HUMBER

ROBOTICS ELECTRICAL SYSTEMS MECH3550

Robot Interfacing & Electrical Wiring Diagrams

by
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Interfacing

Common point at which two or more system communicate with each other.

Common Interfacing Devices - Examples

- Sensors
- Limit switches
- External Relays
- Operator alarms
- Safety Equipment
- Bar code readers
- Conveyors
- Transfer line
- PLC
- Machine Vision System

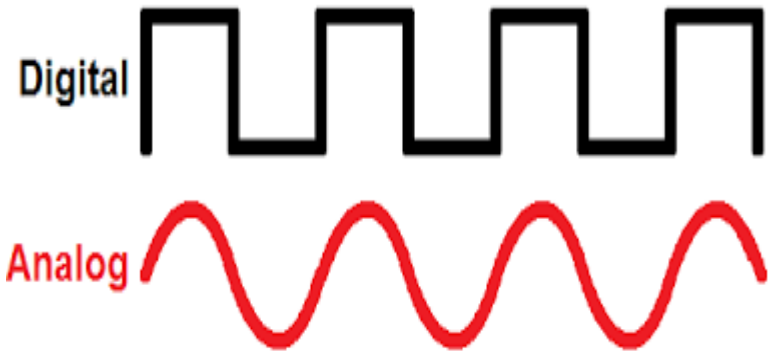
Communication Signals - Analog and Digital Signals

- Continuous Signal

Continue change with respect to time

- Discrete Signals

Constant in the given span of time



Analog Signals & Devices

Example of Analog Signals – Changing with time

- Pressure Signals
- Temperature Signals
- Force Signals
- Displacement

Example of Digital Input Devices

Examples

Push Button

Limit Switches

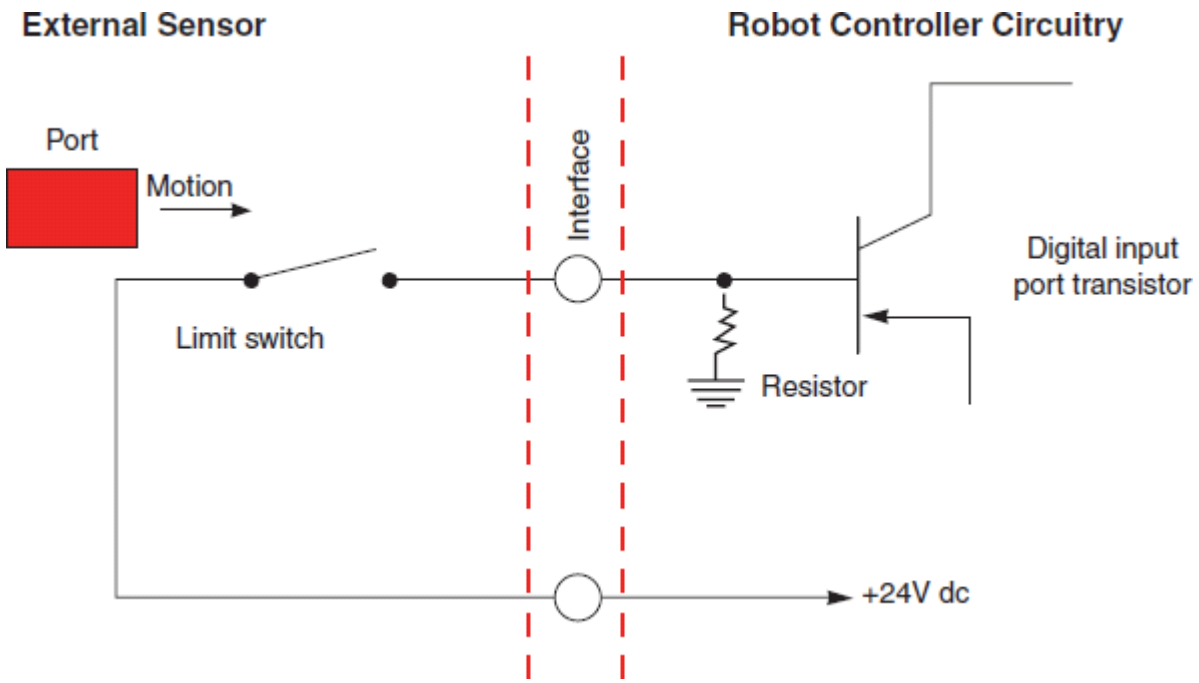
Digital Sensors : Light sensors; proximity sensors (capacitive and Inductive)

Digital Inputs & Signals

- Common digital inputs
  - Limit switch (At Robotic Joints)
  - Light curtains
  - Motion detectors
  - Door switches
  - Safety fences

Robots receive a signal indicating the state of an external switch (on or off) through a digital input port.

Digital Input Circuit



Limit switch is connected to a typical input port. When no object is present, the limit switch is open. When an object is present the limit switch closes and conducts 24V direct current to the transistor. The controller circuitry detects transistor state and passes the information to the robot's computer program

Output Devices

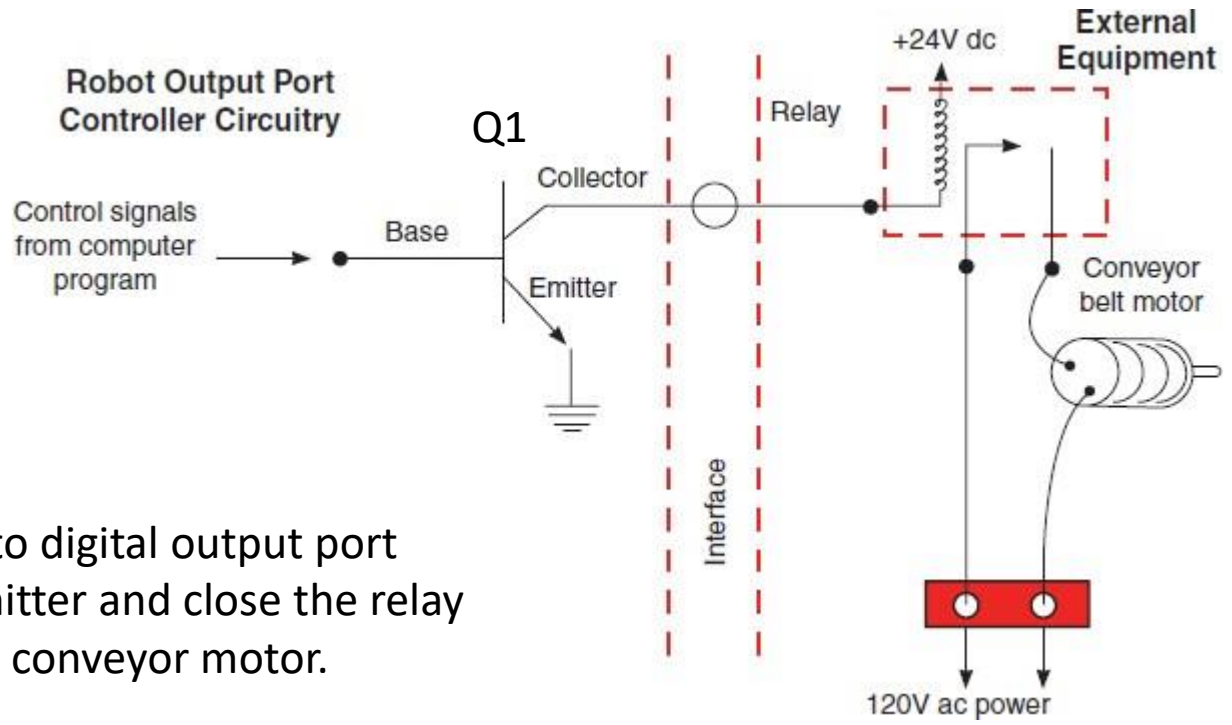
- Light bulb/indicators
- Motors
- Actuators (Pneumatics)

Digital Output Ports

Examples of digital output signals

- Conveyor Belt
- Motor
- Solenoid

Digital Output



When enough voltage is applied to digital output port transistor Q1. It grounded the emitter and close the relay contact to supply 120 V AC to the conveyor motor.

Low Level Signals

- Low level signal is 0 Volt

  Whenever a control signal from the computer program directing the robot is at low voltage level the base (control element) of transistor Q1 does not conduct. When the base is at low voltage level, the output current is zero and the circuit is high resistance. The motor control relay (CR) is not energized and the motor is off

High Level Signal

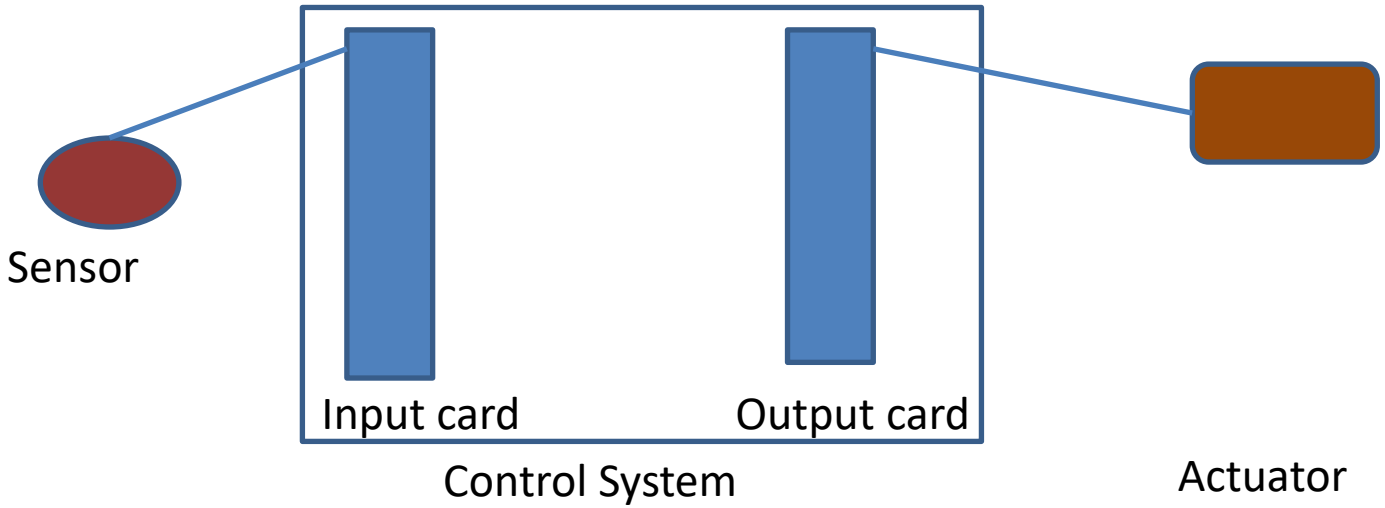
High level signal is 12 V or 24 V

When the computer sends a high-level signal to the base control element of transistor Q1, the resistance between emitter and collector became very low . In this condition control relay energized and the conveyor motor is turn on

Input and Output Device connections

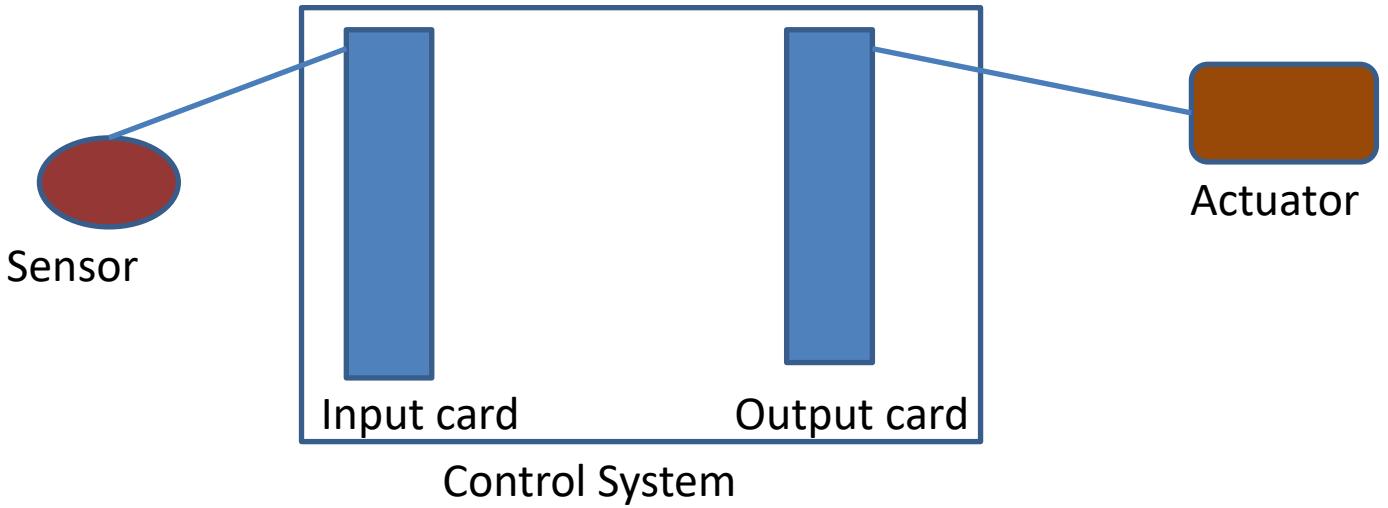
- ROBOTIC CONTROL SYSTEM HAS INPUT AND OUTPUT CARDS
- INPUT DEVICES CONNECT WITH INPUT CARDS
- OUTPUT DEVICES CONNECT WITH OUTPUT CARDS

INPUT AND OUTPUT CONNECTIONS



INPUT AND OUTPUT DEVICES

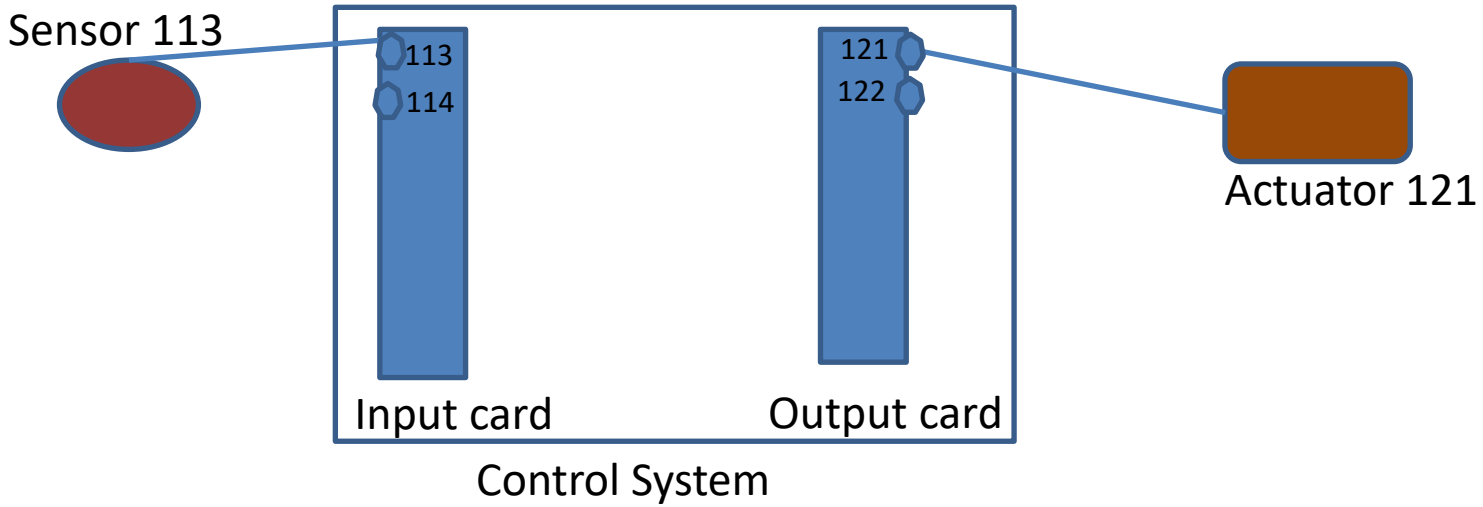
INPUT DEVICES	OUTPUT DEVICES
SENSORS	MOTORS / ACTUATORS
SWITCHES	GRIPPER



I/O MAPPING

INPUT	LABELS
IN113	Sensor A
IN114	Sensor B

OUTPUT	LABELS
Out121	Actuator A
Out122	Actuator B



SINKING AND SOURCING CARDS

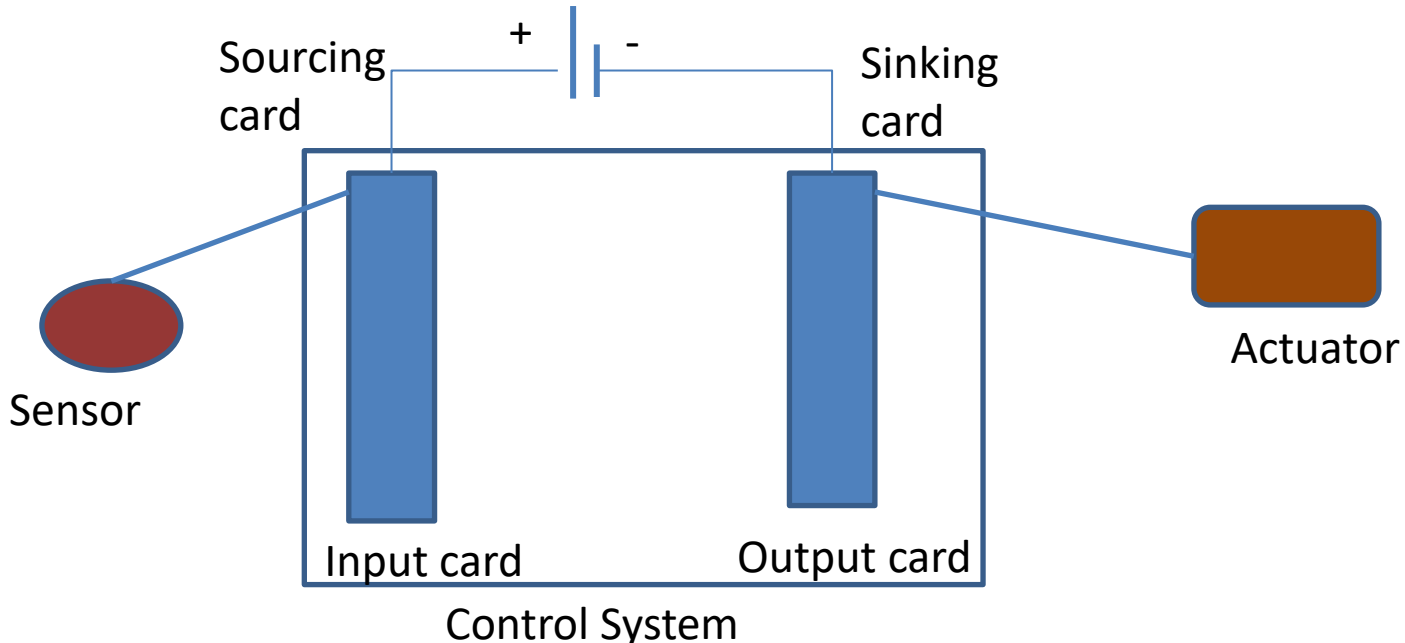
THERE ARE TWO TYPE OF CARDS

SINKING CARDS

If the card is directly connected to the GROUND.

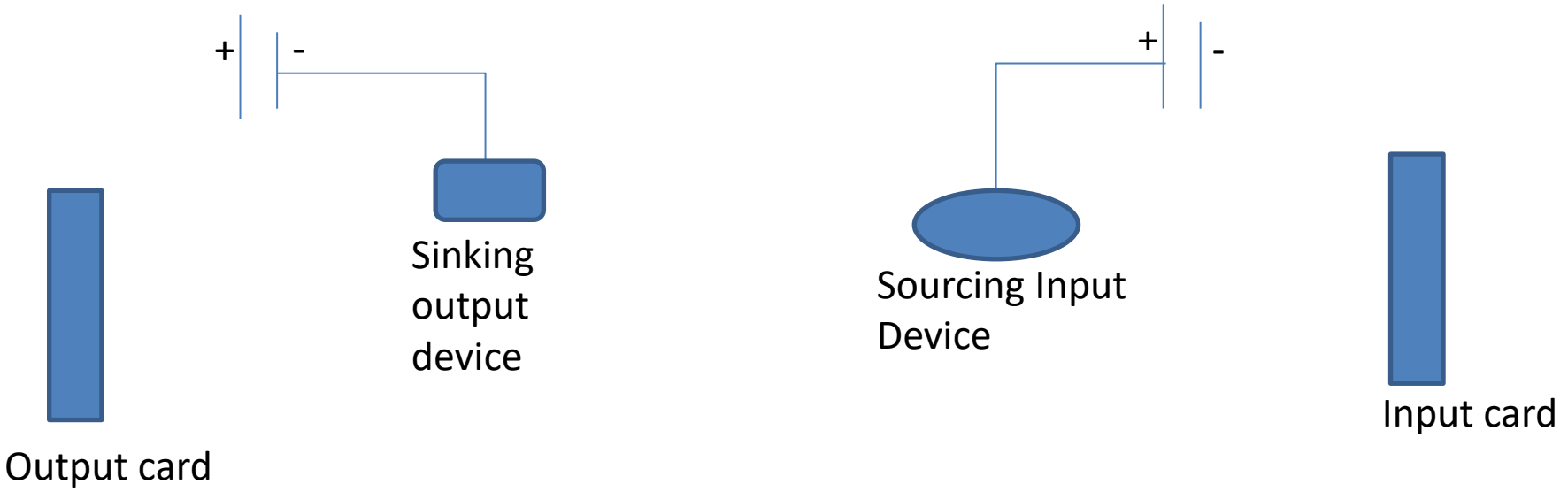
SOURCING CARDS

If the card is directly connected to the POWER SOURCE.



SINKING AND SOURCING DEVICES

SINKING INPUT/OUTPUT
INPUT/OUTPUT DEVICE CONNECTS TO GROUND
SOURCING INPUT/OUTPUT
INPUT/OUTPUT DEVICE CONNECTS TO THE POWER SOURCE (V+)



ELECTRICAL WIRING

SINKING DEVICES (INPUT/OUTPUT) MUST BE CONNECTED WITH SOURCING CARDS (INPUT/OUTPUT)

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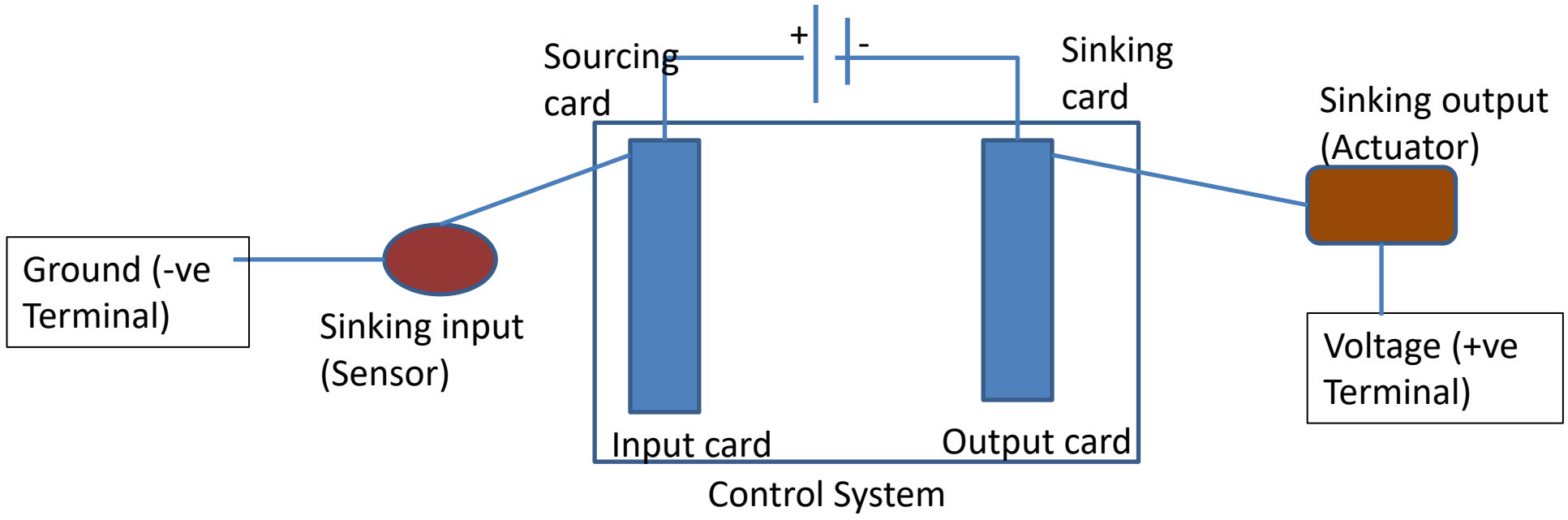
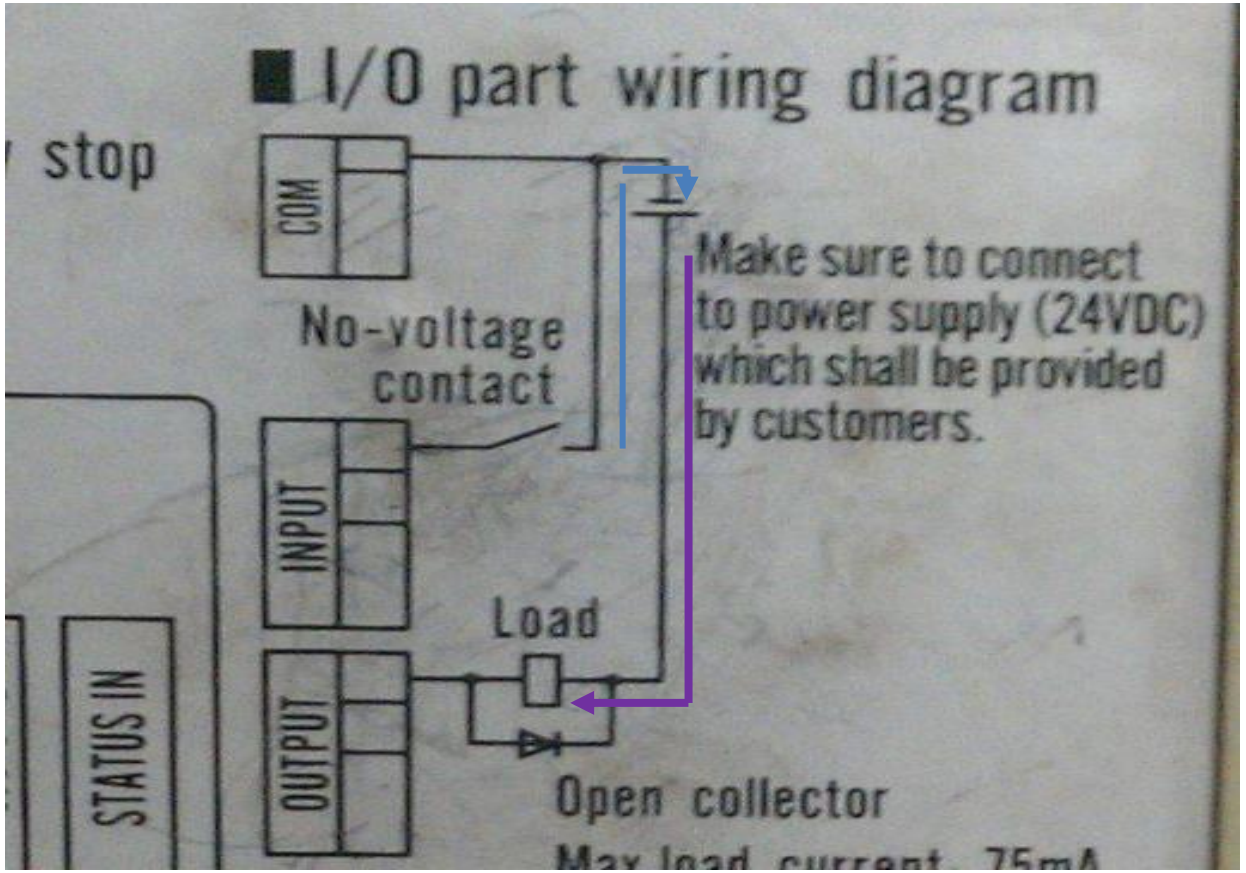
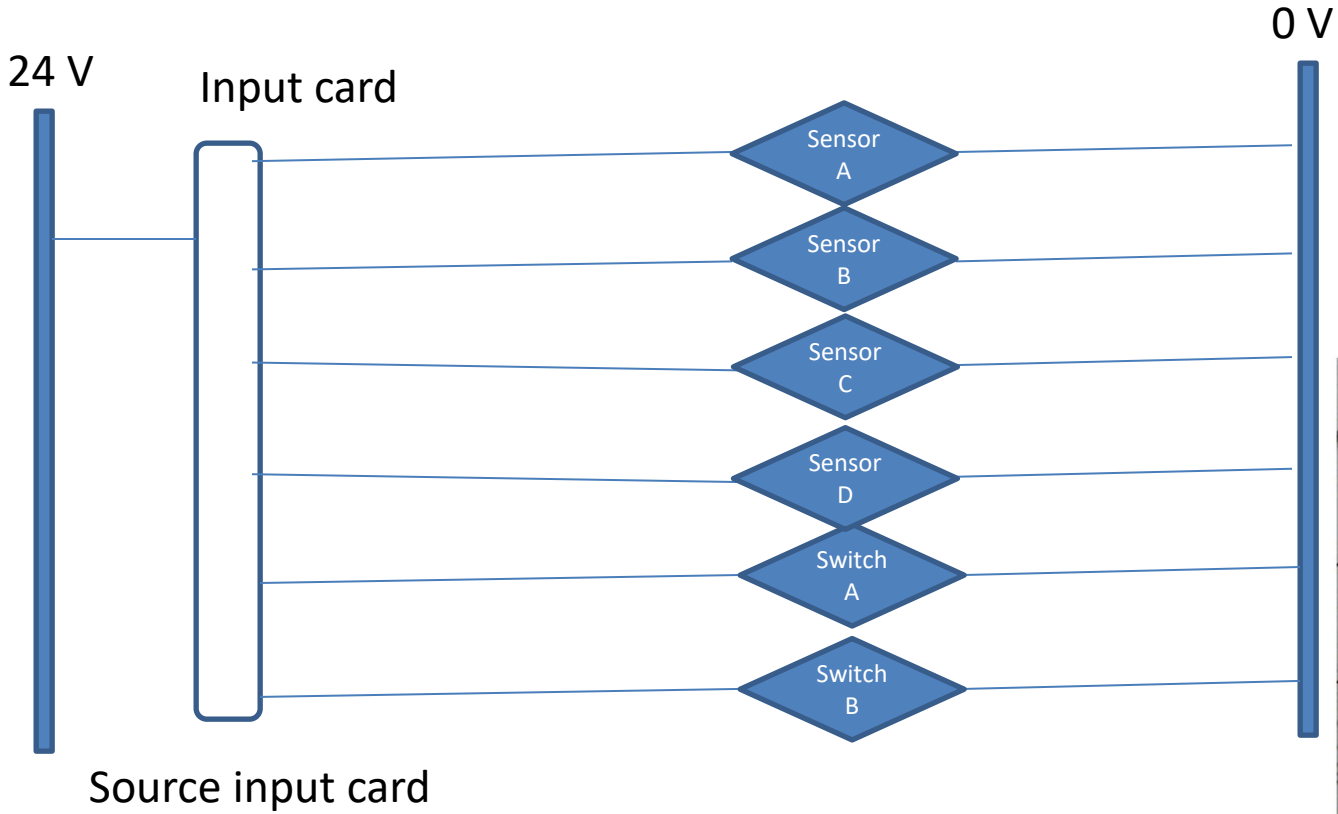


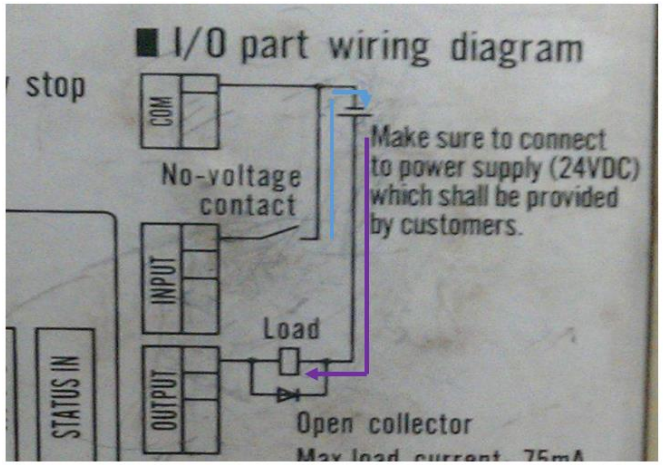
Given Wiring Diagram by Manufacturer Panasonic Robot



EXAMPLE

Input Circuit Diagram for a Sourcing input Card





EXAMPLE

Output Circuit Diagram for an output sinking Card