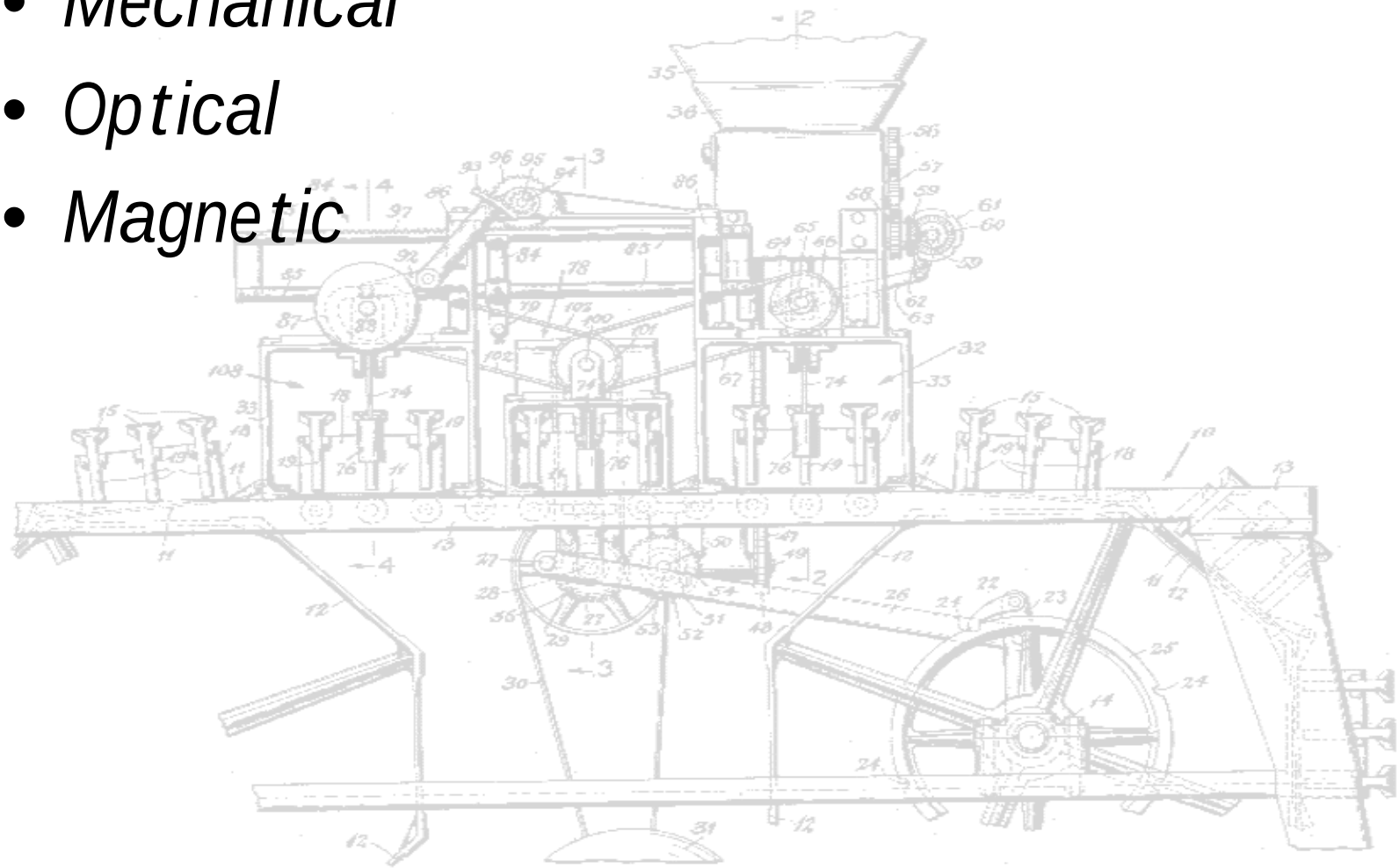
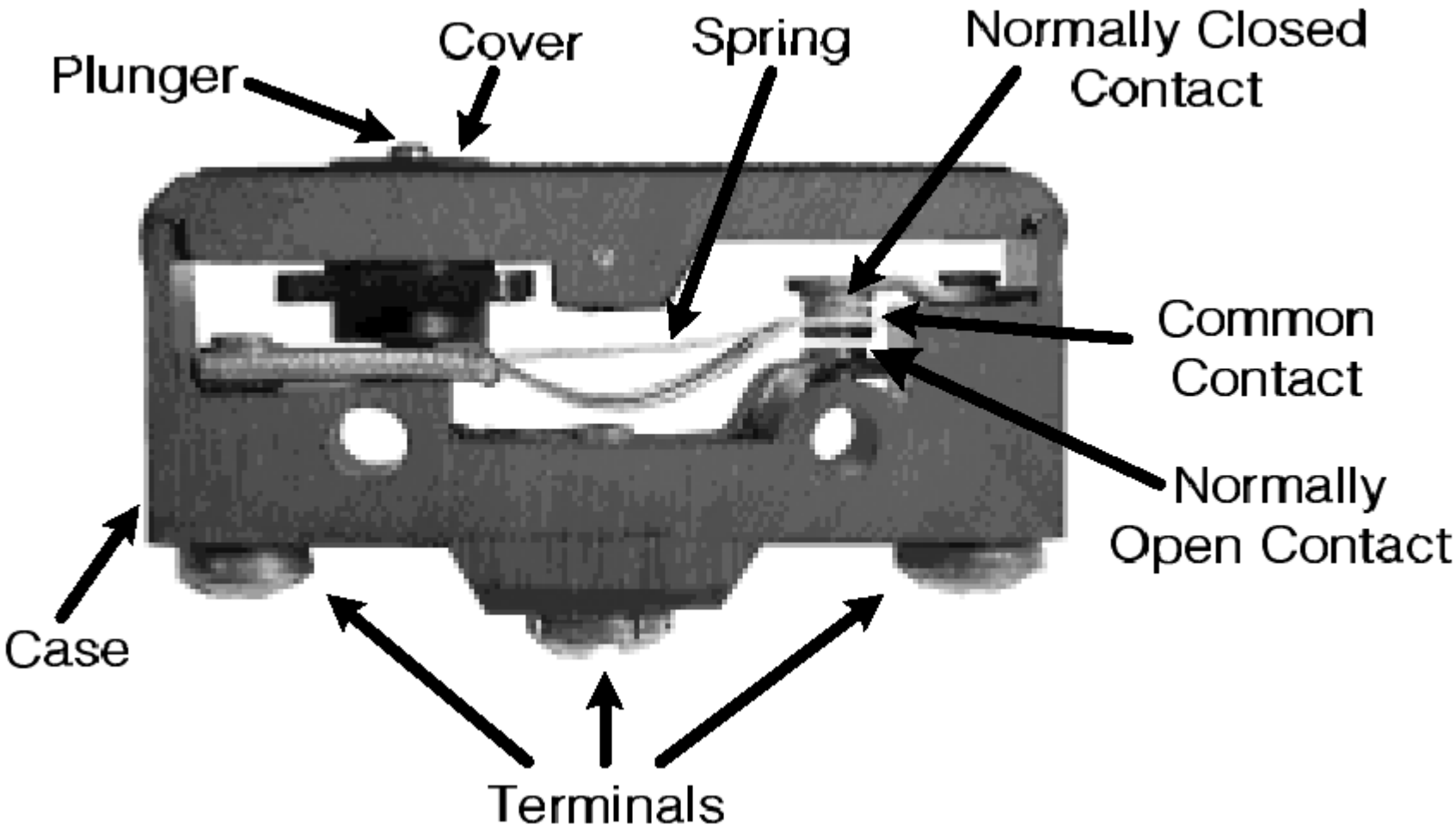
Position Sensing

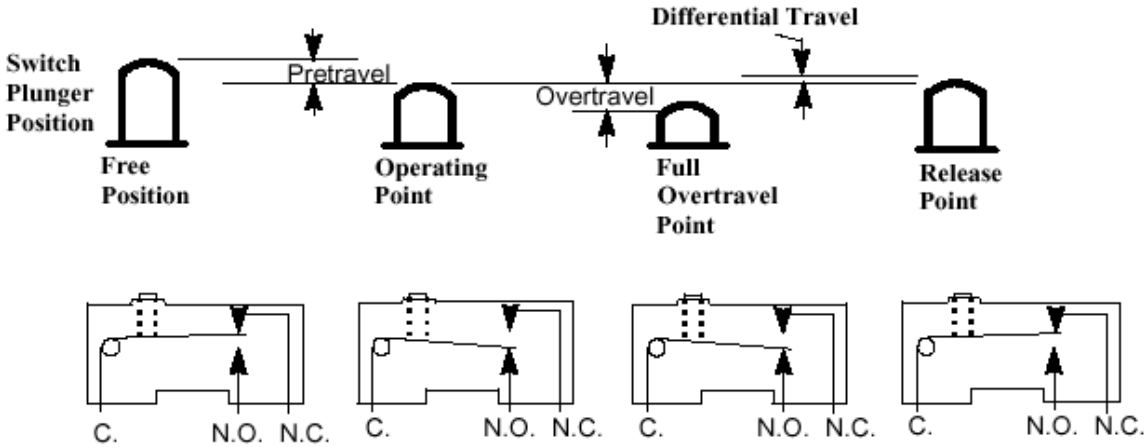
- *Mechanical*
- *Optical*
- *Magnetic*

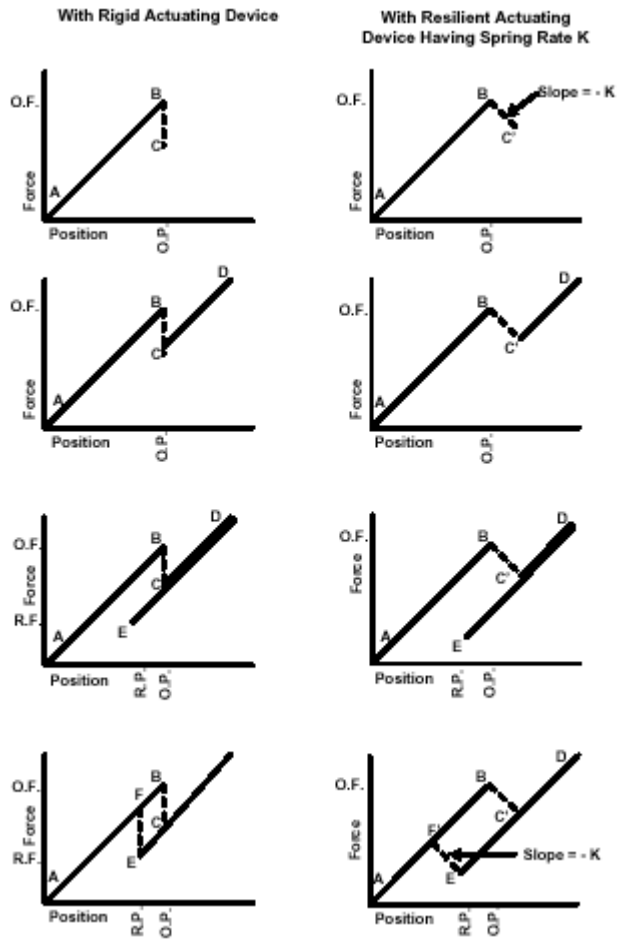


Mechanical Sensing



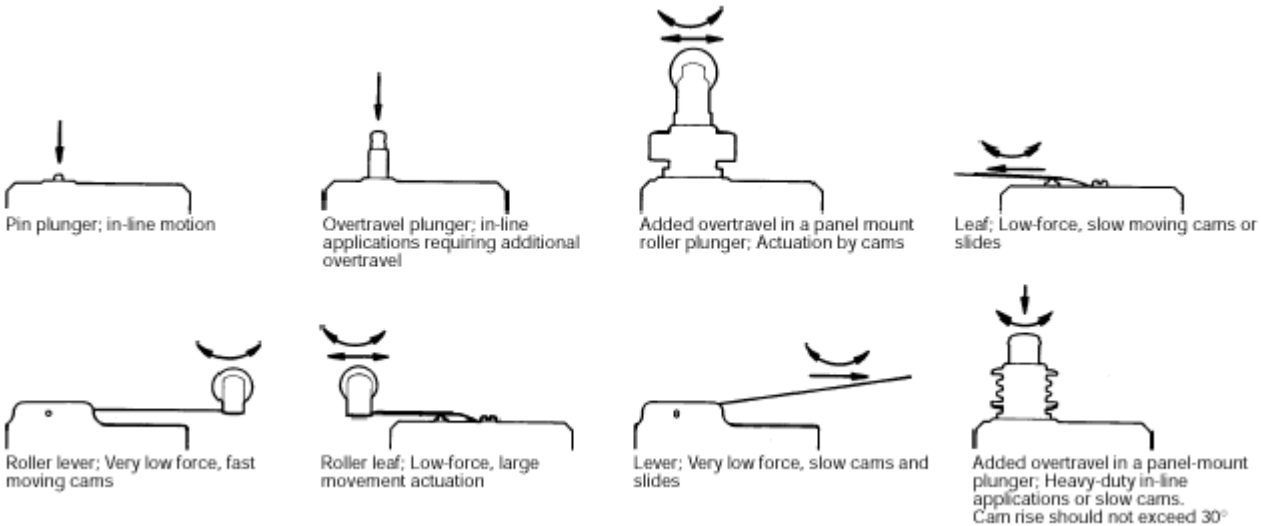
Microswitch Operation





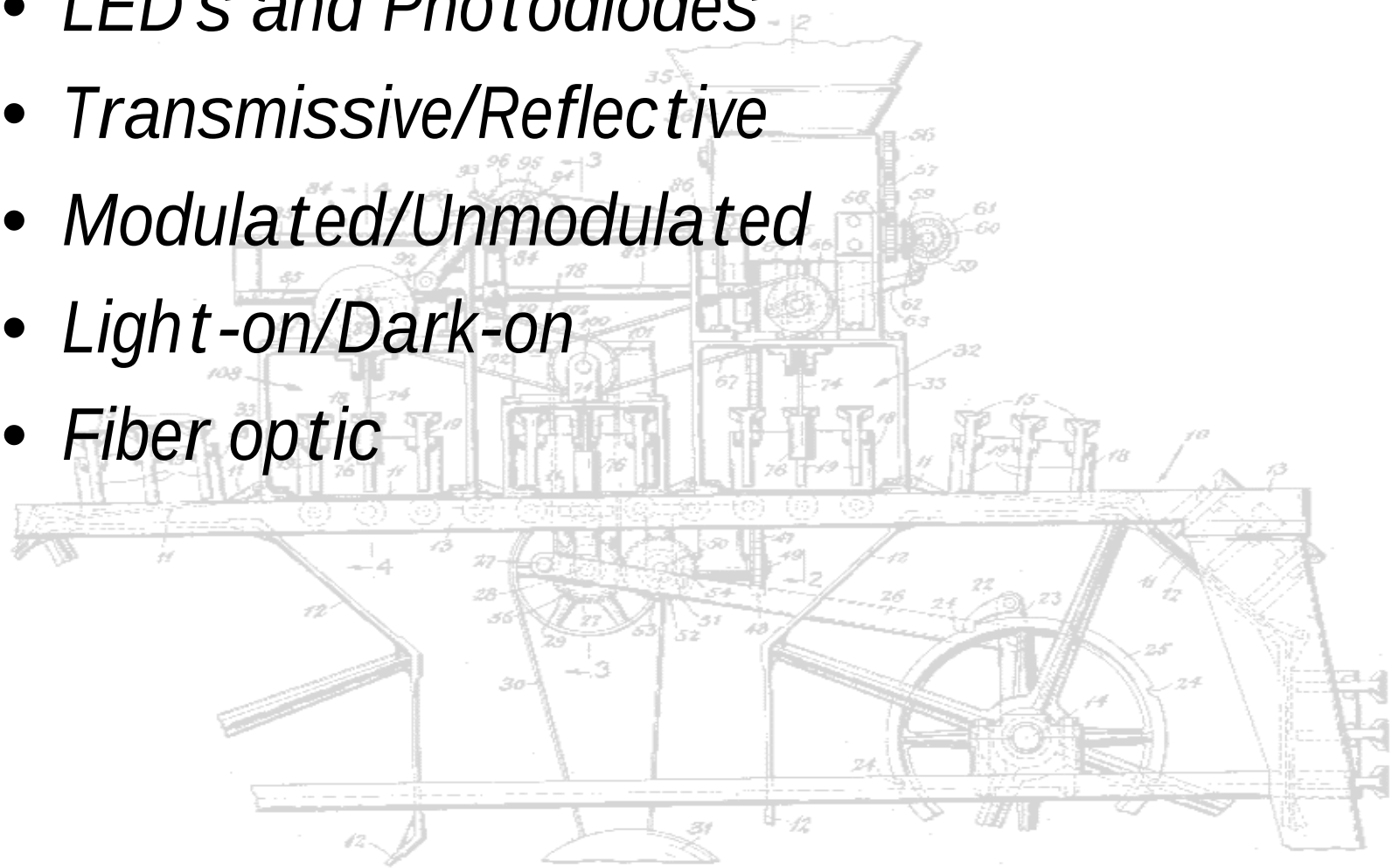
Switch exhibits mechanical hysterisis.

Microswitch Actuators

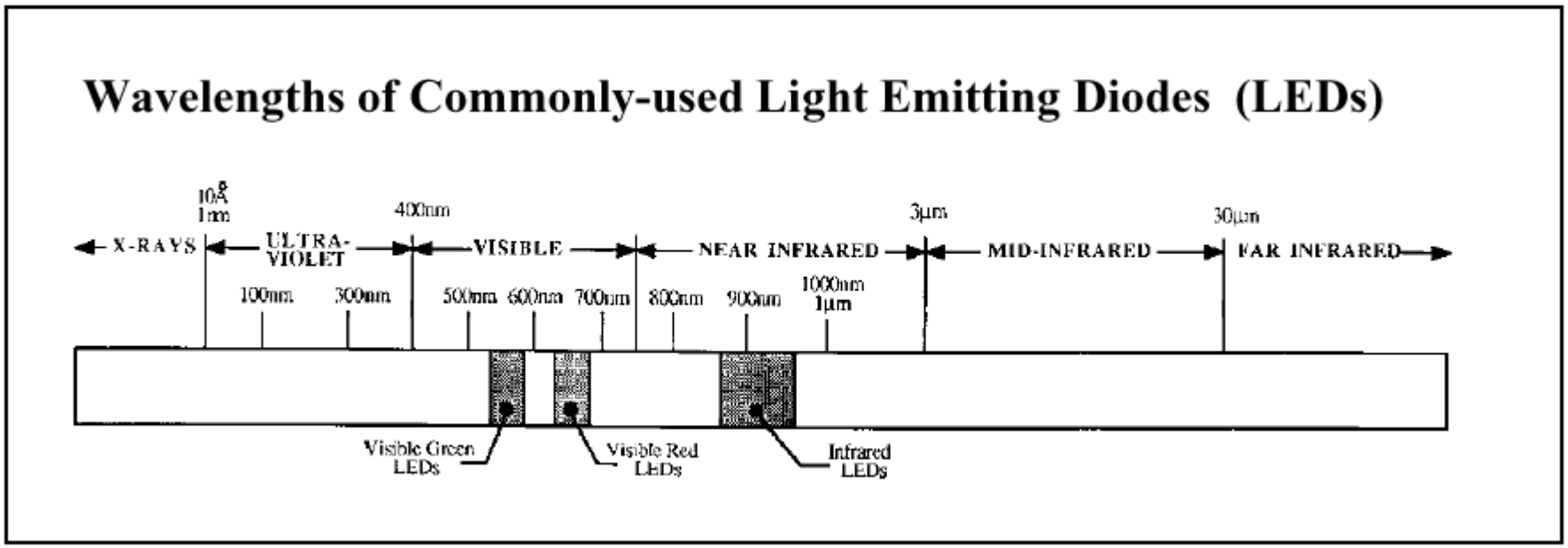


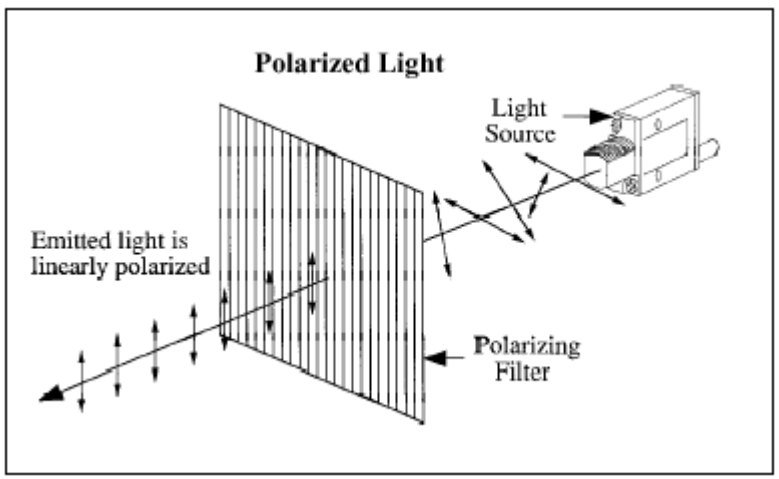
Optical Sensing

- *LED's and Photodiodes*
- *Transmissive/Reflective*
- *Modulated/Unmodulated*
- *Light-on/Dark-on*
- *Fiber optic*



LED and Photodiode Properties

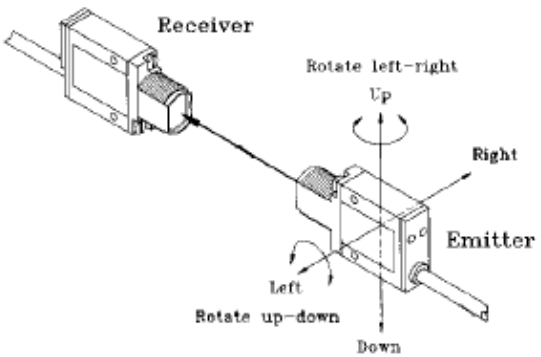




Transmissive & Reflective Photoswitches

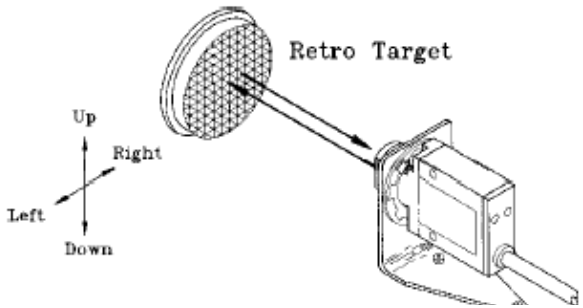
Opposed Mode Alignment

Opposed Mode Alignment: Move Emitter or Receiver Up-Down, Left-Right, and Rotate



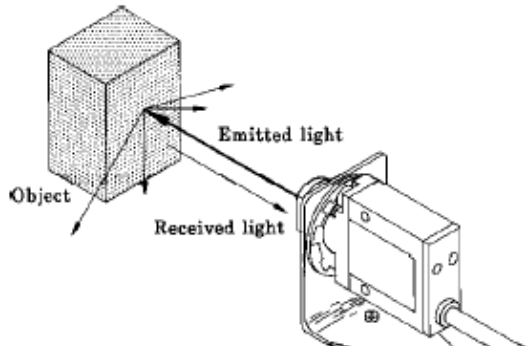
Retroreflective Mode Alignment

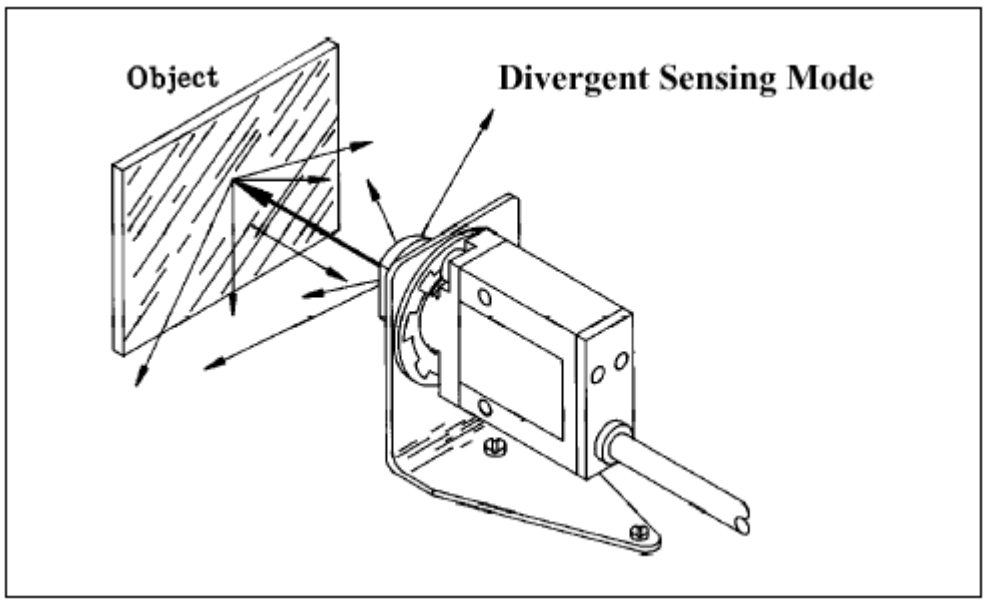
Retroreflective Mode Alignment:
Move Target Up-Down, Left-Right



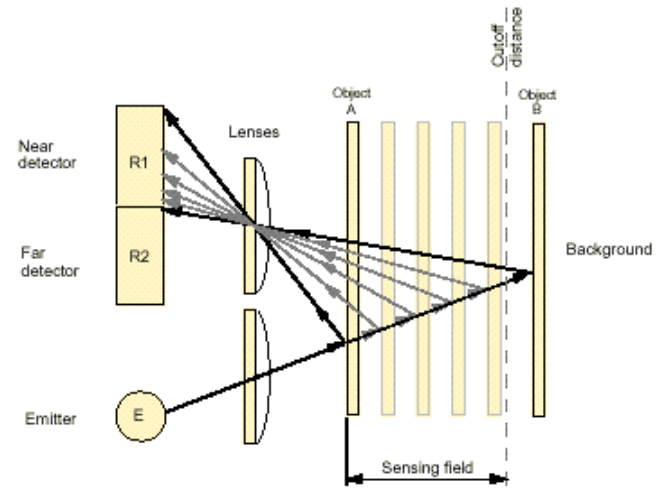
Proximity (Diffuse) Mode Alignment

Diffuse Mode Alignment:
Rotate Up-Down, Left-Right





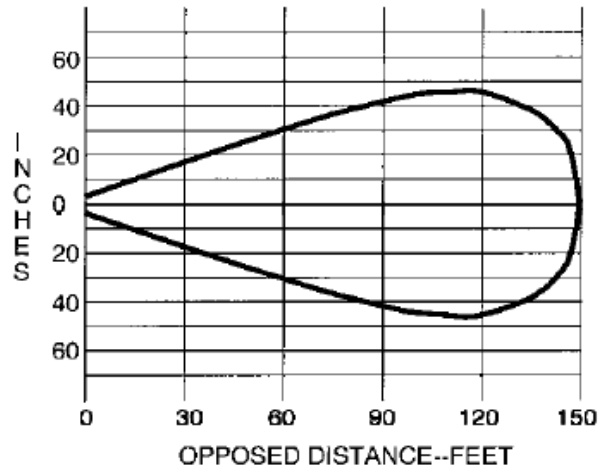
Fixed-field Diffuse Sensing



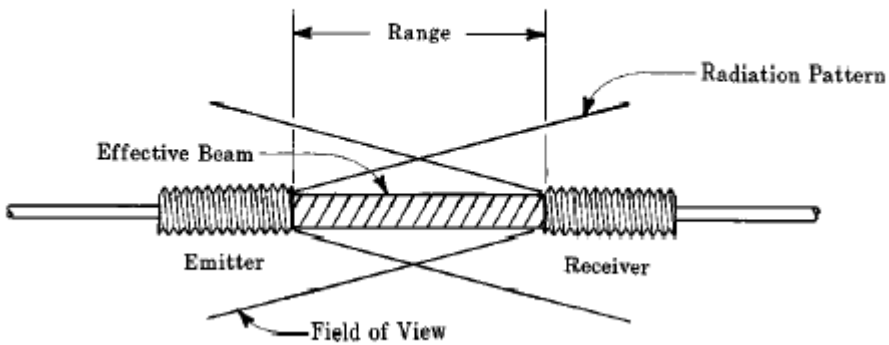
Object is sensed if amount of light at R1 is greater than the amount of light at R2

Beam Pattern and Reflectance

Typical Beam Pattern



Effective Beam

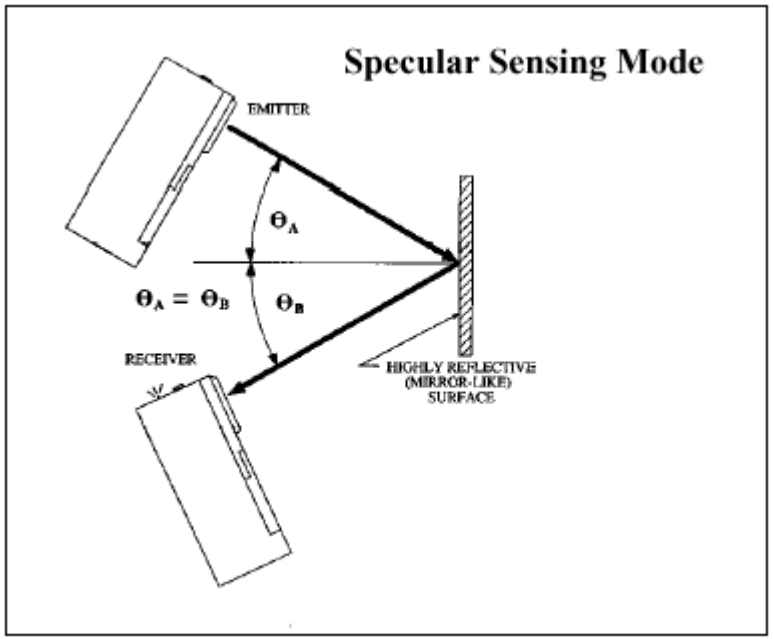


RELATIVE REFLECTIVITY TABLE

Material	Reflectivity (%)	Excess Gain Required
Kodak white test card	90%	1
White paper	80%	1.1
Masking tape	75%	1.2
Beer foam	70%	1.3
Clear Plastic*	40%	2.3
Rough wood pallet (clean)	20%	4.5
Black neoprene	4%	22.5
Natural aluminum, unfinished*	140%	0.6
Stainless steel, microfinish	400%	0.2
Black anodized aluminum*	50%	1.8

*NOTE: For materials with shiny or glossy surfaces, the reflectivity figure represents the maximum light return, with the sensor beam *exactly perpendicular* to the material surface

Specular Reflection



Modulation

- *"Chop" LED drive on and off at many kHz*
- *Bandpass filter after photodiode eliminates other frequencies*
- *Threshold circuit after BPF generates on/off output*