

Comparing My Analog Electronic Edge Finder to my Software-Defined Edge Finder, Version 1.0

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Conclusion

I love both of my Edge Finder children. But with a cold eye toward performance and cost, the [Software-Defined Edge Finder](#) (SDEF), is better than the [Analog Electronic Edge Finder](#) (AEEF). The AEEF is easier to fabricate if the user does not know how to program an ATTiny-85.

Performance

I have twice seen the spindle resistance drop² to a small value during the CNC auto touchdown process while the probe was moving away from the reference surface. Although rare, it has devastating consequences since a crash will follow. This may not be an issue if the AEEF is used on a manual machine.

The SDEF sees this drop as a touchdown, so it will cause the CNC system to safely stop prematurely. The user must look for the gap between probe and surface and understand that the registered touchdown value is wrong.

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² I found swarf bridging the gap between spindle and machine body around the spindle bearing. This might have been the root cause but I can't be sure.

The AEEF will see this drop, but the CNC system will not look for it if the probe is moving away from the reference surface. There is a race between this retract time and when the touchdown signal is active. Out of more than one hundred cycles, I had one crash. That is all it takes for me not to trust the AEEF. Increasing the touchdown signal active time will help, but that is no guarantee. I have that guarantee with the SDEF because it continuously monitors this resistance.

A Detailed Comparison

subject	SDEF	AEEF	notes
Power	Battery	USB	Battery rarely needs to be changed and is one less cable to attach but USB power always there. The SDEF does a battery test at the start of each cycle.
Parts count	10 resistors, 3 caps, 2 transistors, 2 LEDs, 2 optos, ATTiny-85	15 resistors, 6 caps, 3 transistors, 1 LED, 2 optos, LM393B	D1 in the SDEEF is not needed so not counted.
Cost			SDEEF costs less. An ATTiny-85 can cost less than an LM393B.
Physical size	1.6" x 2" Single sided	2.2" x 2.9" Double sided	This assumes through-hole components. Surface-mount would be much smaller.
Algorithm	Measures pre and post TD; monitors continuously	Edge detects continuously	See the performance discussion on the last page.
Sensitivity	0.1 ohms	0.124 ohms	About the same

The SDEF has far more complexity than the AEEF, but it is in the software.

Given a programmed ATTiny-85, the SDEF uses fewer parts, a smaller and simpler board, and costs less than the AEEF.

I welcome your comments and questions.

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