COMPUTER SYSTEM MANAGEMENT PLANNING

1.1 Need of Management in Computer Centers

Normally, all computer centers are responsible for virtually similar tasks in all org anizations, however, their focuses may not be the same. The computer center, one of the support departments in the college, offer a wide range of services to satisfy the general computational and information processing needs of the educational, research and administrative programs. Services Provided by Computer Center are

To provide computer-related services to personnel and customers
To provide advice and consultancy for users
To provide systems development services to users
To provide data entry services for users
To create and maintain IT standards and procedures
To provide IT acquisition services to users
To keep and protect IT and data assets
To ensure that the organization has adequate/advanced IT progress, which is in line with the organization's vision
To ensure that services provided are meeting with users' requirements

1.2 Types of Job Carried Out in Computers in an Organization

1. Providing computing capability, running programs and producing reports, printing documents, providing operations services, make sure that good performance is provided
2. Providing Internet services: Set up Internet and Email accounts, managing mailbox, providing disks spaces for Web, providing security and virus warning, etc.
3. Providing helps: Help users to solve computer usage problems, help users to develop simple applications, help users to keep their data, help on security
4. Providing system development services: Develop system for users
5. Providing data entry services: This is to capture data into the systems, during these days, such function seems to be obsolete now. Such services may include storing data in database, data protection by data backup and recovery. Scanning images into the systems is also considered as a part of this function.
6. Providing consultancy services: Purchasing devices, installing hardware & software, help users to work more efficiently
7. Providing training for users, recently, the use of e-Learning concept of training also implemented

1.3 Duties and Responsibilities of personnel involved:

Duties and responsibilities of person in computer centers are describe here
-Data Processing Center: To process business data (Sales, Deposit/Withdrawal, Airline Ticketing, Student Registration, etc.) and produce summary report or other business documents
-MIS Center: To provide information for managers and executives for making timely and quality decisions (usually continuing the work of data processing.
-Data Center: To provide data for use by all departments (e.g. center to provide criminal records, population records (Khonthai.com), etc.)
-Office Automation and Internet Center: To provide services to all departments with office automation and communication systems.
-

Computing Service Center (or Computer Center or IT Service Center): Basically, t o provide services of all types related to business data processing, business applicat ions, and maintenance services to all departments in the organization. In the department various staff with different computer skills is being employed. The data processing manager is the head of the department under which you have the computer analyst, programmer, operation manager, etc. There is probably no standard structure for data processing department. Precise responsibilities and reporting procedures vary. Figure 1 and 2 show some alternatives.

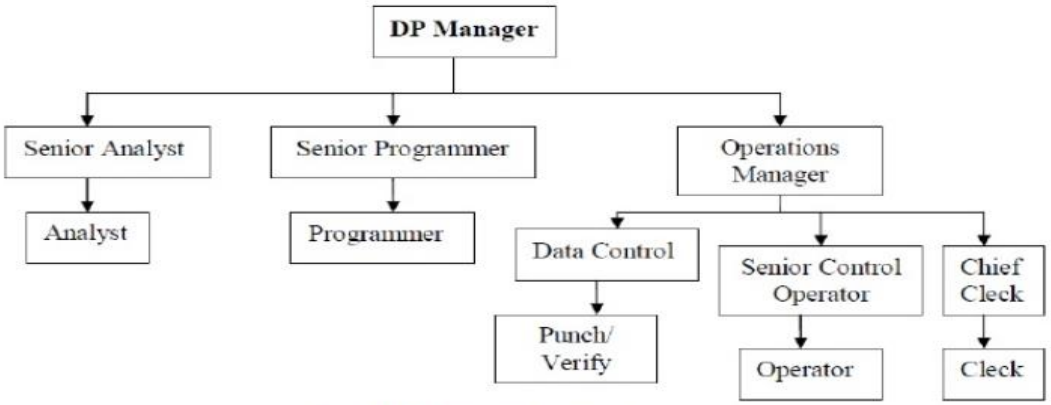
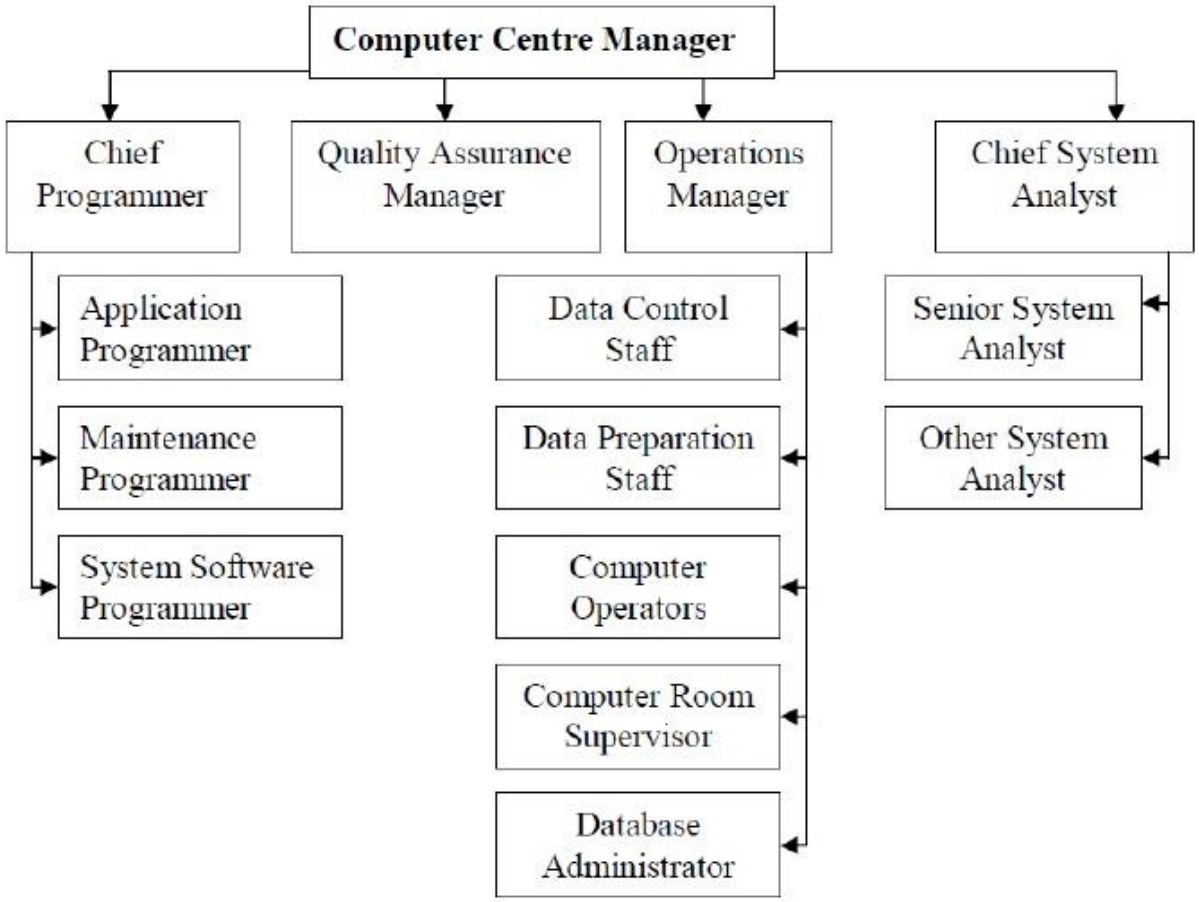


Figure 1DP Department Structure I



Figur : DP department Structure II

Selection of Computer System

2.1 Factors affecting selection and evaluation of Computers

Computer system users, administrators, and designers are all interested in performance evaluation since their goal is to obtain or provide the highest performance at the lowest cost. This goal has resulted in continuing evolution of higher performance and lower cost systems leading to today's proliferation of workstations and personal computers, many of which have better Performance than earlier supercomputers. As the field of computer design matures, the computer industry is becoming more competitive, and it is more important than ever to ensure that the alternative selected provides the best cost performance trade-off. Performance evaluation is required at every stage in the life cycle of a computer

system, including its design, manufacturing, sales/purchase, use, upgrade and so on. A performance evaluation is required when a computer system designer wants to compare a number of alternative designs and find the best design. It is required when a system administrator wants to compare a number of systems and wants to decide which system is best for a given set of applications. Even if there are no alternatives, performance evaluation of current system helps in determining how well it is performing and whether any improvements need to made. The first step in performance evaluation is to select the right measures of performance, the right measurement environments, and the right techniques. The goal is to emphasize simple techniques that help solve a majority of day-to-day problems. Examples of such problems are specifying performance requirements, evaluating design alternatives, comparing tw o or more systems,determining the optimal value of a parameter (system tuning), finding the performance bottleneck (bottleneck identification), characterizing the load on the s ystem (workloadcharacterization), determining the number and sizes of components (planning), and predicting the performance at future loads (forecasting).

Here a ―system‖ could be any collection of hardware, software, and firmware components. It could be a hardware component, for example, a central processing unit (CPU); a software system, such as a database system; or a network of several computers.

2.2 Different Types of Industries and Their Computer requirements

The computer or information technology, or IT industry is the range of businesses involved in designing computer hardware and computer networking infrastructures, developing computer software, manufacturing computer components, and providing information technology(IT)services. The electronic digital computer is the messenger of the Information Age. Just as technologies developed in earlier ages liberated people from physical toil, computers have liberated people from the more tedious kinds of mental toil and have revolutionized the transfer of information. The banking, insurance, and travel industries, to name a few, are vastly quicker and more responsive than they were a half-century ago. The computer industry employs hundreds of thousands directly, but many millions of people outside the industry use computers as an important tool in their jobs. Besides the growth of software development companies there were also some new businesses that depended on software and fast worldwide communication which grew rapidly during this period. They were IT enabled services (ITeS) and Business Process Outsourcing (BPO). IT enabled services included tasks such as checking insurance claims, filling income tax returns,

medical transcription, remote support on bug fixing of software, call centers etc. The call centers operate 24 x 7 for worldwide customers and require language proficiency mostly in English and some European languages.
Business Process Outsourcing (BPO) is primarily performing the back-office work of a number of organizations, the largest segment being banks and insurance companies. The back-office work was typically accounts receivable, payroll processing, account reconciliation, inventory management, and similar jobs. American Express was the first organization to start BPO work in India in 1994followed by GE Capital International Services in 1997 [101]. The success of these pioneers induced a large member of Indian companies to start BPO Centers for foreign clients in SEZs as the profit earned at these locations was tax exempt. The cost of starting a BPO was low as the cost of computer hardware as well as that of communication fell rapidly. The only requirement was trainable human resources with good knowledge of English (which was available in reasonable numbers) and identification of overseas clients. BPOs were established not only by Indian companies performing tasks for off-shore clients but also by many British and American companies who shifted their back-office data processing to India as they could get better quality employees and infrastructure at a lower cost. The falling cost of communication immensely helped the expansion of BPOs.

2.3 Selection and evaluation of appropriate configuration for different levels of Industries

A generic evaluation and selection methodology has been formulated to meet the specific configuration for different levels of industries
(i).Identification of possible vendors and manufacturers.
(ii). Primary elimination of irrelevant candidates.
(iii)Determination of mandatory requirements.
(iv). Examination of vendors' compliance with mandatory requirements.
(v)Setting quantitative and qualitative criteria and respective weighing scale.
(vi)Writing the RFP to be addressed to selected vendors.
(vii)Receiving, comparing and analyzing bids.
(ix)Concluding final list of vendors.
(x)Performance of hardware and software benchmarks.
(xi)Drawing final conclusions and selection of best computer family.
The acquisition procedure consists of five phases:
(i)Preparatory steps: forming an evaluation team.
(ii). Obtaining proposals: including
(a) Prepare if necessary, request for information,
(b) prepare request for proposals,
(c) conduct bidders conference
(iii).Evaluating proposals: how to select vendor
(iv). Financing the acquisition.

(v). Negotiating the contract.
To evaluate vendor proposals, review proposals on the basis of such factors as pricing, fit of proposed equipment to specific needs, future growth potential, vendor qualifications, equipment maintenance, installation, assistance and delivery, etc. Here suggest the direction of rating analysis might take:
(i).Vendor qualifications.

(ii). Differences in hardware implementation.

(iii)Software architecture.

(iv)Software availability

(V) Price/performance

(vi)Future growth potential

(vii) Rick factors

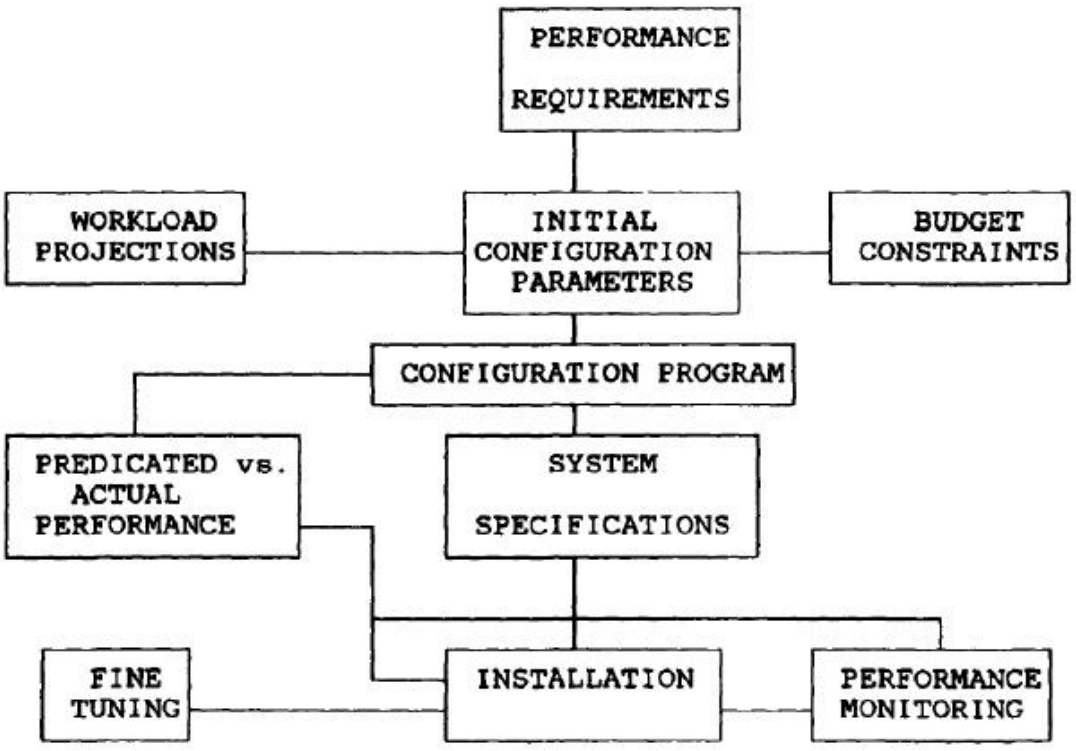
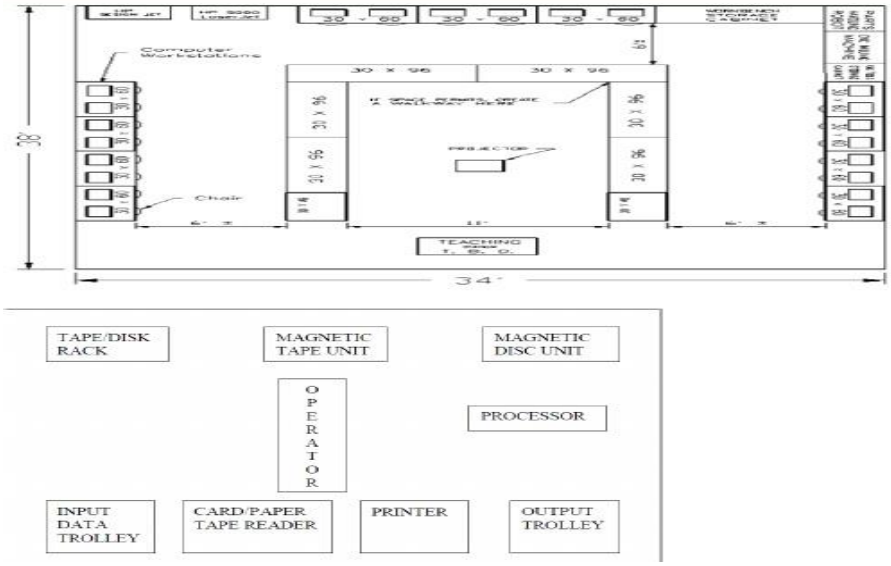


Figure A Process View of System Configuration

3. Site Preparation and installation

3.1 Plan for Computer Room layout based on Size

The environmental conditions of a computer are important to trouble -free running. All necessary conditions must be met before installation exercise. The operator should be near to the input and output units which are most in use e.g. card or tape reader, printer, and tape or disc unit. The room must have air condition used for dust filtration, temperature control and humidity control. The layout of the computer room should be design with work flow in mind as we have in figure 4 below



Stepped up because of the activities of looters. Security attention should be given to the computer hardware's because of their small sizes; if the physical security is slack valuable and costly component of the system might be lost.c)

Dust: It

is almost always advisable to provide dust cover on computer equipment when not in use, and in some areas special dust filters may be needed to prevent dust penetrating the casing.d)

Heat:

Because of the heat been produced by the computer, full air conditioned office is highly imperative. It is advisable to buy portable air condition unit or install cooling fan in micro itself.e)

Power Supply: Computers cannot function without electricity. Electric generators must be provided at the center incase of the public power supply failure. In addition, the generator should be supported with power stabilizer and uninterruptible power supply (UPS). Power stabilizer protect the computer the harmful effects of fluctuations while UPS maintain the continuity of power supply in the gap between the switch over public supply to in- house generator or vise versa.f)

Humidity:

An unusually assemble of humidity can also be a problem, leading to corrosion of electric contact; it may be advisable to use non- corrodible plugs and socket or to use a contactless keyboard for example.g)

Accessories:

It is essential to have a supply of computer accessories and part of a micro andall peripheral equipments.h)

Workshop:

Basic maintenance facilities will be needed. It is not necessary to be an electron engineer to do routine maintenance such as disc head alignment, to change board in the computer, or to run the diagnostics programs which will at least help to locate a fault.i)

Communication Facilities:

These facilities must be provided to provide a link between the main computer centre and its terminals. j)

Space Requirement:

From 400sq. ft. to several hundred thousand sq. ft; length-to-width ratio should be approximately 2:3; no long, narrow rooms.k)

Floor loading:

should be sufficient, preferably with a sound-absorbent and antistaticcovering.h)

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3.2.1 Computer Centre Designs: Physical Computer Centre Setup

1. Site Selection
2. Designing office and rooms
3. Designing the whole centre
4. Detailing the facilities

.Raised floor: let the wind blow under the floor

.False ceiling

- Air conditioner
- Smoke and heat detectors
- Rooms to be designed
- Machine room
- Operator working area
- Storage for paper, tapes, disks and outputs
- Customer engineer working area
- Technician area
- System development areas: for system analysts and programmers
- Library: for storing books, journals and software
- Conference and meeting rooms
- Training rooms
- Director rooms
- Secretary rooms
- Operator and guest areas
- Toilet
- Rest rooms
- Areas for storing power units and air conditioners: such areas are needed to be designed so that there will be no harm in case of power supply shortage.
- Separation into air-conditioned and non-air-conditioned areas
- Floor preparation for equipment installation in the air condition areas
- Quiet zone in personnel areas (management offices, system support, operations scheduling, visiting programmers, library, conference room, coffee room).
- Solid and soundproof walls (over 40 dB in passage ways to separate air conditioned from no air-conditioned and noisy from quiet areas)
- Extensive use of moveable walls to allow for ongoing adjustments to technical and task-related developments
- Important features of a power supply to consider when purchasing it are its form factor, wattage capacity, number and type of connectors it provides, fan size,

support for dual video cards, and warranty. To decide on the wattage capacity of power supply, add up the wattage requirements for all components in a system and then increase that total by about 30 percent.
False flooring: A raised floor (also raised flooring, access floor(ing), or raised access computer floor) provides an elevated structural floor above a solid substrate (often a concrete slab) to create a hidden void for the passage of mechanical and electrical services.

3.3 Power Conditioning Equipment

A power conditioner (also known as a line conditioner or power line conditioner) is a device intended to improve the quality of the power that is delivered to electrical load equipment. While there is no official definition of a power conditioner, the term most often refers to a device that acts in one or more ways to deliver voltage of the proper level and characteristics to enable load equipment to function properly. In some uses, power conditioner refers to a voltage regulator with at least one other function to improve power quality (e.g. power factor correction, noise suppression, transient impulse protection, etc.). A good quality power conditioner is designed with internal filter banks to isolate the individual power outlets or receptacles on the power conditioner. This eliminates interference or "cross-talk" between components. Powerconditioners vary in function and size, generally according to their use. Some power conditioners provide minimal voltage regulation while others protect against six or more power quality problems.

3.3.1 Constant Voltage Transformer

With the popularization of PCs, the constant voltage transformers (CVTs) have also become equally popular. The CVT is simply a magnetic transformer of a special construction that has a capacitor connected across the secondary winding of the transformer. In an ordinary transformer, the primary and secondary windings are wound near each other so that whenever there is a change of voltage across the primary there is a corresponding change in the secondary voltage depending upon the ratio of the turns on the two windings. However, in a CVT the primary and secondary windings are wound separately from each other, as illustrated in figure. To set up field in between the coils, a separate shunt path is provided between the two windings but an air gap is formed in the shunt path. A capacitor is connected across suitable tapings of the secondary winding. The constructional details of a CVT are shown in the figure. Sophisticated computer systems sometimes use diesel engine driven generators for backup in case of mains failure. Where our CVTs are used for power conditioning in the normal mains mode it is desirable to take advantage of the CVT performance when using the generator. These notes provide some guidance on the potential problems which can be met together with solutions.

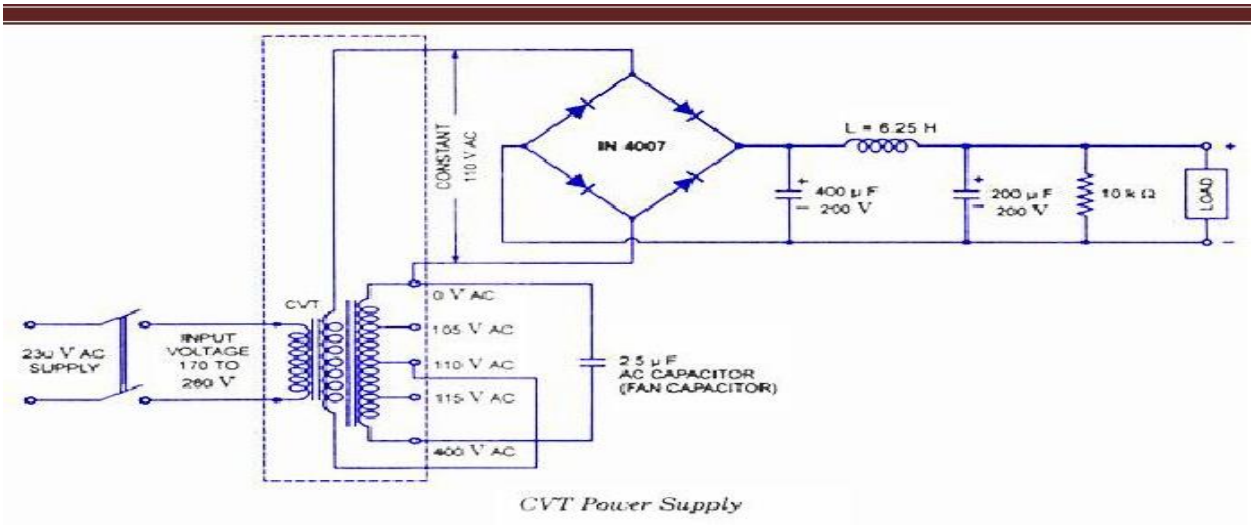
Nutrals:
Some generators do not refer the low side of the output to earth. This MUST be tied down to avoid damage to any of our larger catalogue units which have double primary shields. Care must also be taken that the generator neutral is not connected to the CVT output low.

Frequency:

All Ferro resonant devices are frequency sensitive. The generator must run close to 50 Hz for the unit to operate correctly. Unfortunately the speed/output voltage curve for the generator goes the same way as the CVT so speed should be adjusted at actual running load. Short term off-frequency operation will not damage the CVT:

Phase

The output from the CVT will be out of phase with the input in cases where the generator supplies other equipment directly some care is needed if a phase sensitive trial firing circuit is installed.



CVT Power Supply

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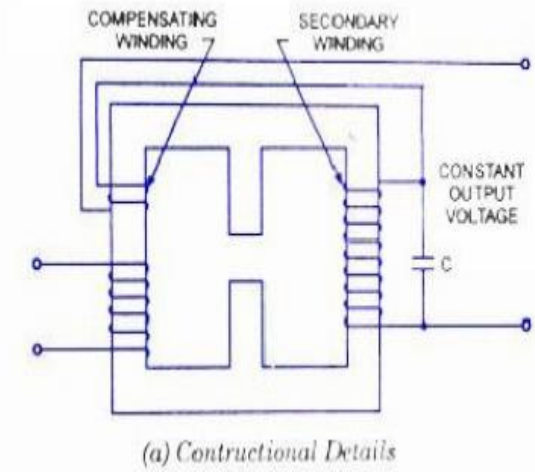
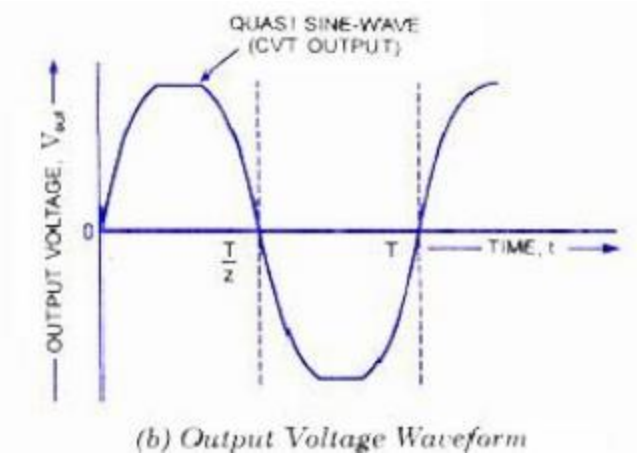


(a) Contructional Details



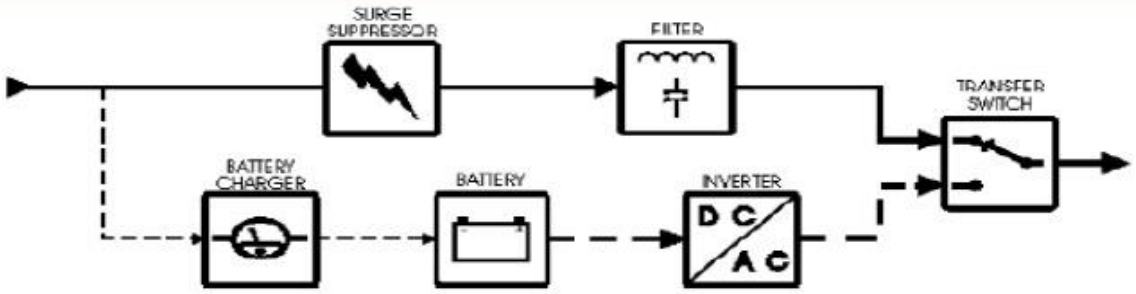
(b) Output Voltage Waveform

Safety

Unless phasing circuits are fitted all circuits should use 'break before make contactors and enforced supply separation. Some thought needs to be given to the Regulations regarding out of phase supplies in the same area.The reason we use a CVT and not a voltage stabilizer for computer applications is that in thevoltage stabilizer relays are present and when these relays operate (switch), the output voltage may be interrupted for a short time. Such a transient may not be desirable for computers which may cause the computer to reboot. Also, the CVT provides a clean spike-free output voltage. The voltage regulation possible in a CVT also is good. The input voltage ranges 170 to 260 V and output regulation is 230 ± 2 % at no load to full-load. Distortion-approximately 5% under full-load conditions. Rating of 50, 150, 250, 350, 500, 750, 1000, 2000 VA.

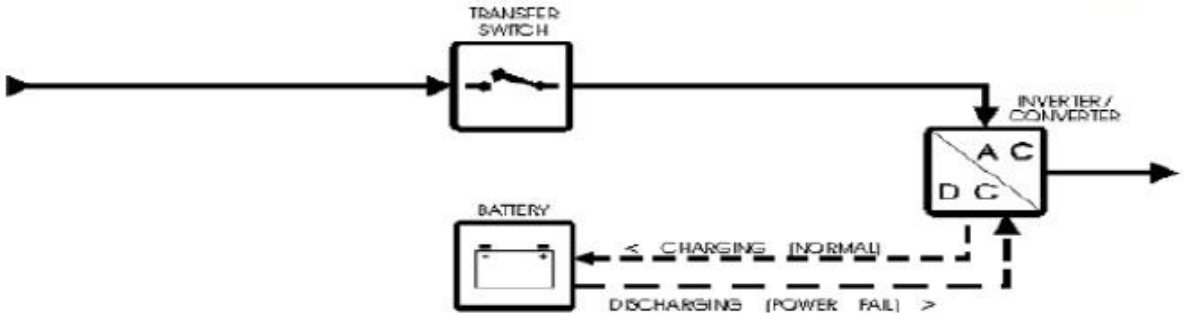
3.3.2 Uninterruptible power supply (UPS)

An uninterruptible power supply (UPS) is a device that allows a computer to keep running for at least a short time when the primary power source is lost. It also provides protection from power surges. A UPS contains a battery that "kicks in" when the device senses a loss of power from the primary source. If you are using the computer when the UPS notifies you of the power loss, you have time to save any data you are working on and exit gracefully before the secondary power source (the battery) runs out. When all power runs out, any data in your computer's random access memory(RAM) is erased. When power surges occur, a UPS intercepts the surge so that it doesn't damage the computer. Every UPS converts in coming AC to DC through a rectifier, and converts it back with an inverter. Batteries or flywheels store energy to use in a utility failure.
A bypass circuit routes power around the rectifier and inverter, running the IT load on incomingutility or generator power. While UPS systems are commonly called double-conversion, line-interactive and standby designs, these terms have been used inconsistently and manufacturers implement them differently: At least one system allows any of the three modes. The Internat*i*onal Electro Technical Commission (IEC) adopted more technically descriptive terminology in IEC Std. 62040. UPS systems are called dual or double conversion because incoming AC is rectified to DC to keep batteries charged and drive the inverter. When electrical utility power fails or drops to an unacceptable level, Uninterruptible Power Systems (UPS) are key in saving and protecting valuable computer data. UPS equipment provides power conditioning, power regulation and, in case of power ou tages, provides thecrucial backup power needed for an orderly shutdown of computer processes and files. UPS are also used for emergency power supplies for Hospitals, data centers, municipalities, industrial and commercial centers to supply power in case of power failure from main supply authority. All UPS include core circuitry that manipulates electricity, converting it from the AC power Produced by the utility company to DC power stored in the battery, and back agai n for use byyour equipment via an inverter. The exact type, nature, size and quality of this circuitry depend on the type of UPS, and more specifically the make and model you have chosen. Most modern UPS are microprocessor-controlled. There is actually a small computer embedded within the UPS itself that controls the key functions of the UPS. This includes detecting AC power failures, handling switching between power sources, monitoring the status of the battery, controlling the status indicators and so on.



Block schematic of a standby UPS

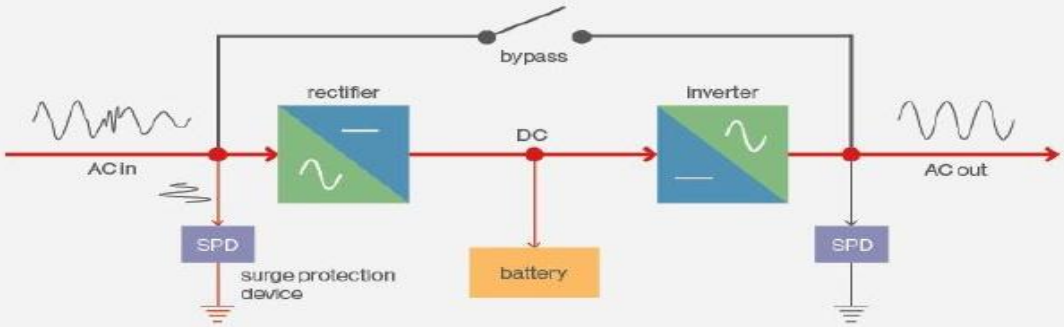
Figure 1



Block schematic of a line-interactive UPS

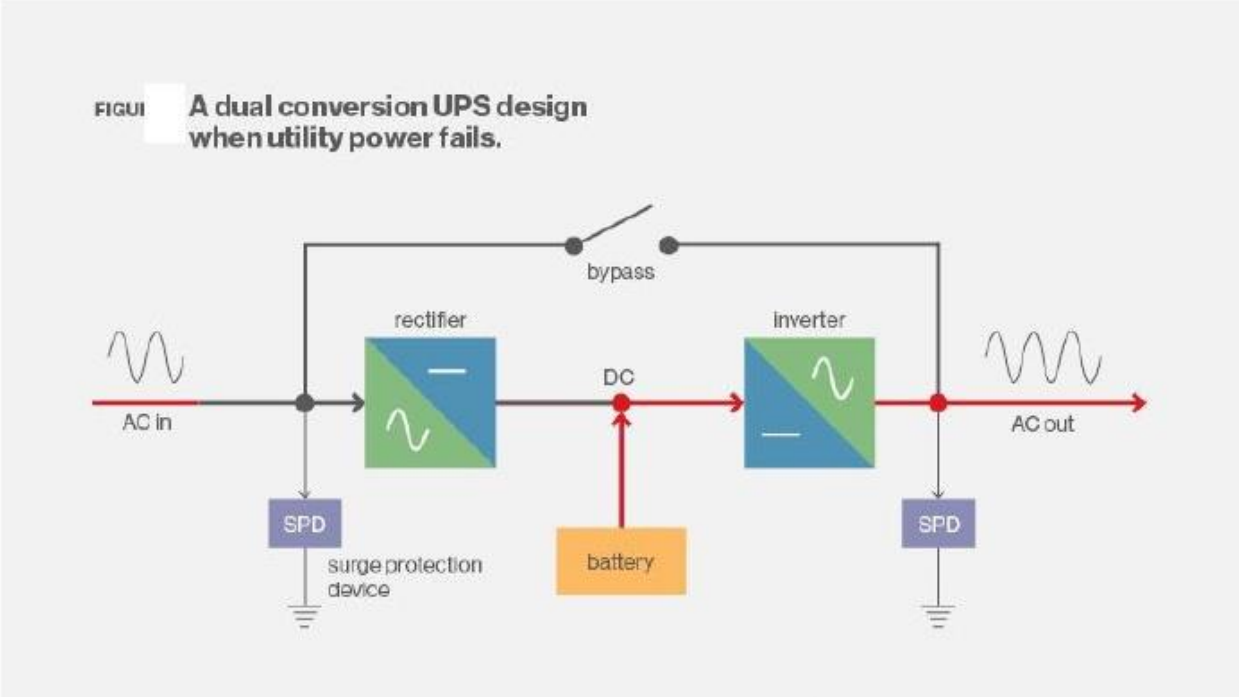
These UPS are available for different Power output range such as: Standby UPS are usually available in a size range of up to about 1000 VA. The Line-interactive UPS is an improved design that is commonly used in units for home and business use, available in sizes up to 3,000 VA or so. It is superior to the standby UPS, but it still has a transfer time like standby UPS.Online UPS are typically used only for large servers, and for backing up multiple pieces of equipment in data centers. They are available in sizes from about 5,000 VA up to hundreds of thousands of VA and even larger. Ferro resonant standby UPS are usually available in a size range of up to about 15,000 VA, making them suitable.

FIGURE : A full-time double conversion UPS design under normal utility power.



The inverter re-creates steady AC power to run the IT equipment. When power fails the batteries drive the inverter, which continues to run the information technology (IT) load. When power is restored, either from the utility or a generator, the rectifier delivers direct current(DC) to the inverter and simultaneously recharges the batteries. The inverter runs full time. Utility input is completely isolated from the output, and bypass is only used for maintenance safety or if there's an internal electronics failure. Since there is no break in the power delivered to the IT equipment, vacuum fault interrupter (VFI) is generally considered the most robust form of UPS. Most systems synchronize the output frequency with the input, but that's not necessary, so it still qualifies as frequency independent. Every power conversion incurs a loss, so the wasted energy has historically been considered the price of ultimate reliability. The newest VFI systems claim better than 96% efficiency at nearly all loads. The offline/standby UPS (SPS) offers only the most basic features, providing surge protection and battery backup. The protected equipment is normally connected directly to incomingutility power. When the incoming voltage falls below or rises above a pre determined level the SPSturns on its internal DC-AC inverter circuitry, which is powered from an internal storage battery. The UPS then mechanically switches the connected equipment on to its DC-AC inverter output. The switchover time can be as long as 25 milliseconds depending on the amount of time it takes the standby UPS to detect the lost utility voltage. The UPS will be designed to power certain

equipment, such as a personal computer, without any objectionable dip or brownout to that device.



3.3.3 Isolation Circuits

Backbone to ensure highest availability of pure power depends on effective power distribution and its conditioning. Power distribution can be Achieve with help of panels, sockets, cables, Automatic transfer switch (ATS), Generator and PDU. While conditioning of power can be done with help of TVSS, K rated Isolation transformer, UPS etc. An isolation transformer is a transformer used to transfer electrical power from a source of alternating current (AC) power to some equipment or device while isolating the powered device from the power source, usually for safety reasons. Industrial electronic equipment commonly uses galvanic isolators to protect systems and users from potentially hazardous voltages. It is well known that industrial equipment must operate reliably in the harshest environments, where strong electromagnetic fields, surges, fast transients, and high noise floors are the norm. This environment presents challenges for designing reliable isolation circuits that deliver error-free operation over long equipment lifetimes. Over the last four decades, opt couplers have been the ―default‖ signal isolation device, but recent breakthroughs in silicon isolation technology have spawned smaller, faster, and more reliable and cost-effective solutions that have

already begun supplanting opt couplers in many end applications. This white paper discusses industrial isolation issues and ways RF isolation technology can be applied to increase system robustness and performance. Benefits of isolator circuits include:

- Higher integration: smaller size and lower cost-per-channel on multi-channel versions
- Higher performance: faster, tighter timing and substantially lower power
- Longer service life: no wear-out mechanisms as in opt couplers
- Higher reliability: operating parameters remains table over VDD, temperature, and device age

3.4 Interpretation of the Installation and Wiring Diagram

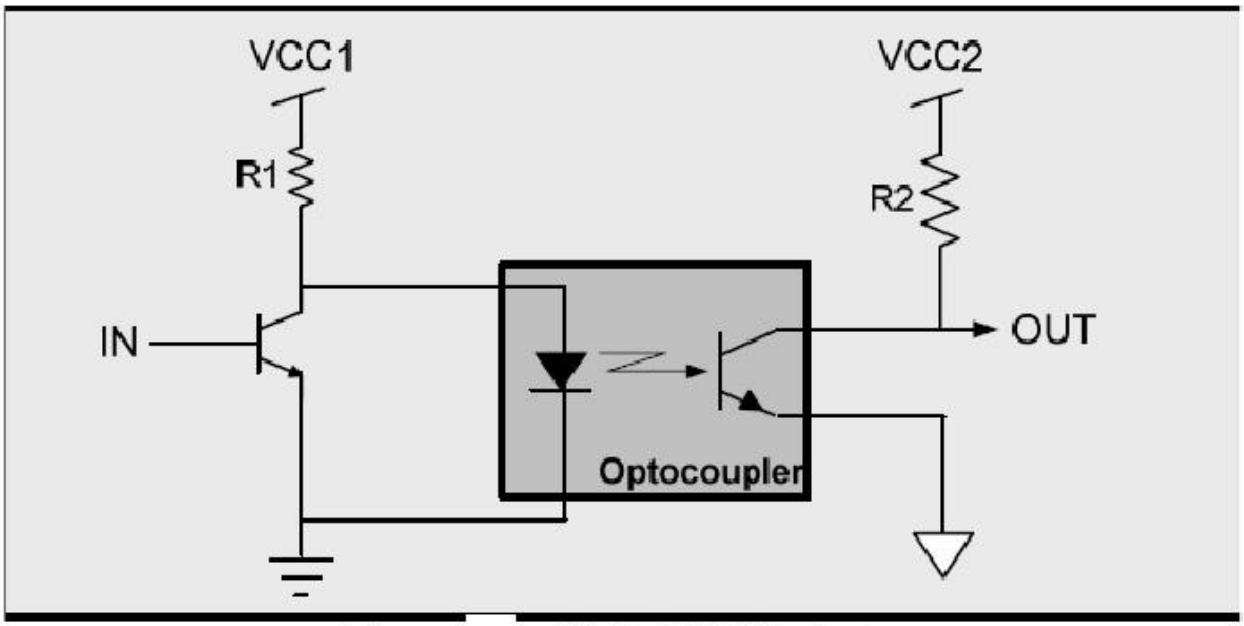


Figure 7 I. High CMTI Isolator

The first commercial computer to be installed in India was an IBM 1401 at ESSO Standard Eastern Inc., an oil marketing company in Mumbai. Between 1961 and 1964 twelve computers were installed in Research and Development organizations and two in educational institutions. Now-a-days for installation we required various types of tools. For example

Here is a list of essential tools:

-Ground bracelet, ground mat, or antistatic gloves to protect against ESD when working inside the computer case

-Flathead screwdriver Phillips-head or crosshead screwdriver

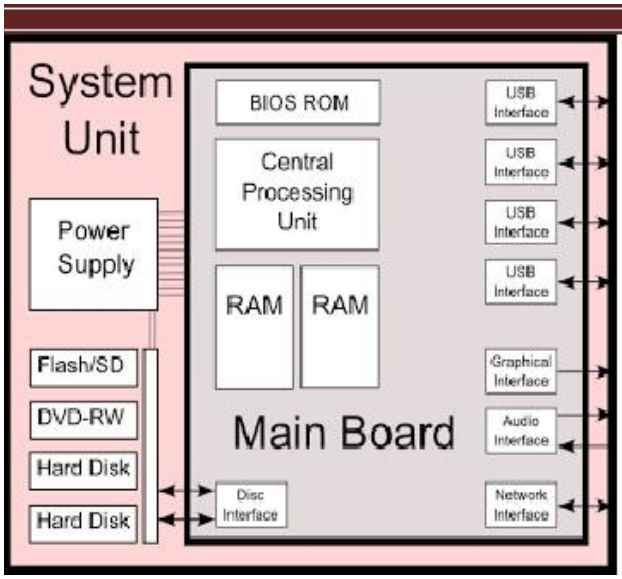
-To rx screwdriver set, particularly size T15
-Tweezers, preferably insulated ones, for picking pieces of paper out of printers or dropped screws out of tight places
-Extractor, a spring-loaded device that looks like a hypodermic needle (When you push down on the top, three wire prongs come out that can be used to pick up a screw that has fallen into a place where hands and fingers can't reach.)
-Software, including recovery CD or DVD for any OS you might work on (you might need several, depending on the OSs you support), antivirus software on bootable CDs or USB flash drives, and diagnostic software.

The following tools might not be essential, but they are very convenient:

-Cans of compressed air (see Figure 1-39), small portable compressor, or antistatic vacuum cleaner to clean dust from inside a computer case Cleaning solutions and pads such as contact cleaner, monitor wipes, and cleaning solutions for CDs, DVDs, tapes, and drives
- Multi meter to check cables and the power supply output
-Power supply tester
-Needle-nose pliers for removing jumpers and for holding objects (especially those peskiness on cable connectors) in place while you screw them in
-Cable ties to tie cables up and out of the way inside a computer case
-Flashlight to see inside the computer case
-AC outlet ground tester
-Network cable tester
-Loopback plugs to test ports
-Small cups or bags to help keep screws organized as you work
-Antistatic bags (a type of Faraday cage) to store unused parts
-Chip extractor to remove chips (To pry up the chip, a simple screwdriver is usually more effective, however.)
-Pen and paper for taking notes
-POST diagnostic cards when building a new system, you can purchase a computer case with the power supply already installed or you can purchase a power supply separate from the case. Important features of a
Power supply to consider when purchasing it are its form factor, wattage capacity, number andtype of connectors it provides, fan size, support for dual video cards, and warranty. To decide on the wattage capacity of a power supply, add up the wattage requirements for all components in a system and then increase that total by about 30 percent.
1. Unpack the monitor and computer case from the box. Remove any plastic covering or protective tape. Place the monitor and computer case on a desk or work area. Be sure to Place

your computer case in an area that is well ventilated and has good air flow. This will help to prevent the computer from overheating.
2.Locate the monitor cable
3Connect one end of the cable to the monitor port on the back of the computer case and the other end to the monitor
4.Unpack the keyboard and determine whether it uses a USB (rectangular) connector or a PS/2 (round) connector. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. If it uses a PS/2 connector, plug it into the purple keyboard port on the back of the computer.
5.Unpack the mouse and determine whether it uses a USB or PS/2 connector. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. If it uses a PS/2 connector, plug it into the green mouse port on the back of the computer.
6.If you have external speakers or headphones, you can connect them to your computer's audio port (either on the front or back of the computer case). Many computers have color-coded ports. Speakers or headphones connect to the green port, and microphones connect to the pink port. The blue port is the line in, which can be used with other types of devices. Some speakers, headphones, and microphones have USB connectors instead of the usual audio plug. These can be connected to any USB port. In addition, many computers have speakers or microphones built into the monitor.
7.Locate the two power supply cables that came with your computer. Plug the first power supply cable into the back of the computer case and then into a surge protector. Then, using the other cable, connect the monitor to the surge protector.
8.Finally, plug the surge protector into a wall outlet. You may also need to turn on the surge protector if it has a power switch.

Steps for actual installation as per the ma



nufacturer's Specified procedure

1. Computerized systems should be validated at the level appropriate for their intended use and in accordance with quality risk management principles. This applies to systems used in all good (anything) practices (GXP) activities (e.g. good clinical practice (GCP), good laboratory practice (GLP) and good manufacturing practices (GMP)
2. The purpose of validation of a computerized system is to ensure an acceptable degree of documented evidence that establishes confidence in the accuracy, reliability and consistency in performance of the system in accordance with predetermined specifications. The validation data should meet the principles of being attributable, legible, contemporaneous, original and accurate (ALCOA) throughout the data life cycle.
3. Computerized system validation should ensure that all necessary technical and procedural controls are implemented ensuring compliance with good documentation practices for electronic data generated by the system (WHO guidance on good data and record management practices, WHO Technical Report Series.
4.System elements that need to be considered in computerized system validation include computer hardware and software, related equipment and network components and operating system environment, procedures and systems documentation including user manuals and people (such as, but not limited to, users, data reviewers, system application administrators, network engineers, database administrators and people involved in archiving). Computerized system validation activities should address both system configuration as well as any custom-developed elements
5. Computerized systems should be maintained in the validated state with risk-based controls appropriate to the different stages of the system life cycle. These stages include
system planning, specification, programming and configuration, system testing, pre paration and verification of standard operating procedures (SOPs) and training pro grammers, system operation and maintenance including handling of software andh ardware updates, monitoring and review, followed by system retirement.
6.Depending on the types of systems or typical applications such as process control systems (distributed control system (DCS), programmable logic controller (PLC),supervisory control and data acquisition (SCADA)), laboratory information management systems (LIMS), laboratory instrument control systems and business systems (enterprise resource planning (ERP), manufacturing resource planning (MRP II)) used by the manufacturer, a document covering (but not limited to) the following information should be available on-site:

-purpose and scope;
-roles and responsibilities;
-validation approach;
-risk management principles;
-system acceptance criteria;
-vendor selection and assessment;
-computerized system validation steps;
-configuration management and change control procedures;
-back-up and recovery;
-error handling and corrective action;
-contingency planning and disaster recovery;
-maintenance and support;
-system requirement;
-validation deliverables and documentation;
-template, formats, annex; example

7A typical model for computerized systems validation is the V-model. The life cycle development model (or V-model for short), is a framework or structure for under taking the design, execution and commissioning of a design project (see also International Society for Pharmaceutical Engineering (ISPE) Baseline: a risk based approach to compliant GXP computerized systems GAMP). The left-hand edge of the V is where

Theproject is defined and specified in greater detail. The bottom point of the V is t heexecution step of the project. The right-hand edge of the V is where the commissioning and qualification testing of the installed system is performed. The V-model provides a logical sequence that helps to organize the complex activities of defining a project scope, executing it and qualifying it.