P-FINN™

Specification Manual

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Patent Pending

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1. Part Numbers and Descriptions

Part Numbers	Description	Bias Resistor (standard)
PFINN-R	P-FINN with Red LED	470 ohm
PFINN-G	P-FINN with Green LED	1 K ohm
PFINN-B	P-FINN with Blue LED	2.7 K ohm

2. Principal of Operation

The P-FINN is a cost effective method of identifying object presence and/or orientation, and/or color. The key to the design is simplicity. The P-FINN design includes both the LED light source and light sensor in a simple easy to mount assembly and is available with blue, green and red light sources. The intensity of the reflected light is related to the color of the object. The output signal is proportional to the reflected light.

Other than a power and ground connection, the only other necessary connection to the sensor is the Output. The LED will light up when power is applied from the Power to the GND pin. Optionally there is a LED Bias pin used to fine tune the LED's intensity.

3. Features

- Operating voltage from 3.0 V_{dc} – 5.5 V_{dc}
- Standard bed of nails probes used for connections
- Placement and/or orientation determined with one signal measurement
- Right angle mounting is easy to install
- Totally automated, no operator action required
- Significantly faster than operator inspection
- Optional bias for fine tuning the intensity of the internal LED

4. Applications

- Any test environment where placement and/or orientation test is required
- Used across a broad range of industries – automotive, telecommunication, network solutions, medical
- Quality control for most in-line manufacturing environments
- Polarized component or capacitor polarity testing
- Placement testing of many components on a PCB assembly that cannot be electrically verified.

5. Method of Operation

The P-FINN operates by reflecting light from the internal LED to a focal point and back to the sensor. The output of the sensor is a DC voltage proportional to the reflective light. The more light reflected the higher the DC output voltage.

5.1. Component Presence Testing

In the application of component presence light would reflect off of the object back into the sensor resulting in a high output voltage. If the object is missing light would not reflect back and would result in a low output voltage.

In the opposite situation, if the object was black and non reflective, a reflective surface behind the object could be used to reflect the light back if the object is missing. For example if a black component was mounted on a green printed circuit board. A green PFINN® could be used and a high voltage out would indicate a failure.

5.2. Component Orientation Testing

In the application of object orientation, the object must have a non-symmetrical color pattern. For example if the object was light in color and had a black orientation mark, the P-FINN would be aligned to a location so you will have either the dark non-reflective orientation mark or the reflective surface under the sensor. We recommend aligning to the smaller of the two. The sensor's DC output will be low if targeting the dark orientation mark. The sensor's DC output would be high if it was targeted at the lighter reflective surface. Typically, if the component is missing the output would be zero.

6. Considerations

6.1. Sensor Alignment and Distance

The focal point of the sensor is centered directly under the opening at the top of the sensor. The sensor face should touch the object under test for optimal operation. The targeted location on the object should be centered in the sensor opening. The bias or center pin in the drill pattern is the optical center of the device but is not the physical center.

6.2. Object Color

The amount of reflective light is proportional to the relationship between the color of the light and the color of the object it is reflecting off. For this reason the P-FINN is offered in three different models, blue, green and red.

7. P-FINN Options

The Blue P-FINN (P-FINN-B) is recommended for most applications. Please refer to the chart below for specific situations.

P-FINN®	Object	Background/ Fault Condition
P-FINN-B	Most	Most
P-FINN-G	Green / Yellow Black Non-clear coating	None Green / Yellow Green / Yellow
P-FINN-R	Red / Orange Black Non – clear coating	None Red / Orange Red / Orange

*For missing device, the fault condition is the background color.
*For reversed part, the fault condition is the color of the reserved area of the part.

8. Optional Bias Pin

The P-FINN is designed with an internal resistor used to bias the internal LED. The resistor is connected between the Power pin and the Bias pin. At 5V operation this supplies approximately 1–5mA of the maximum 30mA that the LED is rated for. The optional Bias Pin can be used to adjust the LED's light in the following ways.

- To increase the intensity of the light, a parallel resistor from the Bias pin to the Power pin can be added. The minimum combined resistance should be greater than 100 ohms.

- To decrease the intensity of the light a load resistor can be placed between the Bias pin and the GND pin.

- Apply a DC voltage to the Bias pin with reference to the GND pin according the chart below. Caution: This voltage will be directly across the LED and should be current limited with a series resistor.

BLUE sensor from 2.2V to a maximum of 3.0V
GREEN sensor from 2.3V to a maximum of 3.0V
RED sensor from 2.7V to a maximum of 3.0V

9. Properties

9.1. Dimensions

.380 inch x .235 inch x .150 inch (not including spring probes)

9.2. Power Source

The PFINN requires a minimal power voltage source, which may vary from 3.0 volts to 5.5 volts, current is typically 10mA@5V. Power is marked with a red heat-shrink on the lead. Ground is marked with a black heat-shrink on the lead. The Output has clear heat-shrink on the lead. The optional bias pin is the center pin and may have a colored heat shrink to indicate the LED color.

9.3. Sensor

The PFINN is available with three different sensor colors: Blue, Red and Green.

9.4. Recommended Test Flows

A) Turn on power to the device.
B) Optional. Adjust LED brightness using BIAS probe.
C) Measure Voltage on Output.

10. Sources of Error

10.1. Outside Light

Light from sources other than the device being tested should be prevented from reaching the sensor surface while making measurements.

10.2. Distance

As the object being tested moves further away from the sensor's focal point the intensity of the reflected light is rapidly diminished. The object being tested should touch the sensor's face plate or intensity should be increased using the bias pin.

11. Verifying Operation

After mechanical installation of the sensor, it should be verified for proper operation before use in production. One simple step in this process may be to measure the diode drop from the Bias pin to the GND pin and also verify that the LED lights up.

The DC output voltage should also be checked to insure that there is enough difference when light is reflected back into the sensor and when it is not. After this is accomplished the test's voltage limits can be determined to either pass or fail a device. The easiest way to do this is to check the limits with the object placed and orientated properly and with it absent or reversed. If the DC output voltage difference is not large enough to detect a fault, the sensor's optional Bias pin may be used to change the intensity of the LED or another color P-FINN® maybe better suited for the test surface. It is also important to check to insure the face plate of the sensor is hitting the object.

12. Fixture Considerations

At the end of this document there are drawings to assist in fixture design issues.

12.1. Wiring

Red (Power) to Vdc (switched 5V typical)
Black (GND) to Ground (0V ref)
Clear (Output) output to measurement device or switch matrix
N/A (Bias) see notes on optional bias pin above.

12.2. Distance from sensor to target

As the object being tested moves further away from the sensor's focal point the intensity of the reflected light is rapidly diminished. The object being tested needs to touch the sensor face plate. The sensor is mounted on spring loaded probes and can be slightly compressed to insure that the object is touching the face plate.

13. Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)†

Supply voltage, VDD (see Note 1)	6.0 V
Duration of short-circuit current at (or below) 25°C	5 s
Operating free-air temperature range	TA 0□C to 70□C
Storage temperature range	–25□C to 85□C
Maximum current for output	±10 mA

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND lead.

14. Recommended Operating Conditions

	MIN	NOM	MAX	UNIT
Supply voltage, VDD	3.3	5	5.5	V
Operating free-air temperature range, TA	0	25	70	Celsius
Supply current	-	8	13.5(Note 1)	mA

Note1: LED’s DC max forward current 10mA plus Detector’s max supply current 3.5mA

15. 5-V DC Electrical Characteristics

Characteristics (1)	Symbol	Min	Typ.	Max	Unit
Dark voltage	Vd	0	-	20	mV
Max Output Voltage Switch	Vom	4	4.2	-	V
LED forward voltage	Red Vf	-	2.2	3	V
	Green Vf		2.3	3	V
	Blue Vf		2.7	4	V
LED forward current		-	TBD	30	mA

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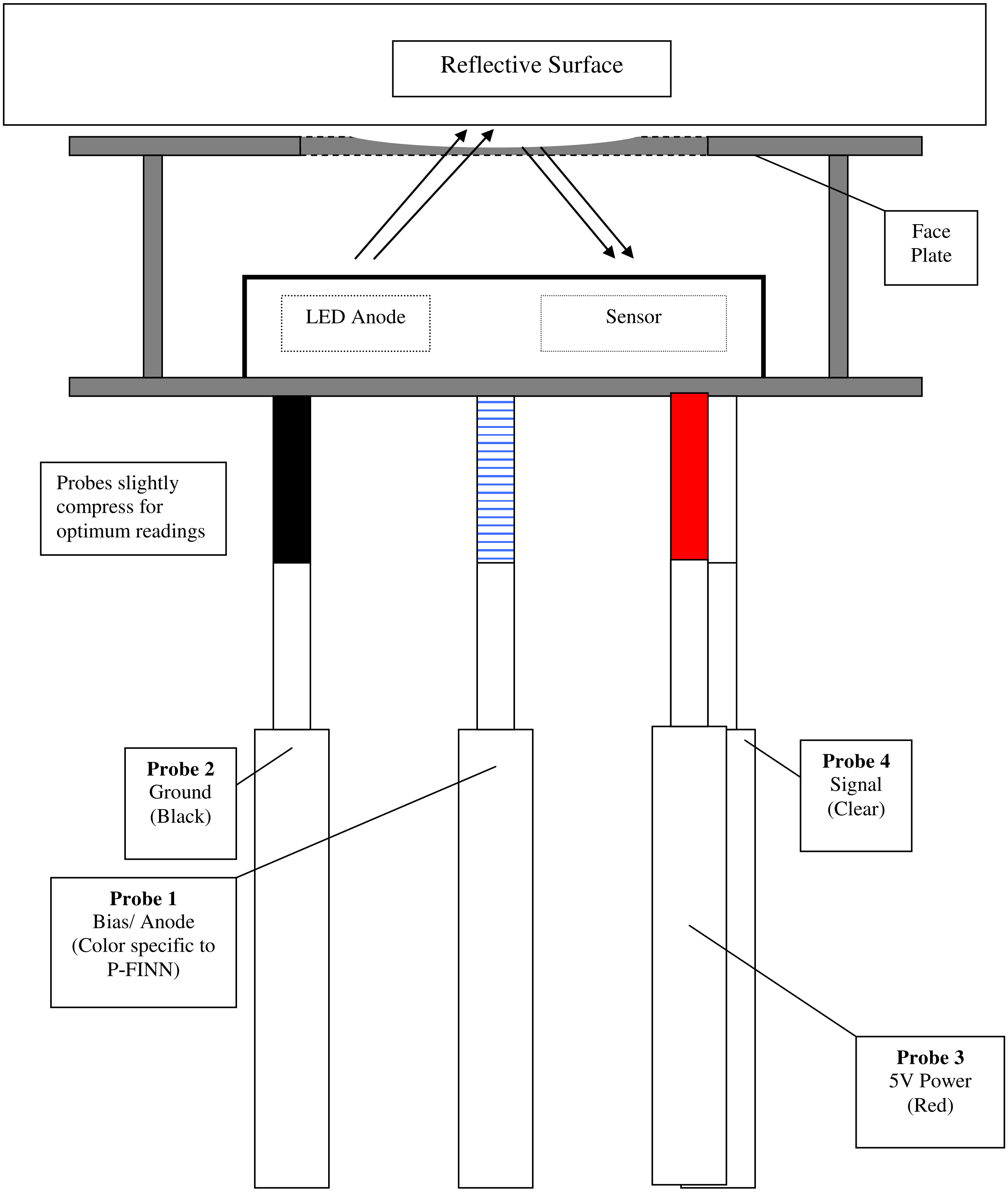
16. Functional Block Diagram



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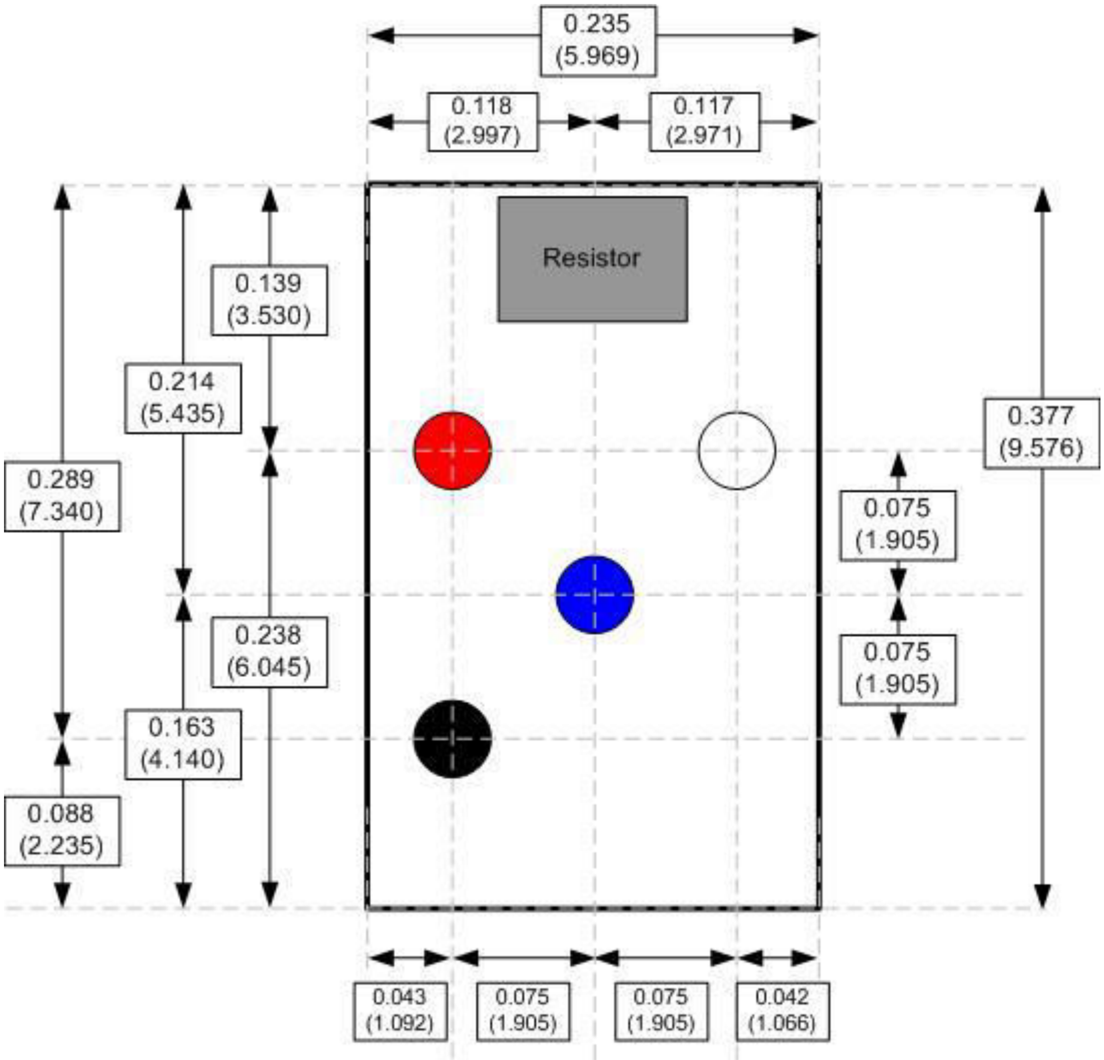
17. P-FINN Diagram – Bottom View

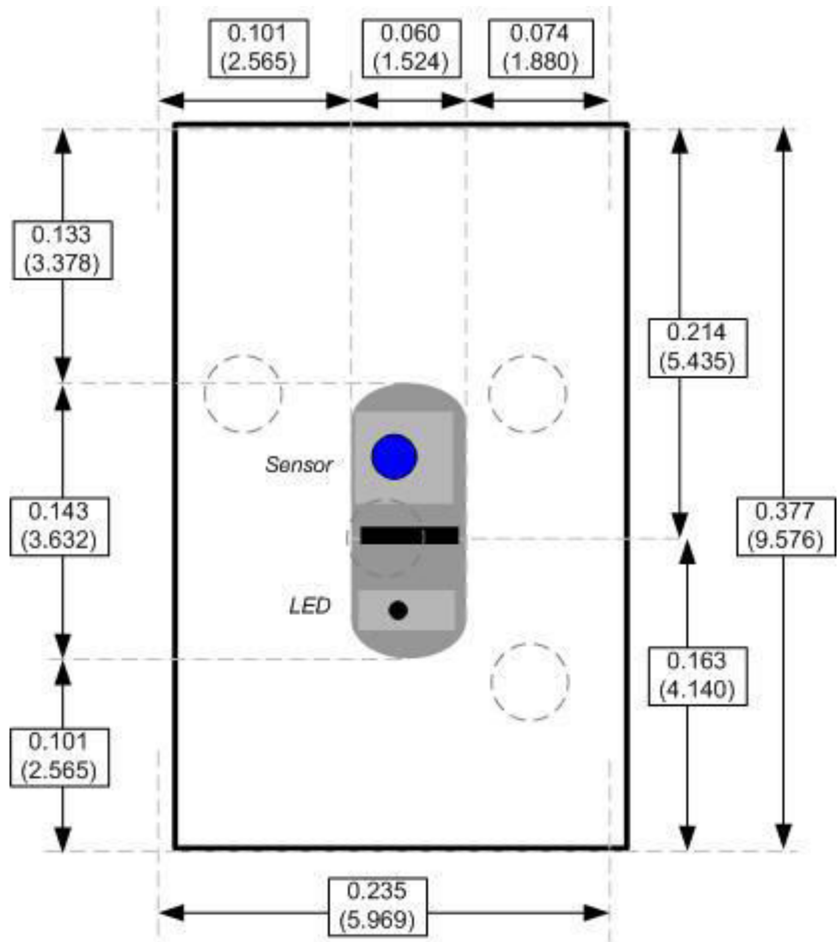


Note: Tolerance +/- 10%

Inches
(mm)

PFINN-B
Bottom View

18. P-FINN Diagram – Top View



Note: Tolerance +/- 10%

Inches
(mm)

PFINN-B
Bottom View

19. Technical Support

Our product engineers are available to assist you with choosing the correct FINN™ product to fit your specific needs as well as to answer any technical questions you may have regarding installation and/or implementation.

Please contact us at:

Email: FINNsales@FINNTest.com

Phone: 224-662-0383

20. Revision History and Control

20.1. Rev A - January 2016

- Logo and layout changes for manual only.

20.2. Rev A - February 2004

- Initial release.