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**COMPUTER OPERATOR SYSTEM**  
**FUNCTIONAL DESIGN**

**USAID Project Number: 263-0170**  
[Develop a Detailed and Updated Management Information System for the  
Egyptian Health Insurance Organization, Cost Recovery Program]

**Prepared by:**  
The MAXIMUS, Chemonics, Arabsoft Project Team

**Date:**  
August 10, 1995

August 10, 1995

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Ref:Project Number 263-0170-C-00-3042-00

Dear Mr. Abdou Rahmaan:

MAXIMUS is pleased to submit the functional design document for the Computer Operator System. Computer operations — the actual running and maintenance of hardware and software, as well as telecommunications — is the backbone of any computer system. The Computer Operator System described in this document automates and facilitates the functions that will keep the HIO MIS running smoothly and efficiently at all its sites.

Ease of use was a priority in the design of this system. It is menu-driven and Computer Operators need a minimum of training to successfully do their jobs. As importantly, the system controls access, thereby minimizing the potential for errors and problems caused by inexperience or lack of expertise.

A different design approach was taken in planning this system than was taken in designing the other, business-related applications in the HIO MIS. Because computer operations falls outside the realm of what HIO has done or does in its daily business, most of the input and analysis for this system was done internally by contractor staff.

We welcome a discussion of any questions or concerns you may have regarding this document. Because programming has started on this system, we request you provide any comments within four weeks of our submission of this document. If you have any questions, please do not hesitate to contact me.

Sincerely,

Leslie Graham  
Chief of Party

cc: Dr. Nabil El Mehairy, HIO Chairman

General Faisal Taie, HIO

August 10, 1995

Dr. Nabil El Mehairy  
Chairman  
Health Insurance Organization  
Heliopolis  
Cairo, Egypt

Dear Dr. El Mehairy:

MAXIMUS is pleased to submit the functional design document for the Computer Operator System. Computer operations — the actual running and maintenance of hardware and software, as well as telecommunications — is the backbone of any computer system. The Computer Operator System described in this document combines and facilitates the functions that will keep the HIO MIS running smoothly and efficiently at all its sites.

Ease of use was a priority in the design of this system. It is menu-driven and Computer Operators need a minimum of training to successfully do their jobs. As importantly, the system controls access, thereby minimizing the potential for errors and problems caused by inexperience or lack of expertise.

A different design approach was taken in planning this system than was taken in designing the other, business-related applications in the HIO MIS. Whereas analysis for those applications was heavily based on the HIO's current procedures and needs, the Computer Operator System was necessarily designed around the needs of the HIO MIS itself. The Computer Operator System falls, unprecedented, outside the realm of what HIO has done or does in its daily business. For this reason, most of the input and analysis for this system was done internally, by contractor staff.

Nonetheless, it is important that HIO review this design to ensure that assumptions are valid, and to identify any organizational, policy or procedural changes which may be necessary for its success. The design should also be reviewed by those who contributed to it to confirm that it meets the computer operations requirements of the HIO MIS.

Should you have any questions about the content of this report or wish to discuss any of the issues, please feel free to contact me directly.

Sincerely,

Leslie Graham  
Chief of Party

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# **1 INTRODUCTION**

This document presents the functional design of the Computer Operator System (COS). The Computer Operator System will be implemented, along with the Health Insurance Organization (HIO) Management Information System (MIS), at HIO Headquarters, branches, clinics, and hospitals. The implementation details of this system's functions may differ from one site type to the other, but the core is the same at all levels. This document presents a global view of all COS functions, irrespective of their level of implementation. This system is being developed as part of the HIO MIS under the umbrella of the HIO and the U.S. Agency for International Development.

## **1.1 Purpose of the Document**

This functional design document is intended to describe the main functions performed by the COS in a global view. This document also intends to serve as a baseline for review, comments, and change before the design is put into place and coding of the system begins.

At a high level, this document describes the following:

- o what the COS is;
- o why the COS is needed;
- o who, organizationally, will use the system;
- o what functions the system will provide for those users;
- o what organizational changes must be implemented along with the system for it to be effective; and
- o any assumptions and minimum requirements upon which the design is based.

## **1.2 Process Used to Develop this Design**

The Computer Operator System requirements portrayed in this document were created after gathering the input of many people, each with a different expertise, currently working on the Cost Recovery In Health HIO MIS Project. Since the HIO does not have any large-scale automated systems, it also has no existing computer operators. Therefore, the input for this design comes from members of the MAXIMUS contractor team, drawing on their experience with other systems, knowledge of needs of the HIO MIS, and their first-hand working experience with HIO staff — the final users of this system. This design has also been presented to the HIO

Consultants for input.

Since this system does not currently exist in any formal means (paper or software), each person who was interviewed gave input, in his or her area of expertise, as to what functions the system should perform. This document presents a picture of how the system would look after integrating its parts. Modifications and enhancements to the system are expected as the design is further defined and additional needs come to light.

### **1.3 Intended Audience**

This document presents a high-level, but technical, specification of the discussions held thus far. It introduces the system, as envisaged by contributing project staff, to the other parties involved in contributing to the overall functionality of the COS.

It is expected that the audience of this document is the people who contributed to the development of this document as well as the managers of the HIO MIS Project and the HIO. This document should be reviewed:

- o to verify that the functions mentioned meet the requirements of the intent of the system;
- o to agree that the assumptions used are valid;
- o to understand what minimum requirements have to be met to ensure the success of the system; and
- o to commit to the organizational changes outlined.

In addition, project management should read this document to ensure that this system is of benefit to both the project and the ongoing activities of the Health Insurance Organization.

## 2 GENERAL OVERVIEW OF THE SYSTEM

The COS is designed to integrate many computer operation functions into a single software tool, and to keep those functions operating smoothly and efficiently. This tool is essential because there are many tasks which must be monitored or completed by the HIO Computer Operators. Yet, these individuals will come to the job with a minimum of prior computer experience.

The COS is a tool that allows the Computer Operator to maintain and monitor daily activities. The COS at Headquarters will remotely support and communicate with all sites, thus providing the HIO the capability to keep data at all sites synchronized, and to remotely assist in the diagnoses of problems. The COS therefore leads to the efficient processing of the HIO computer operations. It also allows the completion of complex tasks while restricting control of the user. This is essential to protect the MIS from potential damage by an inexperienced operator.

To work with the COS, an HIO Computer Operator does not need have a technical background. HIO Computer Operators will be provided the necessary training and information needed to operate the system. The COS described in this document is a menu-driven system. The Computer Operator is not given access to either the UNIX or ORACLE prompt.

Computer Operators will be responsible for:

- o morning setup,
- o problem reporting,
- o guided problem diagnosis,
- o monitoring scheduled activities,
- o backup procedures, and
- o system shutdown.

The COS provides the operator with tools to monitor the activities of each day. However, there are some functions implemented that require a supervisor — someone with more UNIX and Oracle knowledge — to perform them when required. It has not been decided yet whether, at a given site, one Computer Operator will do both normal functions and the functions requiring special authorization, or whether there will be two operators with different levels of authorization.

The COS does not provide the Computer Operator with a Restore function. The Restore function is used to load data that has been previously saved (backed up) on tape to the currently

active system. The decision of not automating this function for the Computer Operator was taken based on the fact that this function is critical, and if executed incorrectly might lead to serious problems and irrecoverable data loss. Experience shows that data loss due to the misuse of this function is too common. Consequently, it has been decided that if the need arises to restore data from a tape at any clinic or hospital, a trained technical person from the branch will have to make a trip to that site to execute this function. It is easier to handle such cases at the branch or Headquarters level since qualified technical staff is on site there.

### **3 GENERAL ASSUMPTIONS**

This section contains the assumptions — the conditions — required for the system to work successfully and efficiently. It is important for reviewers of this document to read this section and determine that the conditions are either already in place, or can be implemented.

#### **3.1 Assumptions Related to the Computer Operator**

- o The Computer Operator is given training on some technical aspects of the system, like Startup, which are outside the menu.
- o The Computer Operator will work eight hours per day. Computer Operators at sites operating two shifts will have an hour of overlap between them.
- o The Computer Operator responsible for the morning setup will arrive to work approximately 30 minutes earlier than other staff members. This is because the Computer Operator needs to set up the machine, the printers, and the terminals before work can begin for the day.
- o The Computer Operator will leave approximately one and one-half hours after the close of the facility. This allows time to do the backup and shutdown of the system and the power. Under some circumstances, the Computer Operator may need more time to accomplish irregularly-scheduled work.
- o If, by decision, two levels of expertise are required for the Computer Operators, the Computer Operator with a supervisor role is required to have some technical background. The supervisory Computer Operator should have sufficient understanding of UNIX and ORACLE environments to be able to operate the functions that require additional authorization.
- o The Computer Operator should understand and be able to identify serious problems. The Computer Operator should report these directly and should be able to assist the technical support staff, at the branch or Headquarters, in the diagnosis of a problem.

#### **3.2 Assumptions Related to Facility Operation**

- o At least two highly-qualified technical people should be available at each branch, and likewise at Headquarters. These individuals must be qualified to work directly with ORACLE, UNIX, and the telecommunications system, as well as be able to solve any problems that might arise.

- o Should a problem arise at a clinic or hospital, the Computer Operator refers to the technical staff at the branch. If the branch is unable to solve the problem, it is referred to the Headquarters technical staff. Should a problem arise at a branch, the branch computer operators refer to the branch's technical staff. If the branch technical staff is unable to solve the problem, it is referred to the Headquarters technical staff. Headquarters technical staff is responsible for any problems at Headquarters.
- o There should be a minimum of two Computer Operators for sites operating on a one-shift basis, and a minimum of three Computer Operators for sites operating on a two-shift basis.
- o There should be a minimum of two facility staff persons other than the Computer Operators who know how to start up and shut down the system.
- o A paper system for problem tracking and reporting should exist.
- o There needs to be at least one telephone line at each facility or site that can be used for voice communications by Computer Operators. Ideally, this telephone line should be located in the computer room.

### **3.3 Assumption Related to the System**

System date and time must be accurate in order for scheduled jobs to run at the appropriate time.

## 4 FUNCTIONAL DESIGN

This section describes the functional design of the COS. The COS is made up of three subsystems: the Clinic and Hospital Computer Operator System, the Branch Computer Operator System, and the Headquarters Computer Operator System. Functions are common to all subsystems, but may differ in the implementation detail. This section defines all functions of the COS without specifying implementation details.

### 4.1 Job Processor

The job processor functions are used by the Computer Operator to monitor jobs that are supposed to be executed according to a schedule, and to explicitly execute predefined jobs that do not have a scheduled time for execution. A job could have prerequisite jobs that have to be executed before it can execute and vice versa; jobs may consist of many subjobs. Examples of these jobs include downloading a table, transfer of files between facilities, and printing reports.

#### 4.1.1 Scheduled Activities Function

Through this function, the operator is able to view information on predefined jobs that have a scheduled execution time. Jobs could be scheduled to execute daily, weekly, monthly, quarterly, semiannually, or annually. On a given day, the operator is able to view information on jobs scheduled for that week. He is also able to look at the prerequisites of a job as well as their subjobs. When the execution time for the job arrives, the job executes. At the beginning of a week, all jobs have the status of "Ready," meaning they are not yet started. Depending on the execution of the job, its status might become either "Finished," "Failed," "Cancelled," or "On Hold." Exhibit 4-1 describes the conditions that would lead to each of the statuses:

**Exhibit 4-1  
JOB STATUS AND CONDITION**

Status	Condition
<b>READY</b>	Not yet started
<b>FINISHED</b>	Successful execution of the job
<b>FAILED</b>	Unsuccessful execution of the job (communication error/file did not exist/etc.)
<b>CANCELLED</b>	Manual deletion of the job
<b>ON HOLD</b>	Manual delay of the job

Note: A single CRON entry is how the database would be queried to initiate the jobs.

A Computer Operator using this function has access (read only) to the following information on a job and its subjobs:

- o system date,
- o job identification,
- o job description,
- o scheduled execution date and time,
- o job execution status, and
- o actual execution date and time.

#### **4.1.2 Unscheduled Activities Function**

Through this function, the operator is able to view information on predefined jobs that are not executed based on a schedule. Those jobs are explicitly executed only upon request, but the details of execution are predefined. The operator is able to view all unscheduled jobs and choose the one that needs to be executed. In the case of some file transfer jobs, executed as need arises, the download of tables would always need to be explicitly executed first, as a subjob. This function alerts the Computer Operator of any subjob that might need to be executed as part of a job, and the status of that subjob.

Jobs that have not yet been executed have the status "Ready." Depending on the execution of the job, the status might also become either "Finished" or "Failed." The screen attributes for this function would be the same as for Scheduled Activities function (4.1.1).

#### **4.2 Database Administration Functions**

These functions provide the Computer Operator with tools that can be used to diagnose problems and to answer questions about the database and its operation. Database administration functions fall into three groups:

- o application database functions,
- o disk storage database functions, and
- o functions that require an authorized user.

Exhibit 4-2 is a list of the database administration functions. It includes a description of

each, as well as attributes.

**Exhibit 4-2**  
**DATABASE ADMINISTRATION FUNCTIONS**

Function	Description	Attributes
Tables	Provides a list of tables that belong to a given user	Table Name/TableSpace/Free Extents/In Use Extents/Initial Space/Incremental Increase Percentage/Minimum Extent/Maximum Extent
Objects	Provides a list of all objects; tables, views or indices	Object Name/TableSpace/Object Type/Creation Date/Last Change
Free Space	Provides a list of all tablespaces and the extents on each	TableSpace/File ID/Block ID/Bytes Free/Blocks Free
TableSpaces	Provides a list of all tablespaces	TableSpace/Initial Space/Incremental Increase bytes and percentage/Minimum Extent/Maximum Extent/TableSpace Status
Synonyms	Provides the synonyms of a particular user	Synonym Name/Table Name/Table Owner
Data Files*	Shows the UNIX file names for all tablespaces	File Name/File ID/TableSpace/Bytes/Status
Display Session*	Shows the sessions that are running; the terminal number and the tool used	Session ID/ Serial No./User Name/Terminal/Program
Kill Session*	Allows the Computer Operator to kill a particular session using the session ID	Session ID/ Serial No./User Name/Terminal/Program
Rollback Segments*	Shows the segments for rollback for each tablespace	Segment Name/Owner/TableSpace/Segment ID/File ID/Block ID/Status
TS tables*	Tables on a given tablespace	Table Name/Free Space/Used Space/Initial Space/(Next) Incremental Space /Percentage Increase/Minimum Extent/Maximum Extent
Start up	Initiates the ORACLE database	N/A
Shut down*	Allows the Computer Operator to close the database	N/A

\* Execution of these tools requires special authorization of the user.

### 4.3 System Administration Functions

This function provides the Computer Operator with tools to diagnose system problems and to answer questions about system operations. Except for one or two, most tools provided for the

system do not require special authorization to access them.

### **4.3.1 Clean Up the System**

This function is designed to keep the local file system from overflowing; it removes files that are older than a specified interval and directories that are empty. The clean up script would, for example, remove system log files and error log files. This function could be one of those jobs added to the Job Processor to be executed every week, though this has not yet been decided.

### **4.3.2 Incremental Data Backup (daily)**

Through this function the operator is able to perform a daily database backup of the rows that were updated during the day. Three sets of tapes are used for incremental backup for a six-day work week. A set could be one or more tapes. Each set should be labeled with the day(s) it is used for backup. The three sets of tapes are rotated through five of the six-day work week (the full data backup subsumes the incremental daily backup one day per week). This system maintains an absolute minimum of two relatively recent daily backups at any given time. Exhibit 4-3 illustrates a sample tape set rotation system for incremental data backup over a period of seven work days.

**Exhibit 4-3**  
**SAMPLE TAPE SET ROTATION FOR INCREMENTAL DATA BACKUP**

Day of Week							
	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Saturday
<b>Tape set</b>	Set A	Set B	Set C	Set A (overwrite Saturday)	Set B (overwrite Sunday)	<b>Weekly full data backup</b>	Set A (overwrite Tuesday)

**4.3.3 Full Data Backup (weekly)**

Through this function, the operator is able to perform a full backup of the entire database at the end of each week. There are two sets of tapes and the set could be one or more tapes. The two sets are used in an alternating manner. A full data backup is expected to take approximately 45 minutes at a clinic or hospital and approximately one and one-half hours at the branch.

**4.3.4 System Backup (monthly or as needed)**

Through this function, the operator is able to perform a full backup of the system once each month. This backup is also performed upon changing the configuration of either UNIX or ORACLE, or with the release of new versions of the application programs. It is expected that the system backup would take approximately one and one-half hours at a clinic or hospital and approximately three hours at the Branch.

### 4.3.5 Ghost Jobs

Ghost jobs or ghost processes are created when a user switches off a terminal without properly logging out of the system. The processes in progress when the terminal was switched off are therefore not linked to a user. This function has two subfunctions, one to identify ghost jobs and the other to remove them. This function does not require special authorization since killing a ghost job does not affect any user. It is important to remove ghost jobs because, as they increase in number, they can slow down the system.

### 4.3.6 View Processes

This function provides the user with a listing of the processes running on a system. It shows the process identification and other information.

### 4.3.7 Kill Process (requires special authorization)

This function allows an authorized Computer Operator to kill any process using the process ID. For the operator to know the process ID, he needs to have used the View Processes function (4.3.6). It is a very useful tool, but access to it must be controlled, since its indiscriminate use could cause problems for users.

### 4.3.8 Printer Information

This function provides the operator with information on the printers linked to the system. Exhibit 4-4 describes the subfunctions that make up the Printer Information Function.

**Exhibit 4-4  
PRINT INFORMATION SUBFUNCTIONS**

Subfunction	Purpose
Printer Queue	Display jobs on the printer queue and the status of each job
Reroute Printer	Changing the default printer of all terminals or a specific terminal
Remove Job	Delete a print job

### 4.3.9 System Information

This function provides the operator with machine information. Exhibit 4-5 lists the system information subfunctions.

**Exhibit 4-5**  
**SYSTEM INFORMATION SUBFUNCTIONS**

<b>Subfunction</b>	<b>Purpose</b>
Date	Display or adjust the system date
Time	Display or adjust system time
Node	Display the host name
Space	Display disk space information

**4.3.10 Shutdown**

Through this function, the operator is able to shut down the system at the end of the day.

**4.4 Application Functions**

The functions in the following sections are all related to a specific application at a facility.

**4.4.1 Add User**

Through this function, the operator adds a new application user to a facility's user list.

**4.4.2 Assign User to Module**

Through this function, the operator specifies the primary and secondary applications that a user is to be given access to and his/her role, whether a support role or a clerk.

**4.4.3 View Users**

Through this function, the operator is able to view all users defined, the date they were added to the user list, their primary and secondary applications, and their roles.

**4.4.4 Delete User**

Through this function, the operator is able to remove a user name from the user list. The function simultaneously removes the user's assignment to any applications.

## APPENDIX A: DEVELOPMENT TOOLS

Function	Function Title	Tool
4.1	Job Processor	SQL*Forms/SQL*Report Writer /Pro*C/UNIX Scripts
4.2	Database Administration Functions	SQL*Plus
4.3.1- 4.3.10	Cleanup the System/Incremental Data Backup/Full Data Backup/System Backup/Ghost Jobs/View Processes/Kill Process/Printer Information/System Information/Shutdown	UNIX Scripts
4.4.1 - 4.4.4	Add User/Assign user to Module/View User/Delete User	SQL*Forms/SQL*Plus

## **APPENDIX B: GLOSSARY OF TERMS**

- Column:** In the context of this document, a set of data (text or numeric values) aligned vertically in a table.
- CRON:** A CRON command starts a process that executes commands at specified dates and times.
- Process:** A program or part of a program; a coherent sequence of steps undertaken by a program. Example: an internal or external data transfer function, handling of an interrupt, or evaluation of a function.
- Row:** In the context of this document, a set of data (text or numeric values) aligned horizontally in a table. Example:
- Table:** In relational databases, a data structure characterized by rows and columns, with data occupying or potentially occupying each cell formed by a row/column intersection. The table is the underlying structure of a relation.

