

Dual Optics Noncontact Digitizing Probe

This optical range sensor is tailored to the home shop and light industry companies interested in adding scanning capabilities to its CNC machines. Noncontact ranging allows continuous scanning at high speed – no ‘stop/touch/withdraw/start’ cycles as required with mechanical probes.



FEATURES

- Dual detector optics allows precision measurement, even near edges
- Tremendous time savings over using mechanical probes to scan an object
- Noncontact - no tips to replace
- Mounting and set-up easier than a mechanical probe
- Not affected by ambient light
- \$2,500 estimated retail sales price

PROPOSED SPECIFICATIONS

Parameter	Proposed Specification
Measurement range (MR)	2.5 Inches
Near point of MR	4.0 Inches
Far point of MR	6.5 Inches
Resolution	0.001 Inches
Accuracy, best case	+/- 0.002 inches, over MR
Accuracy, wood surface	+/- 0.008 inches, over MR
Laser spot size at SO	< 0.003 Inches
Sample rate	300 samples/second
Scanning rate, max ¹	180 IPM at 0.01 inches steps
Output	Serial RS-232 up to 115KBaud. No analog, bluetooth, wireless, or radio.
Data latency	Range data captured within 1 msec of “Take Data” trigger
Laser	Visible red, 5 mW at 635 nm (class IIIa laser)
Power requirements	8-16 VDC at 125 ma
Power supply	12V power supply (wall plug) or optional 9.6V NiMH battery pack
Indicators	1 LED indicates good data, bad data and range
Enclosure size	4.0 x 2.0 x 3.0 inches
Enclosure	Anodized aluminum, water resistant
Weight	1 lb (0.45kg)
Cable configuration	10 conductor: power, trigger and serial data cable
Mounting	Tooling post, ½” diameter x 2” long, concentric to laser probe beam
Retail price estimate	\$2,500

¹ Maximum scanning rate of CNC machine based on 300 samples/second. 300 samples/sec * desired step increment = maximum scanning rate in inches per second.

CONSIDERATIONS

An optical triangulation (OT) sensor relies on the laser probe beam to be reflected back to the detector to measure range. Limitations in applying OT to CNC scanning relate to blocking, absorbing, or deflecting the laser probe beam.

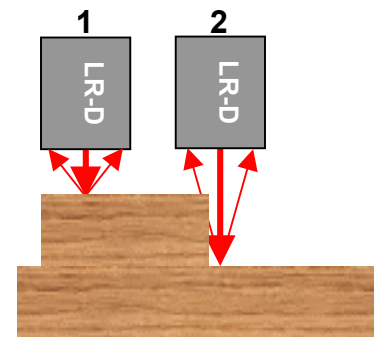
- Transparent and some translucent surfaces (wax, some foams) cannot be accurately measured.
- Surface relief greater than MR cannot be measured in a single pass.
- Narrow, blind holes cannot be measured.
- Due to reflection, the maximum angle of a target surface relative to the sensor face varies by type of material. For example; wood +/- 45°, opaque plastic +/- 25°, and metal +/- 15°.
- Cannot determine the profile of a vertical surface. Unit would need to be repositioned.

All scans will require some degree of manual review. This may be accomplished with modeling software.

OPERATION

Continuous scanning can be achieved because no z-axis movement is required to move from position 1 to position 2 as long as the step is within the measurement range of the probe.

Position 2 shows the condition where one detector is blocked from seeing the laser beam spot but an accurate reading is still achieved by the other detector. This virtually eliminates “blind spots” that have to be re-scanned at a different orientation.



SOFTWARE DEVELOPMENT REQUIRED

The Laser Digitizer is controlled by the CNC platform through its “Take Data” trigger input. The CNC manufacturer must develop software specific to its controller that triggers the “Take Data” line, captures the Laser Digitizer data at the serial port and groups it with the CNC X-Y-Z platform location. This produces 3D point cloud data of the part.

SCANNING SCENARIOS

The user must program the CNC machine to produce a raster pattern and to trigger the Laser Digitizer every xxx inches of travel.

	Scenario 1	Scenario 2	Scenario 3
Size of object to scan	2 x 2 inches	12 x 12 inches	24 x 48 inches
Data point spacing	0.010 inches	0.025 inches	0.050 inches
Scanning rate (IPM)	180	180	180
Estimated scanning time	< 5 min	~ 1 hour	~ 2 hours
# of data points	40K	230K	461K
Data points per second	300	120	60

Single Detector Digitizing Probe

Aculux is also considering a single detector digitizing probe that would have similar performance with reduced edge finding capabilities. It targets DIYers with more time and less money, retail price ~ \$1,000.