SCADA (Supervisory Control and Data Acquisition System)

- Lots of data required regarding the operating conditions of a power system for proper & efficient energy management.
- A large number of operations have to be carried out at unattended locations from the operating centre.
- In many cases remote operation of a device situated at a remote location from a control centre is more economical than providing a person at the location.
- Besides sending a person to remote location for operation of the device leads to a considerable delay resulting in long outage durations and poor reliability.
- SCADA systems have been developed to overcome such problems.
- The need to ***control remote operations and monitor them*** led to development of SCADA.

Main Functions of SCADA

The main functions of SCADA are as follows:

- **Data Acquisition:** To provide data, measurements and status information to operator
- **Plotting:** To plot different measurements in real time regime.
- **Supervisory Control:** To operate and control circuit breakers remotely.
- **Alarms:** To send alarm signals as regards undesirable operating conditions.
- **Logging:** To log all information, signals etc.
- **Load Shedding:** To provide automatic and manual load shedding in emergency conditions so as to maintain system synchronism and stability.
- **Load Restoration:** To restore loads after system returns to normal state.
- **Automatic Generation Control:** To control generation at the power plants.

In addition to the above SCADA systems are many times used for additional tasks like security assessment, training, energy management etc.

Need for SCADA

The main reasons for adopting SCADA are as follows:

- To reduce cost.
- To reduce manpower
- To reduce future capital requirements.
- To improve level of service.
- To avoid environmental accidents.
- To comply with regulator requirements.
- To attain and maintain competitive edge.
- To replace existing ageing system.
- To manage complex systems.

Components of SCADA

- **Sensors:**
  - ✓ digital sensors
  - ✓ analog sensor

  They are basically control relays which interface with the power system.

- **Remote Terminal Units (RTUs)**:
  - small computerized units deployed in field at specific sites and locations.
  - RTUs are collection points for
    - ✓ getting information and reports from sensors
    - ✓ for sending commands to relays.

- **Master Unit**:
  - large computer systems which serve as a central processor.
- **Communication Links**
- **Software**

Configurations of SCADA systems

A SCADA system may have different configurations depending on

- System
- Requirements of the system

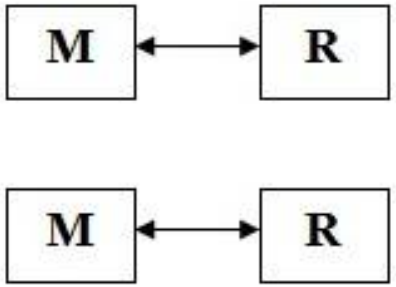
Each configuration consists of

- master unit (M)
- remote unit (R)

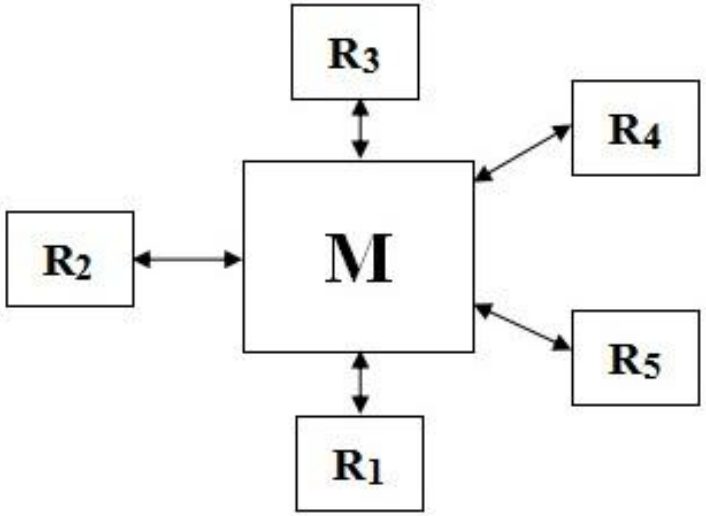
The various configurations which are used in SCADA systems are:

- One to One SCADA configuration
- Star SCADA Configuration
- Party line SCADA Configuration
- Network Configuration

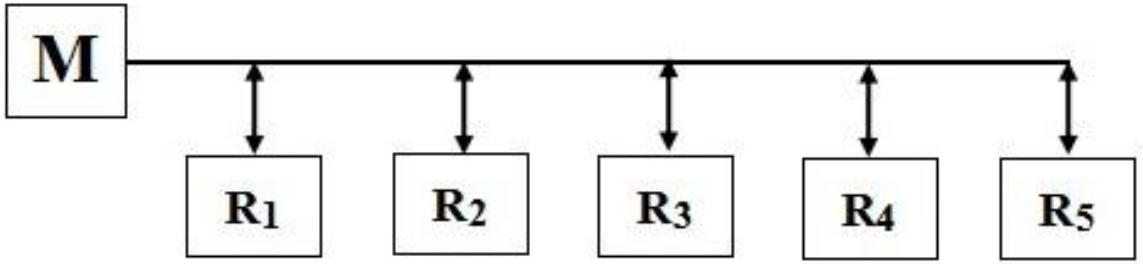
SCADA Configurations



One to One SCADA configuration



Star SCADA Configuration



Party line SCADA Configuration

SCADA Configurations

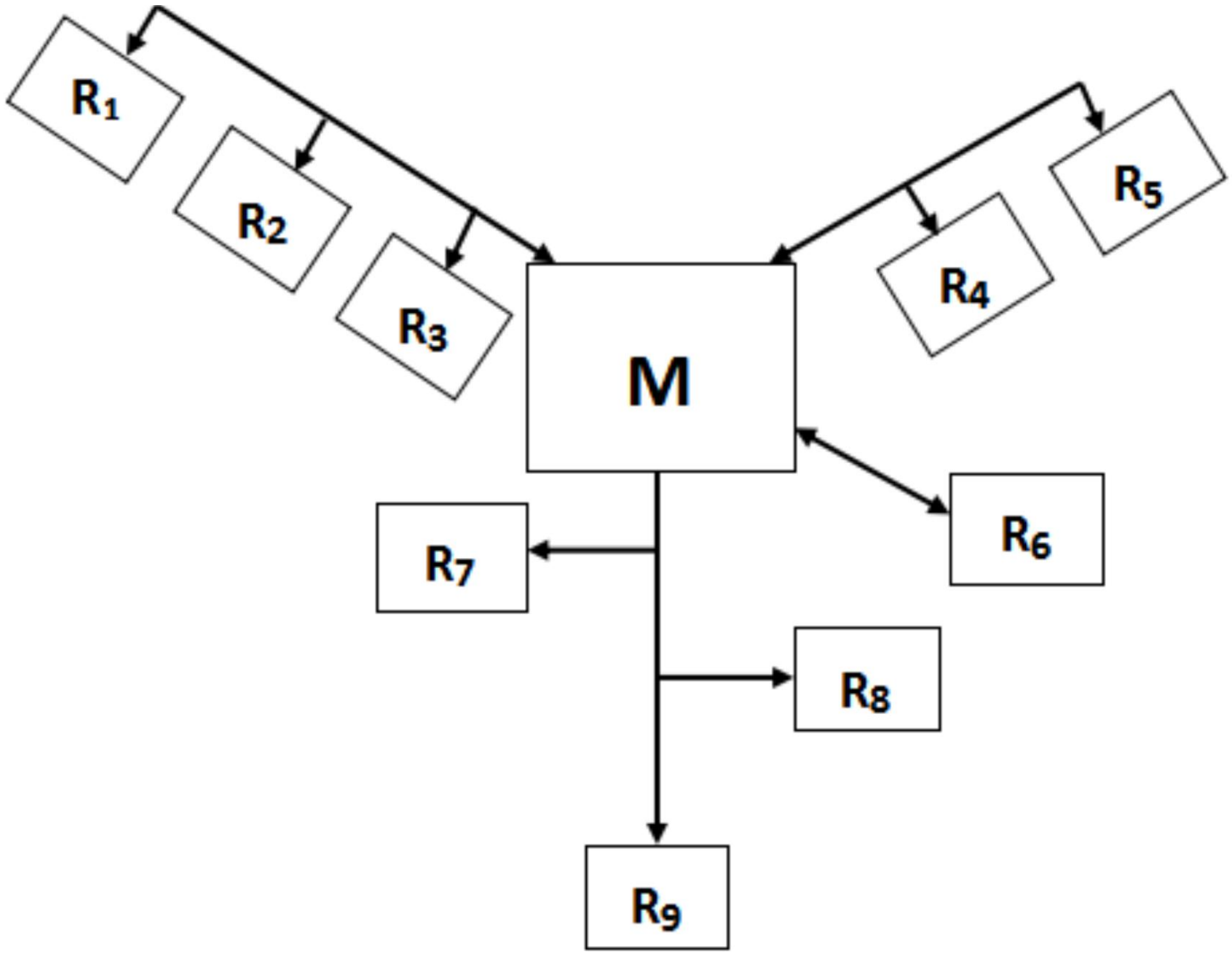
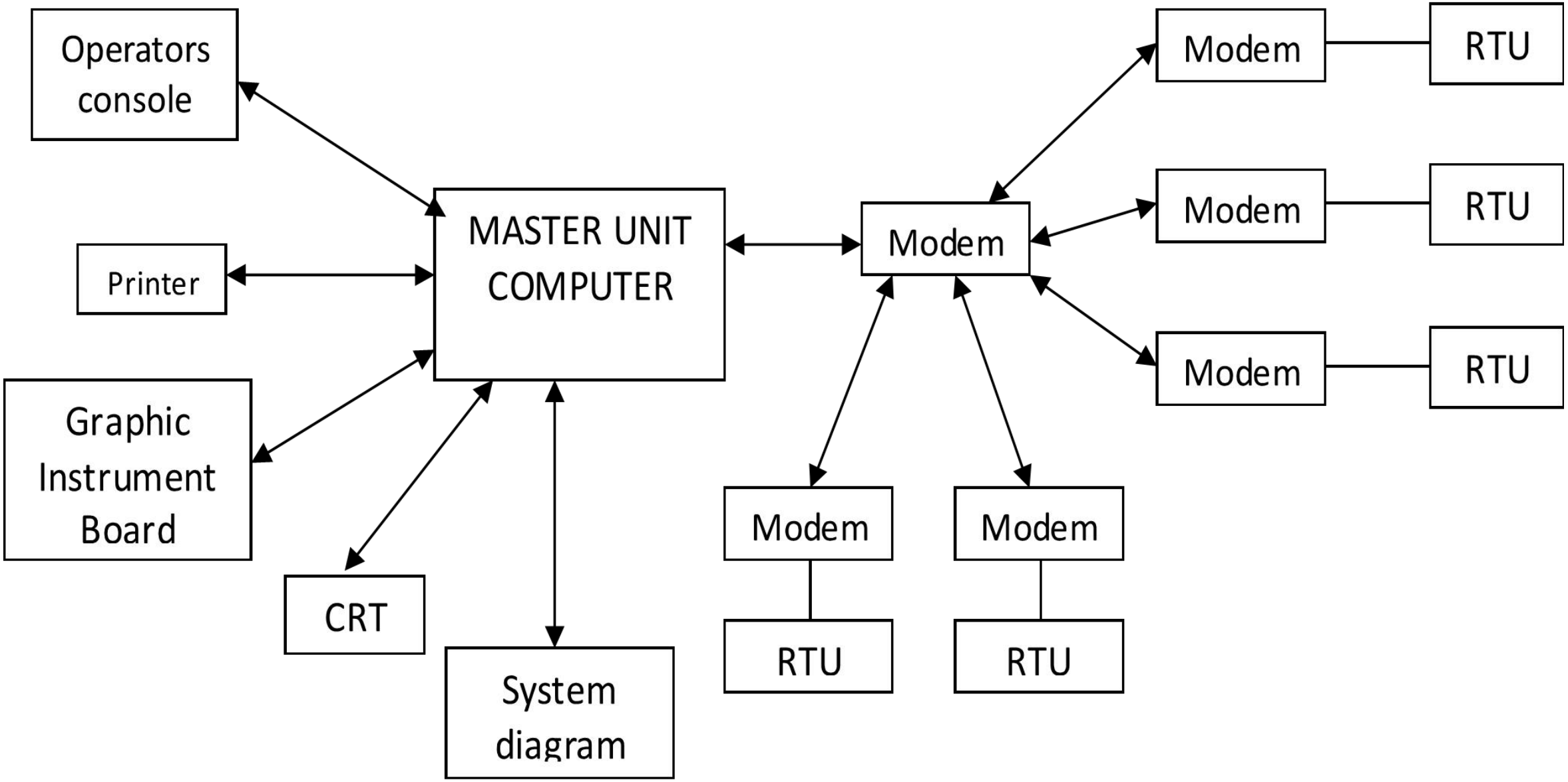


Fig.2 (d) Network Configuration

Master Unit – The fig.3 shows the layout of a typical SCADA system



Remote Operations by Master Unit -

For remote operations the operator at the master station follows **“select before operate”** procedure which is as follows:

- The operator selects the RTU.
- RTU acknowledges the selection.
- Operator selects the device to be operated at that RTU.
- RTU acknowledges that the device has been selected.
- Operator performs the desired operation.
- RTU performs the operation and sends a signal to master unit indicating that the desired operation has been performed. This signal maybe a message printed by printer or indication on CRT screen.