ELECTRICAL WORKSHOP

Robotics Systems

Major Systems

- Mechanical
- Pneumatic
- Electrical ✓
- Software

Electronics Theory

Electronics – Basic Theory

- Voltage
- Current
- Resistance
- Water Analogy
- Ohm's Law

Electronics Diagrams

- Block Diagrams (Boxes, Lines, etc.)
- Schematics (Component Symbols, etc.)
- Waveforms (Voltage vs. Time)

Major Components

Power Source

- Types – AC/DC
- Battery (12 Volts DC)

Safety

- Voltage Levels
- Circuit Breakers and Fuses

Robot Controller (Processor)

- Basic Functions
- Output Capacity

Robot Functional Elements

- Mechanical System
  - ➤ Motors
- Pneumatic System
  - ➤ Compressor
  - ➤ Solenoids (Pneumatics System)

Robot Controllers

- Relays (Spikes)
- Motor Speed Contolllers (Victors)

Robot Controller (Processor) Details

Input/Output (I/O)

- Digital/Analog
- Input Descriptions

- Output Descriptions

Operator Station Interface

- Hard-Wired Connection (Tether)
- RF Connection (Radio)

Robot Sensors

- Types (Active/Passive)
- Potentiometers (Variable Resistors)
- Positional Encoders
- Optical Sensors
- Gyros
- Camera

Robot Motor Controller Details

Motor Controllers (Victors)

- Pulse Width Modulation (PWM)

Robot Electrical Construction

The Rules

- FIRST Rules

Wire Sizes (Gauge)

- Wire Size and Current Capacity

Connectors

- Types

Construction Methods

- Wire Stripping
- Crimping
- Soldering

Measurement Instruments

- Digital Volt Meter (DVM)
- Oscilloscope

Demonstrations/Workshops

OHM'S LAW

E = Voltage (Volts)

I = Current (Amps)

R = Resistance (Ohms)

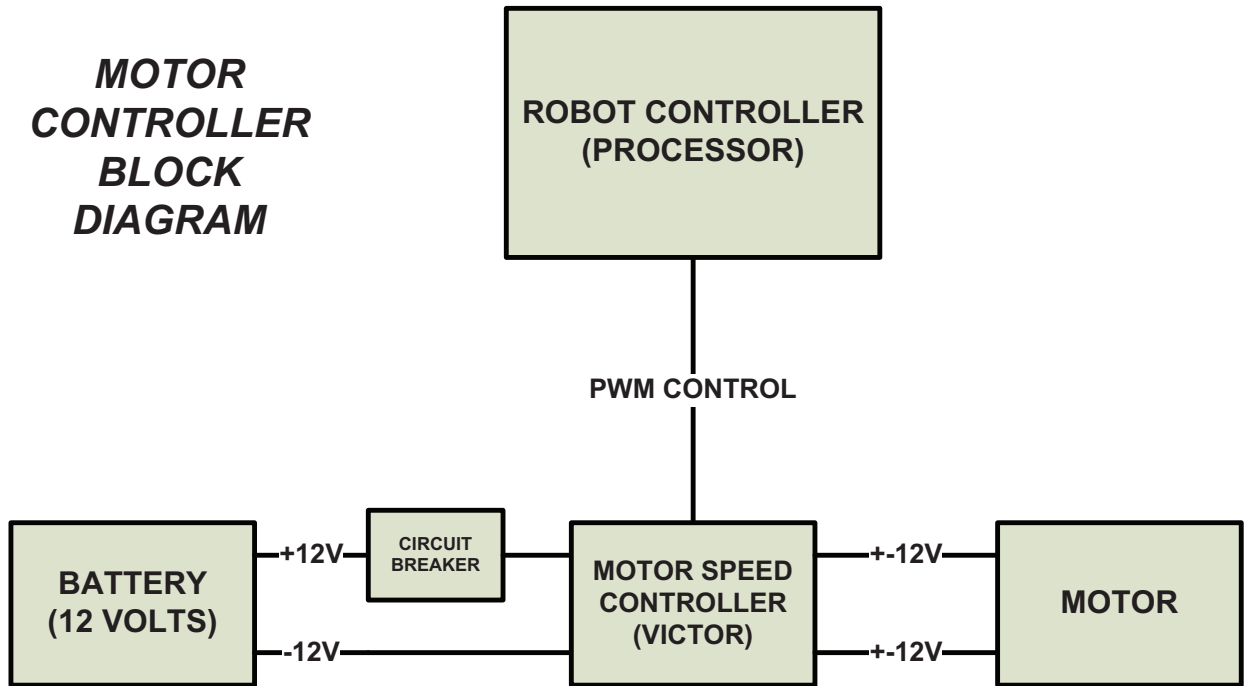**I = E / R**

THE WATER ANALOGY

**Battery ≈ Pump, + is the High Pressure Side
                          - is the Low Pressure Side**

E = Voltage (Volts)   **≈ Water Pressure**

I = Current (Amps)   **≈ Water Volume Flowrate**

R = Resistance (Ohms)   **≈ Flow Restriction**

MOTOR CONTROLLER BLOCK DIAGRAM

ROBOT CONTROLLER (PROCESSOR)

PWM CONTROL

BATTERY (12 VOLTS)

+12V

CIRCUIT BREAKER

-12V

MOTOR SPEED CONTROLLER (VICTOR)

+-12V

+-12V

MOTOR

RELAY CONTROLLER BLOCK DIAGRAM

ROBOT CONTROLLER (PROCESSOR)

RELAY CONTROL

BATTERY (12 VOLTS)

+12V

CIRCUIT BREAKER

-12V

RELAY CONTROLLER (SPIKE)

+12 V

-12 V

SOLENOID