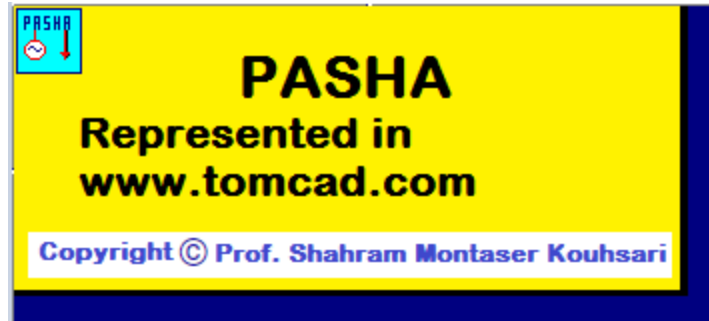




Chapter 1

Introduction (MERGED WITH POUYA)

Power Apparatus & System Homological Analysis (PASHA) is a power system simulation package designed from the ground up to be user-friendly and highly interactive and developed in closed CO-operation with the electrical industry. PASHA has the power for serious engineering analysis, but it is also so interactive and graphical that it can be used to explain power system operations to non-technical audiences. It contains some very advanced, CO-ordinated algorithms for **Load Flow**, **Optimal Power Flow**, **Short Circuit**, **Transient Stability and Frequency dynamics**, equipped with, **User Defined Equipment Modeling**, **Harmonic Analysis and filter design**, **Load Shedding**, **Motor starting**, **Relays checking and coordination**, **Circuit breaker checking**, **EMTP connection**, **Reliability evaluation**, **On line monitoring and control** and makes extensive use of computer graphics to provide a flexible, highly interactive and user friendly procedure for system input, results output and program control functions. With Version 2000 we've made PASHA easier to use, yet even more powerful and more visual.

PASHA 2000 for NT can run under the Microsoft® Windows NT®, Windows® 95, and Windows® 98, Windows® 2000, and Windows® ME environments. The Windows NT platform provides the highest performance level for demanding applications such as large network analysis requiring interconnected computation and on-line monitoring and control applications.

Since PASHA is a multi_platform package, it uses the most out of the existing platforms while user interaction may remain the same under all the available platforms. In this regard users can not distinguish either they are running PASHA on DOS® platform, or Linux® platform or so on Windows® platform. However, the most and the best features of each platform are employed in order to provide the users with the existing facilities of the operating system his computer is working with.

1.1 The user-friendliness of PASHA

Power system analysis involves some very complex analytical and numerical processes. Usually, the input of system data, the manipulation of programs and the extraction of the essential results, for an engineering assessment, constitute a very substantial additional load on

the system designer, as they frequently involve a fairly intimate knowledge of the analytical

aspects, as well as computer operating system procedure and commands.

To overcome this overhead, the algorithms and the interactive procedure used in PASHA effectively remove all organizational aspects from the foreground and allow the user to concentrate on his primary objective: the quality of performance and design of his power system.

This is achieved by the 'user-friendly' interface PASHA provides between the algorithms and the user. The following features of PASHA provide this user-friendliness:

- (i) Networks are entered into PASHA in purely diagrammatic terms. This is not only the preferred means of communication for the engineer, but is also unambiguous and provides a familiar framework for outputting results. Essentially, if the diagram looks right the system has been input correctly and the results displayed on it will be meaningful.
- (ii) All organizational aspects, which are best handled by a computer, are executed automatically, in the background, and need not concern the user. For example, the appropriate number and type of data slots are generated automatically from the diagrammatic information and can be subsequently displayed, in tabular form, when required.
- (iii) Self-explanatory menus are displayed on the screen at the end of each stage. Where data limitations make certain menu options ineffective, these are blocked and do not appear on the options list. Where necessary, specific error messages or warnings are displayed, giving details in direct engineering terms.
- (iv) The algorithms used are reliable, flexible and efficient. Selection of an option directs the program flow through the appropriate analysis path and generates a display of the most relevant results, on a time scale which keeps pace with and assists the user's design process and thinking.
- (v) Display options allow key results such as power flows, busbar voltages, fault levels, etc. to be displayed directly on the network diagrams. Alternatively, time varying quantities such as fault current waveforms, machine rotor angles, motor slips, etc. can be plotted against time to scales specified by the user. These are essential aids for a convenient, rapid and accurate assessment of the design, as it progresses. Furthermore, copies of these displays can be kept and used for documenting the work and the production of reports.

By incorporating the above features into PASHA the user is presented with a very powerful and easy to use power system analysis package.

1.2 The different modules of PASHA

Drawing Routines

- ◆ Easy construction and modification of power system networks
- ◆ Wide choice of network elements
- ◆ Easy data entry and filing
- ◆ Extensive graphical facilities including zoom and pagination capabilities
- ◆ Merging facility
- ◆ Windowing facility

Load Flow

- ◆ Utilizing fast decoupled method & highly sparsity routines capable of analyzing up to 1200 busbars and more
- ◆ Automatic selection of Slack, PQ, PV, PQ-LV, PQ-RV and PQ-LQ busbars
- ◆ Load changing and outages
- ◆ Graphic display of results on a single line diagram & a variety of flexible reports on screen or printer
- ◆ Summary of overloaded circuits

Short Circuit

- ◆ Analyzing LLL, LG, LL and LLG fault at any point in the network
- ◆ Interactive capability for defining fault location and time
- ◆ Plotting fault current waveforms versus time
- ◆ Graphic display of results on a single line diagram & a variety of flexible reports on screen or printer

Harmonic Analysis

- ◆ Harmonic penetration calculation
- ◆ Plotting frequency spectrum of any node in network
- ◆ Sensitivity & resonance calculation
- ◆ Filter design for harmonic elimination

Transient Stability

- ◆ Simultaneous solution of network algebraic and machine differential equations
- ◆ Automatic selection of machine model depending on available data
- ◆ Incorporation of AVR and governors
- ◆ Automatic control of integration step size to eliminate interface errors
- ◆ Dynamic frequency analysis considering load shedding due to under frequency relays
- ◆ Ability to plot up to 20 user-selected variables of a network on screen
- ◆ A variety of flexible reports on screen or printer

Motor Starting & Motor Parameter Estimation

- ◆ Transient stability is capable of handling motor starting
- ◆ Motor parameter estimation routines in data base can obtain motor parameters from any available manufacturer data released

Reliability Evaluation

- ◆ Interactive failure analysis using minimal cut sets]
- ◆ Graphic display of results on single line diagram
- ◆ Reports include: minimal paths, minimal cut sets, permanent failures, transient failures, maintenance failures, total failure rates, total repair times and total outage times
- ◆ Active and Passive failures may be studied
- ◆ Interactive facility for sensitivity analysis

Protection System Design

- ◆ Accommodation of overcurrent, directional, distance and unit protection relays as well as fuses and MCCBs
- ◆ Incorporation of dynamic behavior of relays in transient stability analysis
- ◆ Automatic generation of reports for the devices which are not properly coordinated
- ◆ Interactive coordination of relays and fuses
- ◆ Coordination curve plotting facilities
- ◆ A variety of flexible reports on screen or printer

User Defined Equipment Modeling

- ◆ Ability to construct block diagram transfer functions using predefined blocks
- ◆ Ability to select a variety of nonlinear elements including: time delays, integrators, limiters, PIDs, functions, switches, etc.
- ◆ Ability to construct multi input/output systems
- ◆ Incorporation of block diagram models of various power system equipment in transient stability analysis
- ◆ Isolated study of dynamic models
- ◆ Ability to plot any selected variable of the model
- ◆ A variety of flexible reports on screen or printer

On Line Monitoring & Control

- ◆ By connecting PASHA to SCADA system we succeeded to provide the system analysts with a highly interactive and graphical tool which helps them in on line decision-making procedures.

Data Base

- ◆ Special facility for the entry or storage of typical or prespecified plant data
- ◆ Retrieving the previously stored data for setting up data for any number of new netwo

1.3 System Requirement

Hardware

To use PASHA, your computer must meet the following **minimum** hardware requirements:

- Intel® 486DX or greater
- 32 MB of RAM
- A hard drive with 200 MB available
- SVGA display capable of displaying 800 x 600 resolution
- A free expansion slot

The **recommended** hardware setup would include:

- Highspeed Intel Pentium™ II
- 128 MB of RAM
- 21" SVGA Monitor

Operating System

Operating System **requirements** are met by any of the following:

- Microsoft® Windows NT™ 4.0/98/2000/ME
- MS-DOS operating system for DOS version
- Linux® or Unix® operating system for Unix or Linux version

1.4 PASHA Installation guide (Not needed in POUYA)

Please review carefully the following guide for installation.

1.4.1 Make Sure You've Got Everything

PASHA Package Includes the following items:

- **PASHA Installation Disk**
- **PASHA Internal Hardlock for PC/AT and PS/2 and a label shows its serial number**
- **PASHA Hardlock Installation Guide**
- **PASHA Manuals the number of volumes depends on your package**
- **PASHA one page Installation Guides**

1.4.2 Installing single licensed PASHA Software in a computer

In order to install PASHA on your computer please follow the following instructions.

Chapter 1 Prepare to install PASHA

- **Windows users must run PASHA from PASHA installation CD**
- **DOS Users must Read read.me at CD:/origin to find out how to install the package**
- **Inform TOM Industrial Consultant by Email that you have received the package. If it is required they will send you a running password.**

Chapter 1 Install Hardlock

- **Change directory to c:/pasha/hardlock where c:/pasha is the directory PASHA installed. Run HARDLOCK.EXE**
- **Set the Hardlock jumpers to any number NOT shown on screen. Jumper setting instruction is shown on the Hardlock itself.**
- **Turn off your computer**
- **Install Hardlock in ISA slot according to Hardlock installation guide section 1.3.6**
- **Make sure Hardlock is fixed**
- **Turn on the computer**

Chapter 1 Run PASHA

- **View readme file**

- Run PASHA

1.4.3 Installing PASHA Software on NT (multiple license required)

In order to install PASHA on a network please follow the following instructions.

Chapter 1 Install PASHA Software on server

- Run PASHA from CD
- Share the PASHA folder on network

Chapter 1 Install Hardlock

- Change directory to c:/pasham/hardlock and run HARDLOCK.EXE
- Set the Hardlock jumpers to any number NOT shown on screen. Jumper setting instruction is shown on the Hardlock itself.
Note: Windows 2000 users must consult with an expert or try all possibilities
- Turn off your computer
- Install Hardlock in ISA slot according to Hardlock installation guide section 1.3.6
- Make sure Hardlock is fixed
- Turn on the computer

Chapter 1 Install Hardlock software on Server

- View \\pasha\hardlock\read.me
- Hls32svc -install
- Restart computer
- Hls32svc -start
- Hls32cmd -add ----- -t:5 ----- stands for Hardlock number written in a label in your package

Chapter 1 Install PASHA on Clients

- Map PASHA folder
- Run setup as described in section 1.3 .4
- In Windows 95/98 restart computer

1.4.4 Clients of PASHA Installed on NT environment must follow the following instruction to install PASHA on their computers (NOT NEEDED IN POUYA)

- 1) Select network neighborhood
- 2) Attach to the computer and the Domain that PASHA is installed.
If you can not find the domain, it means that your computer has logging problem. Ask your network administrator to provide you With an appropriate ID and password.
- 3) Go to the pasha folder on the domain
- 4) Run setup
- 5) Follow set up instruction, The serial number is 1
- 6) In windows 95/98 restart your computer. Windows NT, 2000, ME are not required to be restarted.
- 7) Do not forget to enter with your new ID and password if you had problem to attach to the domain in step 2



- 8) PASHA icons are now in your computer desktop.



If the icon is not colorful this means that your computer can not attached to the domain either because you entered with a wrong password or the domain is down.

- 9) If you are using REMOTE-TERMINAL just dial-up the domain you are using and follow the same instructions. To connect to domain, please contact with your COMPUTER CENTER to provide you with the contact numbers and the passwords required. Please also refer to the faster setup process instruction section 1.3.5.

NOTE:

REMOTE-USERS may copy PASHA folder to their local drive and run setup of PASHA from this location. This will cause a faster operation of PASHA. However, since we do upgrade PASHA occasionally, you will miss the new versions of PASHA if you do not update your copied files.

1.4.5 Fast operation setup on NT environment

The following instruction is mostly needed for remote run of PASHA on NT domain.

Include the following lines in your autoexec.bat file:

- Set HL_SEARCH=IP
- Set HLS_IPADDR=DB_SERVER,192.168.15.9 where DB_SERVER stands for your domain name and 192.168.15.9 is an example for the IP address of the domain PASHA installed.
- Set HLS_WAIT=2000
- Set HLS_RETRIES=5

Or

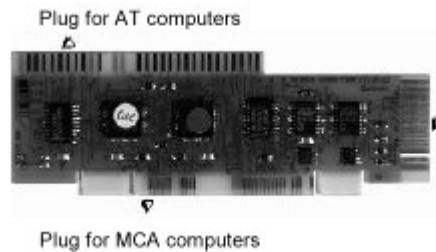
Run remote_setup from pasha folder if available.

Proceed the instructions in section 1.4.4.

1.4.6 Hardlock Installation Guide (NOT NEEDED IN POUYA)

Hardlock on board is necessary to be installed inside the PC in order to run PASHA. Please use the following installation procedure.

The top edge connector on the Flippy Board in the following picture is designed to be installed into an AT - compatible computer expansion slot.



The bottom connector is the MCA Micro Channel Adapter. This edge connector is used for some PS/2 models that have the MCA bus configuration.

AT - Compatible Computer:

1. Switch off your computer and open the housing.
2. Carefully unpack the plug-in board. Avoid touching its components and connectors like any other computer board. Otherwise you may destroy them through the discharge of static electricity.
3. Set the jumpers. The permissible addresses are marked in hexadecimal code on the board; the corresponding jumper configurations are shown as symbols.
4. Insert the board in the appropriate slot. Make sure you plug the right side of the board into your computer (the side with jumpers must face outwards).
5. Close the housing of your computer and switch on your computer.

MCA Micro Channel Adapter:

1. Copy the @6769.ADF file from your PASHA CD in Hardlock subdirectory onto your MCA computer's reference disk before installing the hardware.
2. Switch off your computer and open the housing.
3. Carefully unpack the plug-in board. Avoid touching its components and connectors like any other computer board. Otherwise you may destroy them through the discharge of static electricity.
4. Set the jumpers. Remove both jumpers.
5. Insert the board in the appropriate slot. Make sure you plug the right side of the board into your computer (the side with jumpers must face outwards). When using models PS/2 70 and higher, you can only install the board in 16-bit slots.
6. Close the housing of your computer and insert a copy of the reference disk into drive A: if your MCA<90 otherwise i.e. MCA>90 remove all disks from the drives and switch on your computer.

7. Press the CTRL+ALT+DEL key combination. Keep your eye on the cursor. Once the cursor reaches the top right hand corner of the screen, press CTRL+ALT+INSERT key combination (must be done within 8 seconds)
8. The main menu of the system program should appear on the screen. Choose "Copy diskette for system expansion" and follow the on-screen instructions.
9. From the main menu, choose the configuration sub-men. Choose Automatic Configuration. Make a note of the address assigned to the board. Make sure there is no conflict.
10. Save the new configuration.
11. If you inserted a reference diskette remove it.
12. Reboot the computer

1.5 About this manual

The manual is designed to be used both for initial familiarization with PASHA package and as a long term reference manual when the user is conversant with most of the program's features.

1.6 key conventions used

The following sets of conventions are used in this manual.

Keys

A 'key' is any one of the characters A-Z and 1-9 or ',' etc. on the keyboard. A key on the keyboard is represented by its name enclosed in a pair of triangular brackets. For example, key A is represented by <A>. <CR> represents return (Enter) key.

Click

Place the mouse cursor on an object or button, and then click the left mouse button. Click is used to select an element in the drawing, add elements from the toolbars, etc.

Right-Click

Place the mouse cursor on the object, then click the right mouse button. For example, right-click on screen brings the right click menu.

Double-click

Place the mouse cursor on an object or button, and then click the left mouse button twice rapidly. For example, a double-click on an element inside a single-line diagram brings up the property editor for that element, if double click option has been set up.

Drag

Place the mouse cursor on screen, click and hold the left button down, drag the mouse to the required position while keeping the left button down, then release the left button to select an area.

1.7 About mouse cursor

Since the PASHA package uses the mouse cursor very frequently it has to be represented in some way in this manual. The conventional symbol for the mouse is chosen to show the cursor on any diagram in which the cursor is used.

On some keyboards/OS the mouse cursor is moved using the 'arrow-keys'. These are not directly referred to in the text.

1.8 PASHA screen diagrams.

Most of the illustrations in this manual are copies of the displays produced by PASHA. The convention used in displaying these is to surround the figure with a solid edge to represent the edge of the screen. This can be seen around figure 1.1. It should be noted, however that some of the copies contain extra labeling graphics which were generated specifically for the displays needed for this manual and which are not produced by the standard versions of PASHA.

1.9 Menu options.

Whenever an option from an ordinary option menu (see 2.1) is mentioned it will be enclosed in square brackets. For example the 'DRAW A NEW NETWORK DIAGRAM' option from the main menu is referred to in this manual as:

[DRAW A NEW NETWORK DIAGARM]

1.10 Running PASHA on windows

To run PASHA in Windows 95/ 98/2000/ME or NT, click on the **PASHA icon** on your desktop,



Or click on the **START** button, select **PROGRAM**, then select **PASHA** program, and click on **PASHA**.

Hardlock waiting message will be displayed on the screen. Please wait till this message disappears and PASHA starts to run.

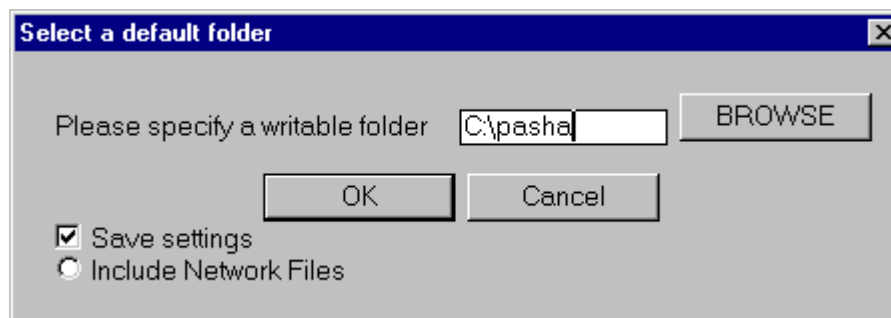
If Hardlock is not available in your computer or if it is not installed in the network you are running at, the following message will be displayed.



If the number of the simultaneous users including you exceed the number of licenses in your network a message will appear on the screen and invites you to wait for one to exit the program.

After a successful starts PASHA invites you to specify a writable directory. This is asked, because PASHA needs a directory to write its temporary files. You must have permit to write in this directory. The Database, Networks, and UDEM files stored in a workspace (see section 2.3.1 and chapter 5) may also be retrieved from this directory, if you have chosen for by selecting [Include Network Files] option. Otherwise default directory where PASHA is running from will be used as present workspace folder.

Note that: In windows 2000 if the folder that you have specified does non exist, computer creates the folder. In windows 95/98 this is not the case, and you must create the folder yourself.



Select [Save settings] if everybody who works on your computer has access to write in this directory. As stated before select [Include Network Files] to choose this directory as your default workspace. If you have selected save settings, this menu box will not appear in your next run, except when you delete TEMP directory of your Windows operating system. Please refer to Microsoft Windows user manuals if you need more information about TEMP directory of Windows.

1.11 Running PASHA on other operating systems

In order to run PASHA on DOS, Linux, or Unix please ask for the appropriate manual. Please contact TOM Industrial Consultant and indicate your operating system. They will send you a relating manual for these systems, however the difference with the present manual is so little that you might work with this too.