Chapter Three

Processor Unit

Objectives

- Describe the function of the processor
- Describe a typical program scan
- Identify the two distinct types of memory
- Describe the function of the *watchdog timer*
- Identify various memory designs

The Processor

- Consists of microprocessor, chips, circuits
- Memory and communication circuits
  - May be separate from microprocessor module

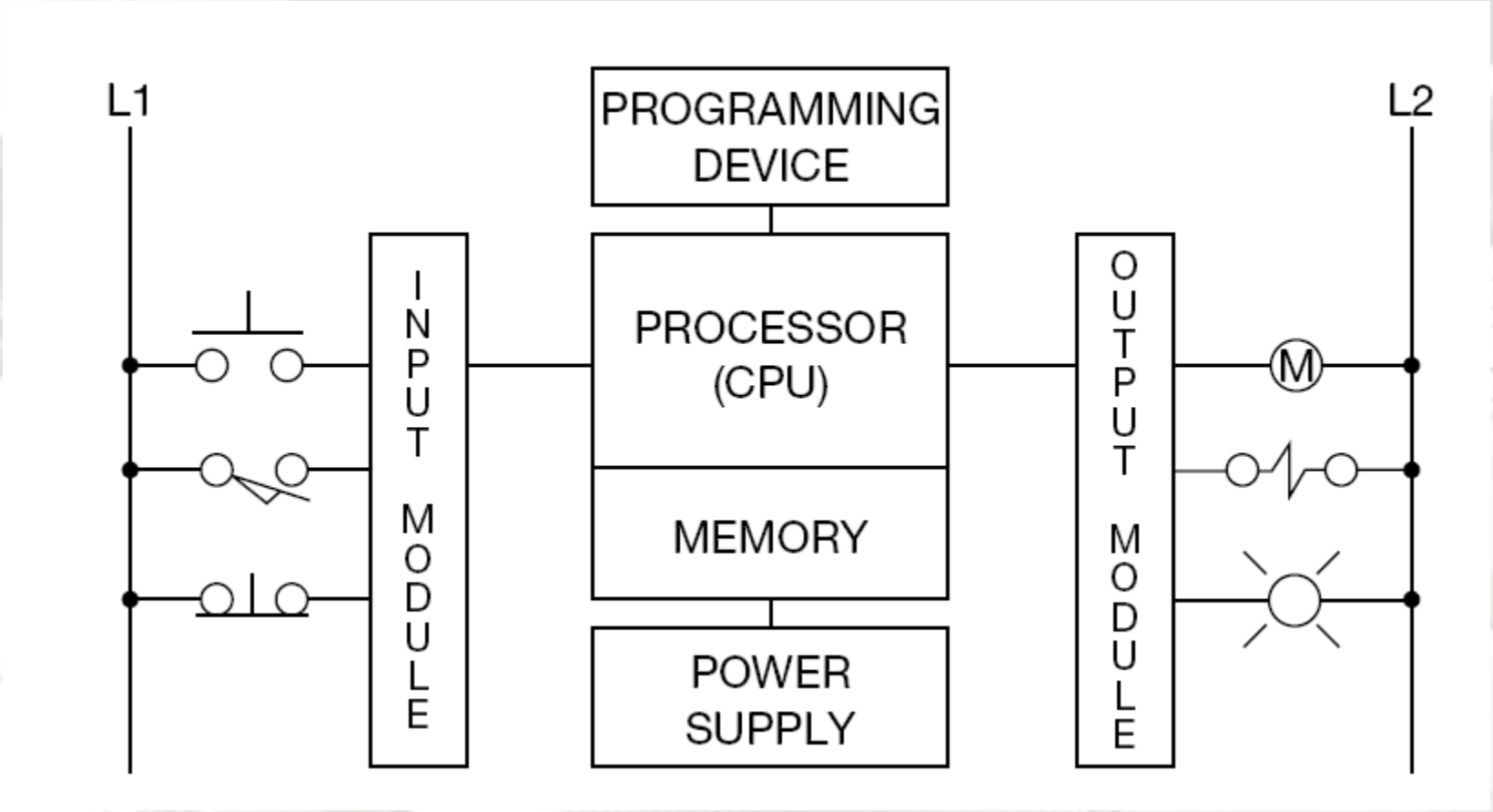

Figure 3-1 Basic PLC configuration

The Processor (cont'd.)

- Microprocessor scan
  - Monitors status of input devices
  - Executes logic of user program
  - Controls state of output devices
  - Communicates with other devices
  - Manages memory and updates timers, counters, registers

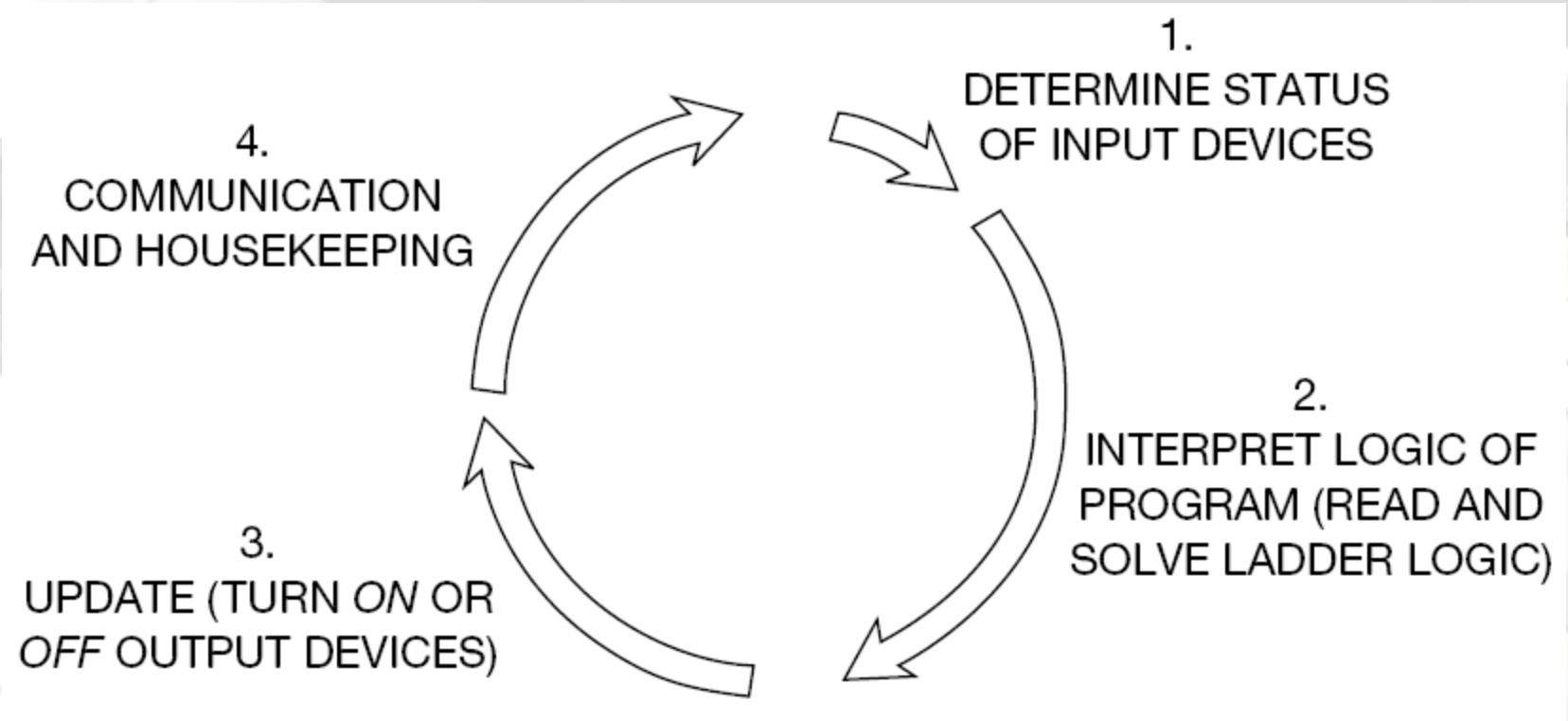

Figure 3-3 Typical processor scan

The Processor (cont'd.)

- Watchdog timer
  - Sets time limit for each scan
  - Puts processor into fault condition if timer exceeded
- User memory
  - Stores user program containing relay logic
- Storage memory
  - Stores status, accumulated values, etc.

The Processor (cont'd.)

- Volatile memory
  - Loses information when power is removed
- Nonvolatile memory
  - Retains stored information when power is removed

Memory Types

- Random Access Memory (RAM)
  - Common type of volatile memory
  - Often called read/write memory
- Read Only Memory (ROM)
  - Stored information cannot be changed
- Programmable Read Only Memory (PROM)
  - Can be written to once only

Memory Types (cont'd.)

- Ultra Violet Programmable Read Only Memory (UVPROM)
  - Also called Erasable Programmable Read Only Memory (EPROM)
  - Semi permanent storage
  - Used when security needed to prevent unauthorized changes

Memory Types (cont'd.)

- Electrically Erasable Programmable Read Only Memory (EEPROM)
  - Chip can be programmed and erased
  - Erased by sending proper signal to erase pin
  - Used primarily as nonvolatile backup for user program RAM

Memory Size

- Expressed in K values (example: 16K)
- Binary system used in PLCs
  - Base 2
  - Digits are 1s and 0s
- PLCs may use 8-bit or 16-bit words
- Required memory size depends on application

Programming Devices

- Needed to enter, modify, and troubleshoot the PLC program, or to check the condition of the processor
- Two types
  - Hand-held: see Figures 3-9 and 3-11 in the text
  - Computer: see Figure 3-10 in the text
    - More display, documentation, and storage options

Guarding Against Electrostatic Discharge (ESD)

- ESD
  - Discharge of static electricity
  - Major cause of failure of memory chips
- Precautions
  - Use nonstatic floor coverings
  - Handle chips correctly
  - Ground the work surface
  - Wear a wrist strap

Memory Structure

- Two general classifications
  - User memory
  - Storage memory
- Specific PLC memory structure information
  - Review individual manufacturer literature

Summary

- Processor tasks
  - Monitor status of the inputs
  - Execute steps in the user program
  - Control condition of the outputs
- User program stored in memory
- Memory types: volatile and nonvolatile