



## P4 Electronics

### **P 4.1 Components and basic circuits**

- P 4.1.1 Current and voltage sources
- P 4.1.2 Special resistors
- P 4.1.3 Diodes
- P 4.1.4 Diode circuits
- P 4.1.5 Transistors
- P 4.1.6 Transistor circuits
- P 4.1.7 Optoelectronics

### **P 4.2 Operational amplifier**

- P 4.2.1 Internal design of an operational amplifier
- P 4.2.2 Operational amplifier circuits

### **P 4.3 Open- and closed-loop control**

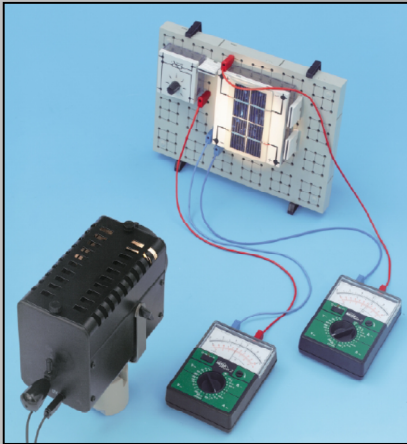
- P 4.3.1 Open-loop control
- P 4.3.2 Closed-loop control

### **P 4.4 Digital technology**

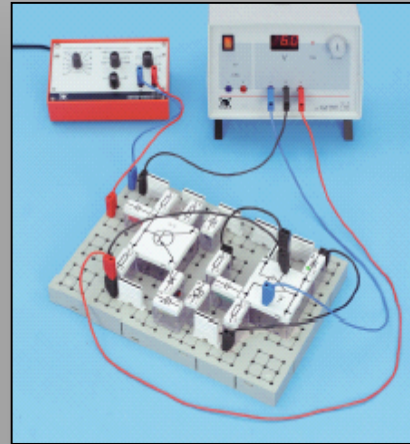
- P 4.4.1 Basic logical operations
- P 4.4.2 Switching networks and units
- P 4.4.3 Serial and parallel arithmetic units
- P 4.4.4 Digital control systems
- P 4.4.5 Structure of a central processing unit (CPU)
- P 4.4.6 Microprocessor

## P4 Electronics

### P 4.1 Components & Basic Circuits

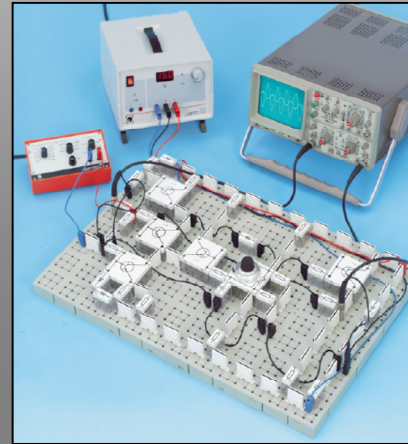


Recording the current-voltage characteristics of a solar battery as a function of the irradiance

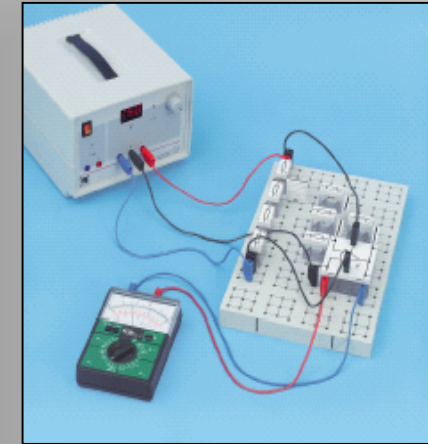


Optoelectronics

### P 4.2 Operational Amplifier

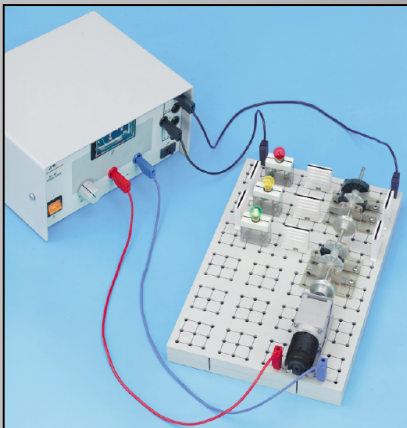


Discrete assembly of an operational amplifier as a transistor circuit

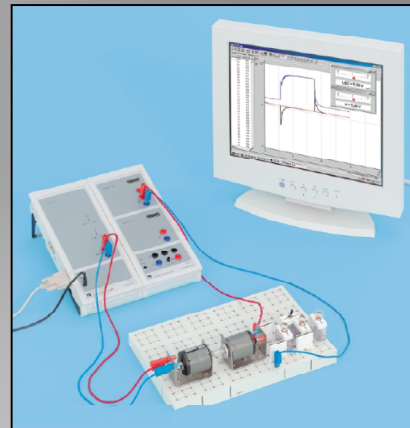


Adder and subtractor

### P 4.3 Open-and Closed-Loop Control

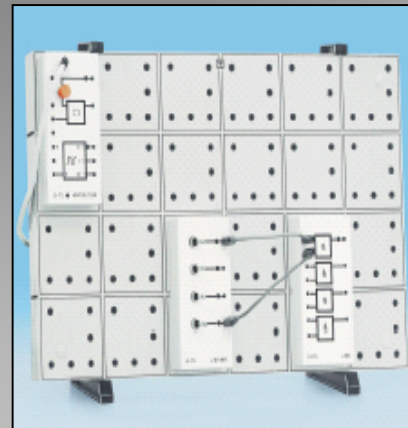


Assembling a traffic-light control system (Open-loop control)

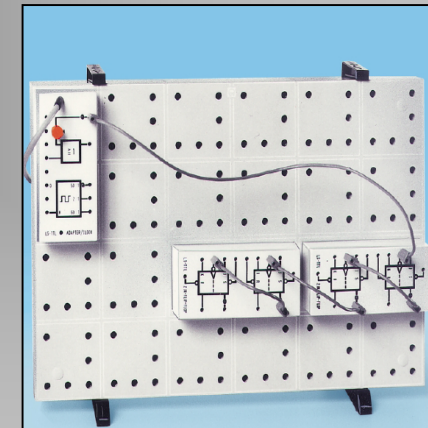


Voltage control with CASSY (Closed-loop control)

### P 4.4 Digital Technology



AND, OR, XOR, NOT, NAND and NOR operations with two variables



4-bit digital counter