Constituents of a Power System:

- The power system consists of three subsystems
- These subsystems have clearly demarcated functions.
- The coordinated working of all the three subsystems is absolutely essential
- The subsystems are:-

    i. The generation subsystem.

    ii. The transmission & distribution subsystem.

    iii. The load subsystem.

    iv. The protection & control subsystem.

Power System Control Centre

- The power systems of today are essentially very huge in terms of
  - ✓ energy generated
  - ✓ transmitted and utilized
  - ✓ number of customers and total investment.
- The system is growing continuously with more generating plants, transmission lines and distribution lines being added every month.
- The power system feeds a very large number of domestic, commercial, industrial, agricultural, electric traction and other customers.
- The increase in unit sizes, growth of interconnections and the need to maintain the system in normal mode requires sophisticated control, instrumentation and protection.
- The operators are called upon to visualize the implications of a variety of changing plant parameters and take critical decisions.
- These requirements led to the development and application of more advanced solid-state modular instruments, computer based direct digital control and data processing systems

Functions of Modern Power System Control Centre

A modern power system control centre has the following functions to perform: -

1. Automatic generation control
2. Economic load dispatch
3. Automatic voltage control
4. On – line load flow
5. On – line short circuit
6. State estimation
7. Steady state security analysis
8. Security monitoring
9. Supervisory control
10. Automatic trouble analysis
11. Emergency control like load shedding, generator tripping
12. Automatic circuit restoration etc.

Basic Components of Computer Control

The computer system involves dual configuration with external interfaces to monitor the data.

- The first one is a process computer linked by telechannels to various generating and sub – stations for data acquisition.
- The second one is a larger one where major calculations are carried out and is linked to the process computer.

For real – time computer control of power systems, the following basic components are needed:

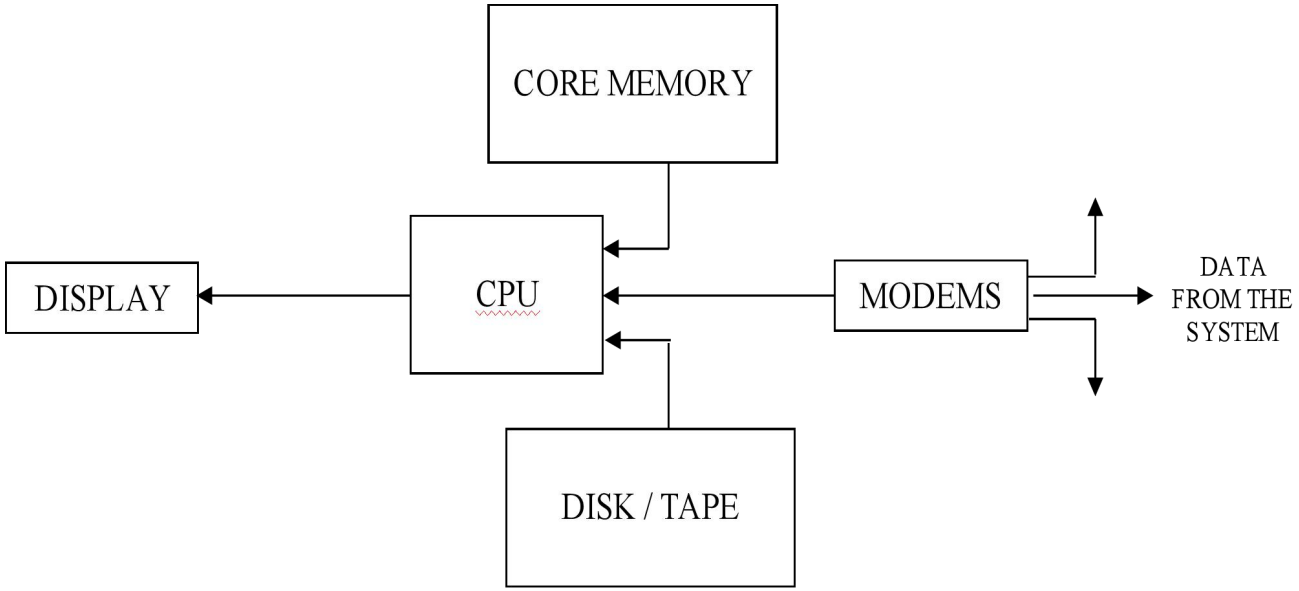
- System wide instrumentation
- High speed digital telemetry
- Central processing unit
- Memory and bulk storage
- Interactive display
- Software (operating and application)

The real time computer is designed to perform

- ✓ data acquisition
- ✓ storage and retrieval
- ✓ data processing
- ✓ interactive display
- ✓ remote signaling and control.

It consists of

- ✓ modems and interfaces
- ✓ CPU
- ✓ memory and bulk storage
- ✓ input-output devices like display devices, card reader, printer etc.



Functional block diagram of a real time computer

Level Decomposition in Power System with respect to power control centre

The power systems are characterized by strong hierarchical structure order.
Accordingly, control strategy can be devised to fit into the hierarchical structure advantageously

Level	System	Monitoring and Control
First Level	Generating stations and substations	Local control centre
Second Level	Sub transmission and transmission networks	Area load dispatch centre
Third Level	Transmission system	State load dispatch centre
Fourth Level or Top Level	Interconnected power systems	Regional control centre