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)

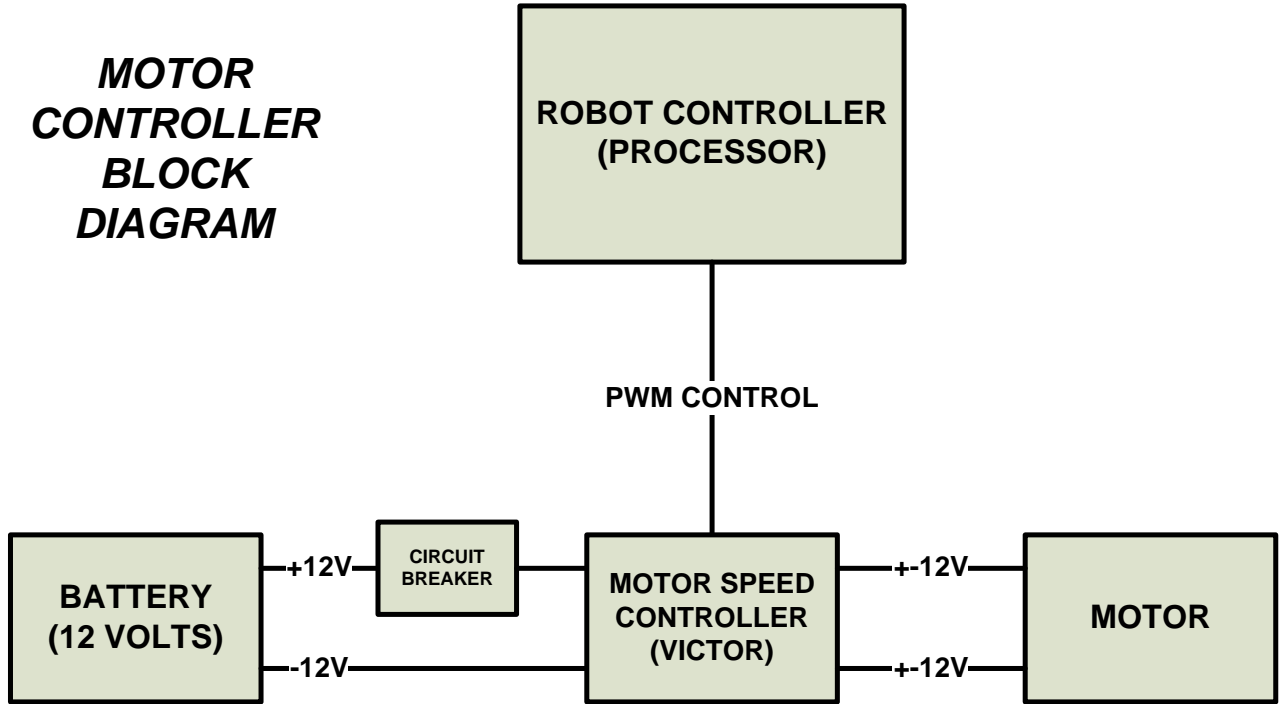**R = Resistance (Ohms)**

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— **MOTOR**

+-12V

RELAY CONTROLLER BLOCK DIAGRAM

ROBOT CONTROLLER (PROCESSOR)

RELAY CONTROL

BATTERY (12 VOLTS)

+12V— **CIRCUIT BREAKER**

-12V

RELAY CONTROLLER (SPIKE)

+12 V— **SOLENOID**

-12 V