TR Electronic Presents

Laser Positioning & Measurement
Steve Cecchini

-Experience spanning two decades implementing sensor and feedback solutions in a multitude of different industries across North America.

-Currently the Regional Sales Manager of the Midwest.
Tristan Pawluch

-13+ years implementing, troubleshooting, piloting and retrofitting solutions for power generation and positioning feedback applications across North America.

-Currently the Applications and Training Supervisor for North America.
Agenda

• TR Electronic Overview
• Light & Optics
• Laser Positioning
• Laser Principles
• Applications
• Questions
TR Electronic Overview
TR Electronic is a:
Designer – Developer – Manufacturer – Distributor

Providing Measurement and Automation Solutions for the Manufacturing Industry for over 25 years!

TR Electronic is also proud to have a dedicated Training and Technical Service Center for all Industrial Positioning and Sensing Solutions.

Providing our Customers with OUTSTANDING Customer Service and Support

"Thank you for assisting today. My guys were impressed with your knowledge and ability to assist further than originally expected. The great level of service is what separates the great companies that will gain return business from the "Also-rans". “ - Line Manager, Plant Engineering - Electrical
TR Electronic – Your exclusive North American source for:

TR Electronic, SENSEable, di-soric, Microsonic, and PowerGap

Unmatched Technical Support and Customer Service 24/7, 365 Days of the year!

Let us earn your business – Our Goal, is Your Success
Light & Optics
Red Light

- Red objects reflect red light

- Laser light is also called “collimated” light.

- Collimated light holds its intensity strength for longer distances than diode or “cone shaped” light.

- Laser receiving optics are more sensitive to specific wavelengths of light than your eyes are.

- Red Light operates within a range of red-light wavelengths. 620-750 nm (400-484 THz)
Receiving Optics

- Receiving optics look for incoming light.
- Receiving optics can be structured using one photoelectric sensor or multiple photoelectric sensor built into an array.

- Array’s can be configured for one use, “Do I see or not”, or multiple uses, “x out of y sensors see, therefore good!”, OR, “perform a math function”
Laser Positioning
Laser Positioning /Measurement

- Absolute and Non-Contact
- Linear / Non-Linear Measurement
- Linearized Accuracy
- High-speed Linearized Positioning
- Able to Detect Moving Targets
- Fast Cycle Times
- 0-65m, 0-250m, 0-500m, 0-10Km
Laser Positioning / Measurement

- Reflector / Non Reflector Requiring Units
- Fast Integration Time (up to 1 ms)
- Easy to Use Configuration Utility
- Multitude of interface options
- Heating / Cooling options
• 5 Methods!

- Phase Displacement
- Time Of Flight
- Triangulation
- Through Beam
- Bar Code Reading

Short Range < 10m
Bar Code Reading:

- A wide laser beam is emitted across several bar codes.
- The position of the read codes is determined within the span of the wide beam using the multiple codes.
- Actual position is then calculated to within 1mm using code information & code position.
Through-Beam Sensors

- Optical Sensors which use separate emitters and receivers, to determine the presence of an object.
- Functions using one main principle:

Light Received
Through-Beam Sensors…cont’d

- Optical Sensors which use separate emitters and receivers, to determine the presence of an object.
- Functions using one main principle:

  Light Received
Parallel Laser Sensors

- Optical Sensors which use separate emitters and receivers, to determine the presence of an object.
- Functions using one main principle: **Differential Light Received**

![Diagram of Parallel Laser Sensors]
LLGT 081

- No Reflector Required
- Easy to Use Teach-In function
- Communication Protocols:
  - Analog (0(4)…20mA or 0…10vdc)
  - Configurable Digital Outputs
- 80 mm Fork Opening
- 20µm Resolution
- Smallest detectable object: 0.5mm (on switching o/p)
Triangulation:

- A beam is shot out at an object.
- The object reflects the light back to the sensor at different angles depending on its distance from the face of the sensor to the object.
- The reflected beam is received by an array and uses this information to calculate the received angle and in turn, the distance to target.
Time of Flight:

- A beam is emitted out to an object. Part of the beam is reflected internally.
- The object reflects the light.
- The unit measures the amount of time it takes to receive the beam back and calculates the distance accordingly.
Phase Displacement (shift):

- A beam is emitted out to a reflector.
- The reflector reflects the light, with a phase shift.
- The unit calculates the distance based on phase shift and frequency.
REMEMBER THE TUNNEL!!!

LE200 Test Tunnel
Linearization:

Defined: a linear approximation of a nonlinear system that is valid in a small region around the operating point.

Linear Measurement ≠ Linearization

Linear measurement = Straight line measurement
Non Linearized Lasers have a larger deviation which grows and Jumps or Spikes as distance increases.
Linearization ensures that there is not Jumping or Spikes in the error of accuracy. It is uniform through the measuring range.
Loop Control
Diameter Measurement
Imbalance Examination
Part Location /Detection

Offset mounting to get around blind zone.
Coarse Distance Measurement
Part Comparison – Part Sort
Part Comparison – Quality Control
Web Edge Detection / Control
Log Measurement  

Leaf Spring Forming
Metal Mold Cup Measurement
Overhead Gantry Crane Positioning

- Fine Positioning
- Moving Target
- Fast Cycle Time
Overhead Gantry Crane Positioning…Cont’d
Crane and Overhead Gantry Systems...again.

Printing and Packaging
Automated Warehouse Systems

• Fine Positioning
• Moving Target
Train Swing Bridge
AGV Application

For AGV’s which follow both linear and non-linear paths the BE 90 is the Perfect Solution.
Entertainment
Elevator Positioning
Application Summary

• Automated Storage & Retrieval - Video
• Cart /Trolley Positioning
• Overhead Gantry Systems
• Stage, Theatre and Entertainment
• Pharmaceuticals
• Paper and Printing
• Elevator Positioning
• Presence Detection
QUESTIONS?
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