59
83 #3.1 DATA COLLECTION REQUIREMENTS AND SCOPE
84 *SKIP 1
85 INFORMATION NEEDED IN ORDER TO ESTABLISH THE VALUES
86 OF EACH DATA ELEMENT:
87 *SKIP 2
88 %FPS N=SALARIED-EMPLOYMENT-FORM
89 %FPS N=HOURLY-EMPLOYMENT-FORM
90 %FPS N=TAX-WITHHOLDING-CERTIFICATE
91 %FPS N=EMPLOYMENT-TERMINATION-FORM
92 *SKIP 2
93 INFORMATION TO BE COLLECTED BY THE USER:
94 *SKIP 1
95 %FPS N=TIME-CARD
96 *SKIP 2
97 OTHER SUPPLEMENTARY INFORMATION:
98 *SKIP 1
```

```
 99 A.INPUT SOURCE(S) OF THE DATA ELEMENT
100 *SKIP 1
101 %FPS N=DEPARTMENTS-AND-EMPLOYEES
102 %FPS N=EMPLOYEE
103 %FPS N=PAYROLL-DEPARTMENT
104 *SKIP 2
105 B.  RECIPIENTS
106 *SKIP 1
107 %FPS N=ACCOUNTING-SYSTEMS
108 *SKIP 2
109 D.  CRITICAL VALUES
110 %FPS N=REMAINING-FUNDS
111 *SKIP 2
112 E.  OUTPUT FORM/DEVICE
113 *SKIP 1
114 %PCOM N=H-EMP-REPORT DESC NOPUNCH
115 *SKIP 1
116 %PCOM N=S-EMP-REPORT DESC NOPUNCH
117 *SKIP 2
118 F.  FREQUENCY OF UPDATE
119 %FREQ
120 #3.2 RECOMMENDED SOURCE OF INPUT DATA
121 *SKIP 1
122 THIS TOPIC HAS BEEN DISCUSSED ABOVE(SECTION 3.1.A)
123 #3.3 DATA COLLECTION AND TRANSFER PROCEDURES
124 *SKIP 1
125 THIS TOPIC HAS BEEN DISCUSSED ABOVE(SECTION 3.1.F)
126 #3.4 DATA BASE IMPACTS
127 *SKIP 1
128 %PCOM N=DEPARTMENT-FILE DESC DEF VOLS NOPUNCH
129 %PCOM N=HOURLY-EMPLOYEE-FILE DESC DEF VOLM NOPUNCH
130 %PCOM N=SALARIED-EMPLOYEE-FILE DESC DEF VOLM NOPUNCH
```

Appendix G

DOCUMENT EXAMPLES

AD-A060 517 MICHIGAN UNIV ANN ARBOR DEPT OF INDUSTRIAL AND OPERA--ETC F/G 9/2
USER REQUIREMENTS ANALYZER (URA) USER'S MANUAL H6180/MULTICS/VE--ETC(U)
JUL 78 F19628-76-C-0197

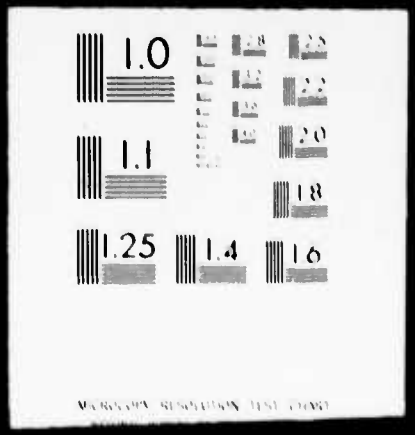
UNCLASSIFIED ESD-TR-78-131 NL

7 OF 7
AD A060 517

END
DATE FILMED
1-79
DDC

7 OF 7

AD
A060 517



This appendix contains examples of the Functional Description Document written using the Automated Documentation System. The Analyzer data base used is the Pay System example described in Part IV of this manual. Due to space limitations, listings of the Analyzer data base are not included.

The following list of Analyzer commands have been used to produce these examples:

Command Name	Parameters Used
CONTENTS	FILE NAME
DATA PROCESS	DATA FILE
FPS	NAME FILE PRINT
FREQUENCY	
NAME-GEN	ENTITY INPUT OUTPUT PRINT NOPRINT SUBLEVEL SUBPART OF SECURITY
PICTURE	DATA NODATA FILE NAME FLOW NOFLOW STRUCTURE NOSTRUCTURE
PUNCH-COMMENT-ENTRY	DEF DESC PROC VOLM VOLS FILE NAME NOPUNCH PRINT
STRUCTURE	INPUT PROCESS PWE

OUTPUT

Although these are the only commands used, all Analyzer commands may be used with the Automated Documentation Generator (with the exception of the STOP command).

Appendix H

EXECUTING AUTOMATIC DOCUMENTATION SYSTEM

Using Multics, the Automated Documentation System can run using the following command:

```
exec-com >ml>CARA>UFA>spg          schema-segment source-segment
```

This command will do all syntax checking needed and generate the document. Output for the document will go to the file spg.output. The system assumes the Analyzer data base is in the file uradb.dbf unless the SET command is used to change the default (i.e., SET DB=file).

Output from this section looks as follows:

```
Line  TEXT  CMNDS SECTION

   2                  &
   3                  & A SMALL TEST EXAMPLE
   4                  &
   5    0     0       =1.  SCOPE
   6    0     2       =1.1 IDENTIFICATION
   7    0     1       =1.2 FUNCTIONAL SUMMARY
   8   *MISSING*      =1.3
   9                  =1.4
*** INVALID SECTION IDENTIFIER
  10                  &
  11    0     0       =2.  APPLICABLE DOCUMENTS
  12   13     2       =2.1 GOVERNMENT DOCUMENTS
  13    5     1       =2.2 NON-GOVERNMENT DOCUMENTS


SUMMARY
   8 SECTIONS
   1 OF WHICH ARE MISSING FROM THE SOURCE FILE.
  18 TOTAL TEST LINES, AND
   6 TOTAL COMMAND LINES.
```

GLOSSARY

analyst	Name used synonymously for "problem definer." One who aids to develop the problem statement or logical system design.
Analyzer	Synonym for "URA." Is the software package that processes problem stated in the Language.
comment entry	The text associated with a comment entry statement. DESCRIPTION, PROCEDURE and VOIATILITY are examples of statements which are specified by comment entries.
comment entry statement	Any URL statement in which the contents of the statement are defined by the problem definer (as is narrative description). The DESCRIPTION and PROCEDURE statements are examples of this.
control commands	Those URA commands which allow the URA user to pass certain control information to the Analyzer. They are particular to an individual operating system.
conversational mode	Interactive use of the computer system through a terminal device. Used synonymously with on-line terminal, or interactive mode.
data base	The data base referred to throughout this paper is the user's data base which is populated by URA from the user inputted URL statements.
data object	Any URA name type that represents some form of data. SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS and ELEMENTS are all data objects described by URL.
fdname	Any legal file or device name. Allowable names are dependent on the operating system being used.
filename	Any legal temporary or permanent file name that is to be specified by the user.
input file	Any temporary or permanent file which contains data to be used by URA commands via INPUT or FILE parameters.
logical description	Synonym to "problem statement." Set of requirements for a new system.
logical system design	The process of specifying a problem statement for any particular system.

modifier commands	Commands which modify the contents of a URA data base in the manner specified by the user.
Multics Command	A command to the Multics system; an element of the Multics command language.
Multics Command Language	The set of commands, subcommands and operands recognized by the Multics Operating System.
name type	Any of the many types of names allowed by URL (i.e., PROCESS, SET, GROUP, etc.). See "The User Requirements Language, Language Reference Manual"[1], Appendix E, for a list of all possible name types.
physical system design	The process of specifying a physical system (consisting of software, machinery, etc.) given a particular problem statement.
physical system designer	Person responsible for deriving a physical system design from the problem statement generated from the logical system design process.
problem definer	Used synonymously with "analyst." That person who develops the requirements stated by the users into a format understandable by others and in sufficient detail to be usable by the physical system designer. The product of his work is the problem statement.
problem statement	A set of requirements specified by users of a proposed system and expressed by the problem definer into a format acceptable by the organization.
prompt	A system function that requests the terminal user to supply operands necessary to continue processing.
PUNCH file	A file which contains data (usually URL user-names) in a format that can be used as input to one or more URA commands.
report commands	Those commands which retrieve data from a URA data base and output it in some meaningful format.
segment	A named collection of data which is accessible by the system. The data set usually resides on

[1] Part II of URL User's Manual.

	an auxiliary storage device.
term	Identifier to designate that the terminal is to be used as a source of input or area for output.
undefined name	A name of a URL object that has been entered into the URA data base, but has no name type associated with it.
URA	The User Requirements Analyzer. A software package which stores information in the URA data base by interpretting URL statements given as input, and retrieves information from the data base in the form of reports.
URA command	Any of the commands that can be used to operate URA. See "User Requirements Analyzer Command Descriptions"[1] for complete descriptions about each command available in URA.
URA data base	File where URL information is stored (in a coded format) which can then be accessed by URA user.
URL	The User Requirements Language. The collection of all URL statements allowed for use by URA. See "The User Requirements Language, Language Reference Manual"[2] for complete description.
URL statement	A statement specified by "The User Requirements Language, Language Reference Manual".[2] Each statement may define a URL object, define a comment entry, or define a relationship among two or more URL objects.
user-name	Any legal URL name specified by problem definer. Also called a "user defined name".

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[1] Part IV.
[2] Part II of URL User's Manual.

Appendix I

ASCII CHARACTER SET FOR URA

The attached list gives for each ASCII character a code of 1 to 4 classifying the characters into the following categories:

Code 1: Nonprinting operating System and transmission control characters to be treated as punctuation, but will always be illegal.

Code 2: Puncutation, delimiters, etc. which are not allowed in names.

Code 3: Characters allowed at any position in a name.

Code 4: Characters allowed at any position in a name after the first.

There are three versions of this categorization:

1. A one page summary.
2. Sorted by Octal representation.
3. Sorted by code, then by Octal representation.

CODE 1: All others

CODE 2: "&'{}*,:;=?[ ]|¬

CODE 3: ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
!#$%@^`\()

CODE 4: 0123456789
+-./<>_

CODE	OCTAL	CHAR	NAME
1	000	nul	null or time fill char
1	001	soh	start of heading
1	002	stx	start of text
1	003	etx	end of text (EOM)
1	004	eot	end of transmission (EOT)
1	005	enq	enquiry (WRU)
1	006	ack	acknowledge (RU)
1	007	bel	bell
1	010	bs	backspace
1	011	ht	horizontal tabulation (TAB)
1	012	lf	line feed (LINE FEED)
1	013	vt	vertical tabulation (VT)
1	014	ff	form feed (FORM)
1	015	cr	carriage return (RETURN)
1	016	so	shift out
1	017	si	shift in
1	020	dle	data link escape
1	021	dc1	device control 1 (X-ON)
1	022	dc2	device control 2 (TAPE)
1	023	dc3	device control 3 (X-OFF)
1	024	dc4	device control 4 (TAPE)
1	025	nak	negative acknowledge
1	026	syn	synchronous idle
1	027	etb	end of transmission blocks
1	030	can	cancel
1	031	em	end of medium
1	032	ss	special sequence
1	033	esc	escape
1	034	fs	file separator
1	035	gs	group separator
1	036	rs	record separator
1	037	us	unit separator

CODE	OCTAL	CHAR	NAME
2	040	sp	space (SPACE BAR)
3	041	!	exclamation point
2	042	"	quotation mark
3	043	#	number sign
3	044	$	currency symbol
3	045	%	percent
2	046	&	ampersand
2	047	'	apostrophe
3	050	(	opening parenthesis
3	051	)	closing parenthesis
2	052	*	asterisk
4	053	+	plus
2	054	,	comma
4	055	-	hyphen or minus
4	056	.	period
4	057	/	slant
4	060	0	zero
4	061	1	one
4	062	2	two
4	063	3	three
4	064	4	four
4	065	5	five
4	066	6	six
4	067	7	seven
4	070	8	eight
4	071	9	nine
2	072	:	colon
2	073	;	semicolon
4	074	<	less than
2	075	=	equal
4	076	>	greater than
2	077	?	question mark

CODE	OCTAL	CHAR	NAME
3	100	@	commercial at
3	101	A	
3	102	B	
3	103	C	
3	104	D	
3	105	E	
3	106	F	
3	107	G	
3	110	H	
3	111	I	
3	112	J	
3	113	K	
3	114	L	
3	115	M	
3	116	N	
3	117	O	
3	120	P	
3	121	Q	
3	122	R	
3	123	S	
3	124	T	
3	125	U	
3	126	V	
3	127	W	
3	130	X	
3	131	Y	
3	132	Z	
2	133	[	opening bracket
3	134	\	reverse slant
2	135	]	closing bracket
3	136	^	circumflex
4	137	_	underline

CODE	OCTAL	CHAR	NAME
3	140	`	grave accent
3	141	a	
3	142	b	
3	143	c	
3	144	d	
3	145	e	
3	146	f	
3	147	g	
3	150	h	
3	151	i	
3	152	j	
3	153	k	
3	154	l	
3	155	m	
3	156	n	
3	157	o	
3	160	p	
3	161	q	
3	162	r	
3	163	s	
3	164	t	
3	165	u	
3	166	v	
3	167	w	
3	170	x	
3	171	y	
3	172	z	
2	173	{	opening brace
2	174	|	vertical line
2	175	}	closing brace
2	176	~	tilde
1	177	del	delete (RUBOUT)

CODE	OCTAL	CHAR	NAME
1	000	nul	null or time fill char
1	001	soh	start of heading
1	002	stx	start of text
1	003	etx	end of text (EOM)
1	004	eot	end of transmission (EOT)
1	005	enq	enquiry (WRU)
1	006	ack	acknowledge (RU)
1	007	bel	bell
1	010	bs	backspace
1	011	ht	horizontal tabulation (TAB)
1	012	lf	line feed (LINE FEED)
1	013	vt	vertical tabulation (VT)
1	014	ff	form feed (FORM)
1	015	cr	carriage return (RETURN)
1	016	so	shift out
1	017	si	shift in
1	020	dle	data link escape
1	021	dc1	device control 1 (X-ON)
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1	177	del	delete (RUBOUT)

CODE	OCTAL	CHAR	NAME
2	040	sp	space (SPACE BAR)
2	042	"	quotation mark
2	046	&	ampersand
2	047	'	apostrophe
2	050	(	opening parenthesis
2	051	)	closing parenthesis
2	052	*	asterisk
2	054	,	comma
2	072	:	colon
2	073	;	semicolon
2	075	=	equal
2	077	?	question mark
2	133	[	opening bracket
2	135	]	closing bracket
2	174	|	vertical line
2	176	~	tilde

CODE	OCTAL	CHAR	NAME
3	041	!	exclamation point
3	043	#	number sign
3	044	$	currency symbol
3	045	%	percent
3	100	@	commercial at
3	101	A	
3	102	B	
3	103	C	
3	104	D	
3	105	E	
3	106	F	
3	107	G	
3	110	H	
3	111	I	
3	112	J	
3	113	K	
3	114	L	
3	113	M	
3	116	N	
3	117	O	
3	120	P	
3	121	Q	
3	122	R	
3	123	S	
3	124	T	
3	125	U	
3	126	V	
3	127	W	
3	130	X	
3	131	Y	
3	132	Z	

CODE	OCTAL	CHAR	NAME
3	134	\	reverse slant
3	136	^	circumflex
3	140	`	grave accent
3	141	a	
3	142	b	
3	143	c	
3	144	d	
3	145	e	
3	146	f	
3	147	g	
3	130	h	
3	131	i	
3	132	j	
3	133	k	
3	134	l	
3	135	m	
3	136	n	
3	137	o	
3	160	p	
3	161	q	
3	162	r	
3	163	s	
3	164	t	
3	165	u	
3	166	v	
3	167	w	
3	170	x	
3	171	y	
3	172	z	
3	173	{	opening brace
3	175	}	closing brace

CODE	OCTAL	CHAR	NAME
4	053	+	plus
4	055	-	hyphen or minus
4	056	.	period
4	057	/	slant
4	060	0	zero
4	061	1	one
4	062	2	two
4	063	3	three
4	064	4	four
4	065	5	five
4	066	6	six
4	067	7	seven
4	070	8	eight
4	071	9	nine
4	074	<	less than
4	076	>	greater than
4	137	_	underline

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