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1631

ENERGY CONSERVATION IN INDUSTRY

DP/EGY/83/001

EGYPT

Technical report: Application of PERQ 2 computer in
Energy Conservation Project

Prepared for the Government of Egypt
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of Ratimir Kvaternik
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United Nations Industrial Development Organization
Vienna

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EXPLANATORY NOTES

ECIP : Energy Conservation in Industry Project.
TIMS : Tabbin Institute of Metallurgy
IECC : Industrial Energy Conservation Center at TIMS
ICL : International Computers Limited-British
computer manufacturer.
PERQ 2 : Name of the computer system
PNX : Name of the operating system used on PERQ 2
computer.
WM : Window Manager System
UNIX : Name of the operating system
(UNIX is a trade mark of Bell Laboratories,
USA).

1 Egyptian pound is approximately 1,36 US dollars.

ABSTRACT

This report covers activities, results, findings and recommendations resulting from the mission to Egypt within the project DP/EGY/83/001. The main goal of the project mission was the application of PERQ 2 computer in the Energy Conservation Project.

The main findings are that computer PERQ 2 was not put into operation because there was no application software supplied with the computer, that could be used immediately, then the f77 compiler was not supplied with the computer and finally TIMS staff was not trained at all how to use the PERQ 2 computer system.

The main recommendations are following: the f77 compiler (Fortran 77 compiler) should be supplied, since the TIMS staff has experience in Fortran programming and could develop some applications. After this training they will be capable to implement the applications like history data gathering, analysis and modeling of energy consumption etc. but some consulting help will be still needed. Further it is necessary to repair the floppy disc drive and enable the plot function to use plotting from the window.

During the mission TIMS staff was trained in operating PERQ 2, using its existing systems software and maintaining it. Also the course lectures were given covering basic topics in data processing and PERQ 2 computer system usage.

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1. INTRODUCTION

The mission to Egypt, duty station Cairo, was a part of the Energy Conservation Project DP/EGY/83/001/11-64.

It took place from 22nd April to 17th of May 1987.

The main purpose of the mission was to assist in computer application in Energy Conservation in Industry. Particularly the PERQ 2 computer was earlier assigned to this project and it was installed at Tabbin Institute for Metallurgical studies. The main goals set were therefore following:

- To put PERQ 2 computer and Peripheral equipment installed into operation.
- To train the project staff in operating the computer system and in using its software (operating system, utilities and application software).
- To consult project staff in maintenance aspects regarding software and hardware.
- To give to ECIP recommendations regarding possible extension of hardware or software part of the system.

In order to achieve these goals it has been tried to give to the TIMS staff included on this project as much training as possible. Therefore an intensive 6 days training was held. On the other hand it was also necessary to give an introductory course on data processing, trying to concentrate on basic topics in data processing and the usage of existing PERQ 2 computer.

This course was intended not only for staff members who will be further in charge of the computer operation but also for the others who might be potential users of the computer regarding energy saving and conservation.

The other part of the mission was devoted to discussions with senior and management staff of the project to determine what are the necessary steps to be undertaken to put the computer PERQ 2 in operating condition and use

it on daily basis for the information processing in ECIP. The duty station was Cairo and there was no need to travel to any other site or place, since the PERQ 2 computer was installed at TIMS.

The main results of the mission are obviously findings and recommendations summarized in chapter 2 and Chapter 4 of this report. However some results have already been visible at TIMS and that is actually putting the PERQ 2 into the operation. The staff trained during the 6 days training is capable to use, maintain and explore further by themselves the PERQ 2 computer system.

Therefore it is evident that the main objectives and goals of the mission have been achieved.

2. RECOMMENDATIONS.

RECOMMENDED:

CONCERNED
PARTY

1. An agreement for maintainance (monthly preventive maintainance) should be done with ICL representative in Egypt.
This seems reasonable because there is a lot of spare parts (so no need to import) and ICL is producer of PERQ 2 computer which gives guarantee that maintainance will be proper. In such way TIMS would ensure to keep PERQ 2 in operation condition and rely upon it. ECIP
2. It is the most urgent to repair the floppy disc drive because without it the system cannot be recovered in the case of any fatal errors that cannot be solved by rebooting. Also in case of hard disc corruption or error the whole software that will be developed would get lost. ECIP
3. The f77 compiler is a necessity for PERQ2 users at TIMS since all of the staff have experience in Fortran programming. Therefore it is strongly recommended that f77 compiler be supplied (purchased from ICL). ECIP
UNIDO
4. For technical drawing it is important to have the plot facility from the window directly using the WM command from the pop-up menu. Therefore this facility should be repaired in any case. ECIP
5. For input of the technical drawing and graphs in digitised form it would be advantageous to have in the system the bit-pad with stylus. This is the only hardware expansion that might be necessary at this moment. ECIP
UNIDO

6. Regarding the graphical data processing and the software expansion of the system it would be advantageous to have GKS (Graphical Kernel System) produced also by ICL. because its routines can be normally called from Fortran programs (using CAAL statement) and that would make the use of graphical capabilities of ERQ 2 complete. They are unefficiently used otherwise. ECIP
7. TIMS staff has experience in Fortran programming and should be able to start developing some applications on PERQ 2 that would be to the benefit of the project. It is recommended that they start development of an application however with some help and consulting assistance. ECIP
UNIDO
8. PERQ 2 computer is not a suitable system for big databases neither from the hardware nor from the software point of view. Small technical databases could be maintained however the DBMS software would be necessary. For any bigger database and intensive queries the system will not be able to give the expected response. ECIP
9. To have the database system and to develop further an information system it would be necessary to educate the staff in system analyses and information system design and implementation. ECIP
10. In any case of system expansion (except those mentioned in 1.,2.,3.,and4).it is strongly recommended to consult the computer application expert before (not after) the equipment or software has been purchased or negotiated. ECIP
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3. ACTIVITIES

1. Background information and job description.

Research and development undertaken within the past decade in various countries has resulted mainly in many technological and non-technological achievements towards conservation and more efficient use of energy. To reduce and rationalise the consumption of energy became a main goal for many major industry branches up to the smallest production units.

This was extremely important for many countries, particularly developing countries.

In Egypt with assistance of UNDP a project DP/EGY/83/001 was undertaken to establish and make operational an Industrial Energy Conservation Center (IECC) at TIMS. The main goals of the IECC were following (as put in the Project Document):

- To train the staff in all technical, economic and other aspects energy conservation.
- To carry out plant surveys in selected industries.
- To recommend energy conservation methods and equipment.
- To test the equipment and processes for energy efficiency.
- To assist industries and institutions in production and maintenance of energy efficient equipment.
- To operate on energy conservation databank.
- To promote awareness of the benefit of energy conservation.
- To establish linkages with universities, ministries, companies and agencies in order to optimize resource utilization for energy conservation programmes.

Obviously to achieve any of these goals the efficient information system is a necessity.

It has been pointed out that the data bank should be maintained.

There are however many other informational aspects that could and should be analysed, solved and implemented in order to achieve the desired efficiency in energy conservation. All these aspects and possibilities could not be covered within this project.

It was intended however to start with collecting the data and storing those data. The data could then be analysed regarding various aspects of energy consumption, conservation and saving.

Research could be done using mathematical models, analysing the energy situation at various levels and from various points of view, taking into consideration economic (money); technical (construction), operational, energetic, resource (materials) and other factors. It was decided that the first step should however be collection and storing of data (history data of energy consumption). Further could be monitored energy usage distribution, also evaluation of energy management, reporting system of energy quantities and cost could be made etc. All that should finally be integrated into an Energy Accounting and Information System.

As the very first step toward this truly huge undertaking the PERQ 2 computer system was purchased. It is a question whether this computer was exactly a right choice and a right step toward informatization, however this is not the point and objective of this report. Once the system is here it should be used and therefore this mission was undertaken. The main duties as already outlined in chapter 1. for this mission were:

- Assist the project in putting into operation the PERQ 2 computer with peripheral equipment.
- Train project staff in software usage (operating system, utilities, application software).
- Instruct the staff in operation of PERQ2 WORKSTATION and maintenance aspects.
- Advise the staff on possible extension of the computer system from the hardware and software point of view.

According to this the activities were planned and undertaken, however having in mind that broad issue of an information system should be preserved as final goal and ultimate achievement, that should probably result in another project.

2. Activities

To achieve the goals set by the duties it was necessary to undertake following activities:

- To find out what is the present situation regarding the PERQ 2 computer system and its use in the project as explained in the previous text. This was done mainly by discussions with senior and management staff members. The main findings are outlined in chapter 4.
- To set up a training and train the staff according to the situation that is present.
- To give a course on basic topics in data processing and PERQ2 computer usage.

The first discussion regarding the project in general and the situation of computer usage in the project was held with Dr.T. Sabry senior officer of UNDP Cairo, who shortly explained what is the project about, what are general ideas set by the project documentation and finally that the PERQ 2 computer as now is not used for capturing history data.

At TIMS the discussions were held with Dr. Prof. M.H. Selim who is the Rector of the Institute and also National Project Director, and with Dr. Samir El Bardisy who was the main coordinator during the mission, as well as occasionally with other staff members that are listed in Appendix VI.

The discussions cleared the present situation found at TIMS. The main findings are separately outlined in chapter 4. The detailed list of hardware installed at TIMS is given in Appendix I together with its technical specifications. The list of Software installed at TIMS is given in Appendix

II together with the main features of the installed software. The list of spare parts stored at TIMS and supplied with the computer is given in Appendix III. The list of installation floppy discs is given in Appendix V. The list of Manuals and Literature for PERQ 2 computer which was supplied by the manufacturer is given in Appendix IV.

The most important facts that have come out are that the staff had no training for PERQ 2 computer system at all and could not use it. As the system itself is fairly complex and it is not expected to be used without proper training this was understandable. Even more one has to be familiar with PNX or UNIX operating system to be able to use PERQ 2 system. Supplied manuals are completely inadequate for learning because there are no explanation or examples. Obviously the system was not put into operation. However there was no application software and the system could not be used anyway for the purpose assigned in the project. Further the Fortran compiler (f77 compiler) was not supplied with the system software and TIMS staff although having experience in fortran programming could not try to develop programs in fortran language. The only supplied compiler was C language compiler but C is not the most suitable for development of engineering applications.

Therefore it has been recommended that f77 compiler be supplied. The TIMS staff will be able then to develop some applications (history data gathering, analysis, modeling) but some consultations and advising will be still necessary.

Discussed were also problems regarding technical maintenance of the computer. Since there are many spare parts at TIMS it would be reasonable to make a maintenance contract with the representative of ICL since they are producers of PERQ 2 computer and could give the proper maintenance to the system.

Some parts of the computer have been find malfunctioning; like floppy disc drive that could not accept floppy discs and could not be used. In software only plot function could not be used.

The second activity as well as the third activity were consequences of the situation found at TIMS.

The meaning and aim of the training was first of all to practice the operation of the computer getting also necessary knowledge about the system itself. It was agreed with Dr. M.H. Selim and Dr. S. El-Bardissy that the training will take six days with following content (title for each day):

1. PNX OPERATING SYSTEM, OPERATING PERQ 2.
2. PNX COMMANDS
3. WINDOW MANAGER SYSTEM
4. SPY GRAPHIC EDITOR
5. REDIRECTION, PIPING , FILTERING
6. MAINTAINANCE ASPECTS.

The detailed content of each topic can be found in Appendix VII .

The third activity, course lectures, where aimed at a broader audience that might use PERQ 2 computer. It was also agreed with Prof. Dr. M. H. Selim and Dr. S. El-Bardisy that it takes five days and lecture topics be following :

1. INTRODUCTION TO COMPUTER SYSTEMS AND DATA PROCESSING
2. INTRODUCTION TO PNX OPERATING SYSTEM
3. FILE SYSTEM ON PERQ 2 AND ITS USE
4. WINDOW MANAGER SYSTEM AND SPY EDITOR
5. PNX COMMANDS.

The detailed content of each topic can be found in Appendix IX. Appendices VI and VIII list the attenders of the training and course respectively.

3. Results

This mission has brought twofold results. The first kind of results are immediate results that are visible already.

The second category of results are results that can be visible only after some period of time and when the necessary software be supplied.

The immediate results are following:

- The staff at TIMS that attended the training will be able to operate PERQ 2 computer.
- The staff will be able to use PERQ 2 computer as it is now only for storing, manipulating and searching text files.

The staff will be able to learn further by themselves about the system and research the possibilities to use the system. The results that will be visible after the system will be updated with f77 compiler;

- The staff will be able to write and use fortran programs.
- After some practical experience the staff will be able to maintain the systems software and use it efficiently.
- The staff will be able to use manuals, learn from them and teach others how to use the computer system.

Regarding the application development it should be pointed out that this training was not intended to teach the staff how to develop, design and implement an application, especially not how to design and implement a database system and develop an information system. The PERQ 2 is however not very suitable system for large databases and implementation of an information system like those mentioned in the project documentation it is rather aimed for engineering application that can make use of its graphic capabilities. For the application development the TIMS staff will still need some consulting and advising help.

4. FINDINGS

1. Computer system PERQ 2 was properly installed at TIMS premises (except for 2).
2. The printer was connected to the port RS232B but activated was port RS232A.
3. Plot function could not be activated from any window (using plot command from pop-up menu). There is some software malfunction which should be corrected.
4. The floppy disc drive is not in order and does not accept inserted floppy disc, so for any command addressing the floppy disc the message NO FLOPPY DISC IN DRIVE is displayed.
5. Fortran compiler (f77 compiler produced by ICL for PERQ 2 computer system) was not supplied with other software and TIMS staff cannot do any programming (application programs). As they have only experience with fortran and C language which was supplied with the system is not suitable for engineering problems programming, it is important to supply the f77 compiler for PERQ 2.
6. No training at all was provided for the TIMS staff and they could not put the PERQ 2 computer into operation (see also 7).
7. Manuals supplied with PERQ 2 computer are completely inadequate for learning because there are no explanations or examples that could be of help to the novice user. The same applies for operating the system and maintaining the system.
8. No application software ready for use was supplied with the system, and that is another reason that PERQ 2 could not be used at all.
9. There was found stored at TIMS a lot of spare parts for PERQ 2. (see Appendix III).

In fact too much has been invested in hardware and too little in software. However the computer without software is useless and that is a mistake done when acquiring the computer.

10. There is also a problem of technical maintainance of the computer system. Since the installation there was no maintainence or checking of the hardware and software of the system.
11. There was no organized work on applications at TIMS which is understandable since the system was not in operation. However for developing an application aproprate organization of work should be introduced.

5. CONCLUSIONS

The data processing function was not adequately developed on this project although it makes a very important part of it.

The computer system was installed but due to reasons stated in chapter 4 (Findings) and in chapter 3 (Activities) it was not used for data processing. The chapter 2 (Recommendations) contains the recommendations that should be followed in order to use the PERQ 2 computer system efficiently.

This mission resulted in giving the basic training to the TIMS staff that is assigned to the ECIP, in order to enable them to operate and use the installed computer system.

The mission could be considered successfully finished although some functions could not be activated.

The findings (Chapter 4) and recommendations (Chapter 2) summarize what was the situation with PERQ 2 computer system and what should be undertaken in this project or by the TIMS staff that the data processing function be efficiently developed and used within the constraints imposed by the hardware and software capabilities of the PERQ 2 computer system.

APPENDIX I

PERQ 2 HARDWARE INSTALLED AT TMS

Type : 8223/25 PERQ 2 system
Producer : ICL, London, Great Britain
Configuration : 1. PROCESSOR CABINET contains following :
- CPU
- DISPLAY AND I/O CONTROLLERS
- OSLAN CONTROLLER
- GFIB AND RS232 INTERFACE
- 1Mb MAIN MEMORY
- 35 Mb FIXED DISC
- 8 inch FLOPPY DISC DRIVE
2. GRAPHIC DISPLAY MONITOR (Portrait type)
3. KEYBOARD
4. TABLET DEVICE (3 button pointing device)
5. 3815 MATRIX PRINTER

TECHNICAL SPECIFICATIONS :

Processor : Microprogrammed bit-sliced CPU with 48 bit wide microword.
- Microcycle time 170 ns
- Hardware implemented RasterOp bit-map manipulation enabling bit addressed raster data to be moved at up to 32 Mbits/sec.
- AMD microprogram sequencer.
- Hardware assisted interpretation of byte coded instruction set.
- 256 word, dual ported, general purpose register block; 20 bit real address registers.
- 16 level hardware implemented expression evaluation.
- Barrel shifter and mask logic.
Display :- Free standing, raster scanned bit mapped CRT.
- 768 x 1024 pixels, portrait orientation.

- P4 white tube phosphor
 - 0.27mm dot spacing (nominal)
 - Hardware cursor, user definable up to 56x64 pixels .
 - Direct bit-mapping onto main memory
 - Screen diagonal 380mm
 - Nominal picture dimensions (adjustable) 210x275mm
- Keyboard** :- Free standing, lightweight, low profile, solid state.
- 84 keys with numeric keypad and four functions keys.
 - ASCII character set.
 - Serial interface
- Tablet** :- Free standing
- Serial interface
 - Active area 180x240mm
 - Resolution to one pixel
 - Electromagnetic operation.
 - Three button puck (mouse).
- Memory** :- MOS semiconductor RAM 1 Mb with parity checking
- 64 bit wide memory access via two 16 bit memory data buses; memory cycles up to 64 bits every 680 ns.
 - Integrated memory/display controller
 - One to one screen bit-map onto memory; bit map can be realigned within store..
- Input/Output** :- I/O controller (for high speed devices) multiplexes up to five simultaneous DMA channels at up to 10 Mbits/sec each.
- 16-bit I/O bus to processor
 - 8-bit microprocessor for low speed device control.
 - 2x RS232C interface; full duplex, synchronous/asynchronous serial data port, speeds up to 9600 baud.

- GPIB interface; IEEE-488 1978 implementation of General purpose Bus; speeds up to 160 Kbytes/sec.
- OSLAN-Open Area Local Network Interface: ECMA 72 standard for physical data link layers; 500 meters maximal between active nodes.

Fixed disc Unit:-8 inch winchester technology rigid disc

- Up to 35.6 Mb formatted capacity
- 3 platters, 5 surfaces, 5 heads
- Rotational speed 3600 rpm
- Latency 8.33 ms
- Average seek time 42 ms
- Transfer rate 920 Kb/sec.

3185 Printer :- Bidirectional impact dot-matrix

- Graphics resolution: 0.353 mm 72 dots/inch for whole dot spacing, 0.176mm 144 dots/inch for half dot spacing.
- 5,6,8.5,15,10,12 or 17 cpi selected by control mode (5,6 and 8.5 utilize double width characters)
- Print positions/line 68,81,115,136,163,231 dependant upon character spacing.
- Character matrix 9x9, 9 needle print head
- Line spacing 6 or 8 lpi selected by control mode
- Speed 200cps, 100 cps, 74 lpm (at 10 cpi)
- Data rate 300 to 9600 baud
- 94 ASCII character set or 64 special graphics symbols.
- Paper feed: friction or tractor
- Single copy for friction feed, Original + 3copies for tractor feed.
- 3 x 16 inch paper width.
- RS 232C interface
- Paper out sensor, column indicator.

Power requirements: - 220/240 AC, 5C Hz

Power consumption : - approximately 760 wats.

APPENDIX II

PERQ 2 SOFTWARE INSTALLED AT TIMS

Operating system : PNX Version 3.C
Compilers : C Language Compiler
Utilities : Window Manager-WM
Graphic Editor-Spy editor
Cursor Editor-CEDRA
Graphic Intrinsics

Operating system main features:

- UNIX-like operating system supporting nearly all standard UNIX features and tools such as: shell command interpreter, shell programming facilities, hierarchical file system: structure, directory files, special files (devices drivers), libraries, on-line manual, uucp, adb, file transfer, demo, aliasing, fonts, nroff text formatting, spell, help, system calls, awk, ed, eqn, loader etc.
- OSLAN-Open system Local Area Network Support
- Graphic system calls.
- 32 bit virtual address
- Double precision real arithmetic(64 bit)
- Virtual storage system (RRO paging system)
- Multiprocessing support (up to 30processes)
- Interprocess communication
- System assigned process priorities
- Time silicing
- Background /Foreground interactive processing.
- Stack area (51e Kb), Off-stack area(128Kb)
- Process limits (Code) 4Mb
- Total limit on program size 6 Mb
- Spooling for text printing and plotting on matrix printer.

- Support of ECMA-72 (European Computer Manufacturer Association) protocols up to 4 level.

- WM features** :- Interactive work with windows
- Definition of window descriptors
 - Deletion, moving, altering size and plotting of the window content
 - Clipping
 - On the screen help menu
 - On the screen command menu (pop/up menu)

Spy Editor Features:

- Graphic oriented editing
- Simultaneous multiple file editing
- On the screen menu for command selection
- Graphical command selection
- Forward/Backward continous and jump scrolling
- Escaping for shell execution of a selected string .
- Help (on the screen)
- Editor commands for deletion, searching, replacing, moving and copying text.

APPENDIX III

SPARE PARTS LIST (STORED AT TMS)

CPU Kit G211579, Kit K1148, Kit K1120
STORE Kit G1943 (F2361/03)
DISPLAY (PORTRAIT) Kit G2533, Kit G2554
FIXED DISC Kit G2550, Kit G2551, Kit G2549
8.5 inch TABLET (F2362/04) Kit F2314
Printer (3185/33) Kit G2006, Kit G2007

APPENXID IV
MANUALS AND LITERATURE FOR PERQ 2 COMPUTER
(Supplied with PERQ 2, Published by ICL)

1. Guide to PNX
2. UNIX Programmers Manual Vol. 1
3. UNIX Programmers Manual Vol. 2A
4. UNIX Programmers Manual Vol. 2 B
5. User Guide.

APPENDIX V

INSTALLATION FLOOPY DISCS SET
(17 Floppy discs stored at TIMS)

Installation Boot Floppy	- 1
PNX Base Floppies	- 3
Kernel and WM Floppies	- 1
C Compiler	- 1
Utilities	- 8
Manual	- 1
Learn and Spell	- 1
Demo	- 1
	<hr/>
Total Floppies	17

APPENDIX VI

LIST OF TRAINING ATTENDERS

1. Dr. Samir Haffez (Head Automatic Control Department).
2. Dr. Samir El-Bardisy (Automatic Control Department)
3. Dr. Hashem Ali-Hassan (----- " -----)
4. Eng. Hassan Mohamed Hassan(-----" -----)
5. Eng. Mchamed Abdel-Kalek(Mechanical Equipment Department).
6. Eng. Amer Ibrahim (Industrial Furnace Department)
7. Eng. El-Kahlavi Abdel-Menim (Computer Specialist)
8. Eng. Ateff Mostaffa (---- " ----)
9. Eng. Saleh Abdel-Kalek (---- " ----)
10. Eng. Samira Radi (---- " ----)
11. Dawlet Ismail (---- " ----)

APPENDIX VII
CONTENT OF THE TRAINING (5 days)

- 1st day : PNX OPERATING SYSTEM, OPERATING PERQ 2
- Overview of PNX operating system
 - Hardware and software configuration of FARQ2
 - Characteristics of PNX operating system
 - File system in PNX
 - Directory files
 - Ordinary files
 - Special files
 - operating systems shell and Commands
 - Login procedure
 - Lcgout procedure
 - Pheripheral equipment and its use
- 2nd day : - PNX COMMANDS
- List directory comm. - ls
 - Change directory comm. - cd
 - Print working directory comm.-pwd
 - Concatenate and print comm.-cat
 - Remove (delete) comm.-rm
 - Copy file comm.-cp
 - Rename comm.-mv
 - Make directory comm.-mkdir
 - Remove directory comm.-rmdir
 - Print file comm.-pr
 - Print file on line printer comm. - lpr
- 3rd day : WINDOW MANAGER SYSTEM
- What is window manager
 - Using puck for pointing
 - WM initialization
 - Commands and how to use them
 - Pop/up menu
 - Create comm.
 - Create + Tittle comm.

- Open comm.
- Delete Comm.
- Grow/Shrink comm.
- Move comm.
- Plct comm.
- Wipe comm.
- Terminate comm.
- Help menu
- General suggestions for WM usage.

4th day : SPY -GRAPHIC EDITOR

- Using editor in editing process
- Characteristics of the spy editor
- Initialization
- Using spy editor display
- Continous and jumps scrolling
- Thumbing with thumb bar
- Selecting the text
- Inserting the text
- Deleting text
- Copying and moving text
- Replacing text
- Writting text in the file
- Editing new file-file creation
- Editing old file-changing existing file
- Quiting editing session
- Multiple file editing
- Suggestions for spy editor use in program development

5th day : - REDIRECTION, PIPING, FILTERING

- Echo command
- What is redirection
- Redirection of output
- Examples of output redirection
- Redirection of input
- Examples of input redirection
- Piping and its use
- Grep command

- Sort command
- Examples of piping
- Filters and filtering
- Examples
- Pipelines and creation of new commands
- Chmod command
- Man command
- f77 program development and testing

6th day : MAINTAINANCE ASPECTS

- What can go wrong and what can be done
- Hardware checking
- Software checking
- Installation of PNX from boot floppies
- Formatting new floppies
- Backup procedure
- Setting new username and password
- Testing aids in PNX - et/fsck
- Changing password

APPENDIX VIII
LIST OF COURSE LECTURE ATTENDERS

1. Eng. Samy Narouz (Iron Steel Company)
2. Eng. Ibrahim Amen (----- " -----)
3. Hamcalla Mahmoud Surage, Programmer, (Iron Steel Company)
4. Eng. Hayat Abdel Based Ali, " (Cement Portland of Helwan).
5. Nhed Gamal Olama, Programmer, (Naser Automative Comp).
6. Moha Elaid Abdal Ogafar, Programmer, (----- " -----)
7. Zenab Mohamed El Setofy, Programmer, (-----" -----)
8. Samira Mohamed Rady, Programmer, (TIMS)
9. El Kahlawy Abd. El-Manaim, Programmer (TIMS)
10. Salah Abd. El Khalah, Programmer (_"-)
11. Amro Ibrahim Mohamed, Eng. (-"-)
12. Eng. Mohamed Abdel Khalek Hassan, (-"-)
13. Eng. Khairy Abdel Atef Abdel Salah (-"-)
14. Dawlet Elsayed Israil, Programmer, (-"-)

APPENDIX IX
CONTENT OF THE COURSE LECTURES
(5 days)

1st Day : INTRODUCTION TO COMPUTER SYSTEMS

- Data Processing and Information Systems
- Input, Output, Processing, Storing
- Input Units
- Output Units
- CPU (CU, ALU, Main Memory)
- External Storage units
- Magnetic disc, magnetic tape
- PERQ 2 configuration
- Number and character representation
- Instruction execution and stored program concept.
- Algorithms

2nd day : INTRODUCTION TO PNX OPERATING SYSTEM

- Systems software
- Language processors
- Programming in high level programming Languages
- Utility programs
- Service programs
- Database management systems
- Data management and file systems
- Memory management
- Processor scheduling
- Multiprocessing
- PNX Overview
- Shell and commands execution

3rd day: FILE SYSTEM ON PERQ 2 AND ITS USAGE

- Files-general overview
- Sequential files.
- Direct files
- Indexed sequential files
- Files under PNX

- Hierarchical file system in PNX
 - Special files
 - Ordinary files
 - Directory files
 - Commands in PNX
- 4th day : - WINDOW MANAGER AND SPY EDITOR
- What is a window manager system
 - Use of the WM system
 - WM commands and pop/up menu
 - Spy graphic editor
 - Spy commands display
 - How to use editor in program development
 - f 77 programming on PERQ 2
- 5 th day: - PNX. COMMANDS
- Commands for file manipulation
 - Commands for directory searching
 - Commands for listing and printing
 - Piping, Redirection, Filtering
 - Making own commands-shell programming
 - Demo.