ReadMe: A Guide to My Electronic Edge Finder Journey, Version 1.0

By R. G. Sparber

Recently my friend John Herrmann pointed out the mess I have made over the years as I documented my quest to find the ideal Electronic Edge Finder (EEF). As with anything that grows slowly, I was unaware. John then suggested the outline used here to sort it all out for the reader.

The Starting Point

Title: The Problem that is Solved by The Ultra Low Resistance Electronic Edge Finder, version 1
Date of last update: 6/19/2012
Number of pages: 6
URL: http://rick.sparber.org/ueef.pdf
Description: The structure of a lathe is explained with respect to electrical resistance. This understanding is useful in seeing why the various EEF work.

The Destination

Title: Universal Low Cost Electronic Edge Finder for use in a Machine Shop, v4.1
Date of last update: 8/25/2016
Number of pages: 58
URL: http://rick.sparber.org/MCEEF.pdf
Description: I'm not often fast but I am persistent. After more than 3 years of thinking about the problems discovered while developing the Lathe Electronic Edge Finder (LEEF) series of circuits, I finally hit on a solution. It has fewer parts count because a key component of the design is a Harbor Freight Multimeter. The

central strategy was to replace a lot of electronics with human judgment. I have repeated some of the theory presented in past articles.

Title: A Resistance Amplifier, version 1.2
Date of last update: 8/1/2013
Number of pages: 21
URL: http://rick.sparber.org/electronics/ramp.pdf
Description: Although the Resistance AMP (RAMP) can be used as an EEF, it is actually a milliohm meter. It can measure down to 0.1 milliohms while using a test current of about 10 milliamps. The circuit uses a Harbor Freight Multimeter which keeps the cost and parts count down. Features include automatic power control. I use this instrument often and have found it reliable and accurate.

The Rest of the Journey (302 pages worth of learning)

Title: Tune In for Better Electronic Edge Finder Accuracy
Date of last update: 4/3/2007
Number of pages: 3
URL: http://rick.sparber.org/Articles/ea/ea.pdf
Description: This article deals with commercial edge finders like the Fowler Electronic Edge Finder 54-575-600-0. Most mechanical edge finders spin as they detect touchdown. Electronic versions can also spin. But if you have reason not to spin the edge finder, total indicated runout must be addressed. The logic and math related to this compensation are presented.

Title: An Electronic Edge Finder - Simple Mechanical and Relatively Complex Electronic for use on a Mill
Date of last update: 5/16/2012
Number of pages: 2
URL: http://rick.sparber.org/meef.pdf
Description: I had developed an EEF for the lathe (http://rick.sparber.org/rctf.pdf). This short article demonstrates how it can be used on a mill.

Title: An Ultra Low Tech, Low Cost Electronic Edge Finder
Date of last update: 5/28/2012
Number of pages: 8
URL: http://rick.sparber.org/lteef.pdf

Description: By insulting the cutter on a lathe, a simple continuity checker can be used as an EEF.

Title: An Ultra Low Resistance Continuity Checker
Date of last update: 6/10/2012
Number of pages: 23
URL: http://rick.sparber.org/electronics/ueef.pdf
Description: This was my first step in developing a user friendly EEF able to handle low spindle electrical resistance. It is complex and ultimately not acceptable. The test current was high enough to concern some potential users. Could the current damage bearings? No way to prove it. This high current also required the use of a large battery. Well, I had to start some place. Subsequent designs solved all of these issues.

Title: A Precision Electronic Cutter Touch-down Detector, version 7
Date of last update: 7/6/2012
Number of pages: 15
URL: http://rick.sparber.org/rctf.pdf
Description: The complexity of the EEF is a function of sensitivity. Given a relatively large bearing electrical resistance, the EEF can be fairly simple. This design has automatic power control and audible output. The audible touchdown indication enables the user to keep their eyes on dials rather than having to look back and forth between touchdown indicating light and dials. On the other hand, I found the sound annoying over time. This design was intended to be used on a lathe but later was found to work on my mill too.

Title: A Self Compensating Electronic Edge Finder, version 6.0
Date of last update: 7/8/2012
Number of pages: 66
URL: http://rick.sparber.org/sceef.pdf
Description: This EEF deals with very small bearing electrical resistance. A key part of the solution is to employ a Kelvin connection to avoid probe resistance. When dealing with resistances in this range, there is a lot of variation in the pre-touchdown value. The circuit attempts to compensate for this variation. Later circuits use fewer parts and are more reliable.

Title: A Noise Canceling Electronic Edge Finder, version 2.1
Date of last update: 8/8/2012
Number of pages: 14
URL: http://rick.sparber.org/NCEEF.pdf

Description: Field experience taught me that when dealing with very small bearing electrical resistances, the voltage being processed is on the order of millionths of a volt. It was not hard to pick up noise from 60 Hz power that was far larger than my desired signal. This circuit overcomes the noise by using it to define the touchdown threshold. Better methods were found later in my journey.

Title: Lathe Electronic Edge Finder, Model 1,version 0.1, document version 2.2
Date of last update: 11/27/2012
Number of pages: 34
URL: http://rick.sparber.org/LEEF_Model_1.pdf
Description: This EEF is designed to handle spindle electrical resistances above 2 ohms. The circuit is almost identical to http://rick.sparber.org/rctf.pdf except that the beeper has been replaced by an LED. The major advantage of this circuit is that it tells the user when the spindle resistance is too low to detect touchdown. It also tells the user when the probes are not making good contact. The most significant change is the repackaging of the circuit to a double sided commercial grade circuit board that was designed by Mark Cason. The original intent was for Mark to be involved in selling this design as part of a suite of EEF that covered a range of resistance values. The plan was put on hold when it was discovered that customers had difficulty figuring out which model to use.

Title: Lathe Electronic Edge Finder, Model 2, version 1.0
Date of last update: 12/3/2014
Number of pages: 111
URL: http://rick.sparber.org/LEEF_Model_2.pdf
Description: This EEF is designed to handle spindle electrical resistances between 0.01 ohms and 2 ohms. An essential part of this circuit is the layout of the double sided circuit board. It was masterfully designed by Mark Cason using rules generated from analysis of prototypes plus past experience. The circuit can process voltages down to 5 microvolts in the face of noise 40 times larger than that. The original intent was for Mark to be involved in selling this design as part of a suite of EEF that covered a range of resistance values. The plan was put on hold when it was discovered that customers had difficulty figuring out which model to use. Field testing of this circuit showed that it was not reliable. It looked for abrupt changes in resistance at touchdown but could not warn the user when the bearing electrical resistance was too small to permit this change. This problem was solved with a later design.

Title: Lathe Electronic Edge Finder Model 1.5,version 0.1
Date of last update: 12/29/2012

Number of pages: 15
URL: http://rick.sparber.org/LEEF_Model_1.5.pdf
Description: This EEF is designed to handle spindle electrical resistances between 0.2 ohms and 2 ohms. The circuit is similar to the Model 1 except it uses a Kelvin Connection to overcome contact resistance. The major advantage of this circuit is that it tells the user when the spindle resistance is too low to detect touchdown. The circuit uses a double sided commercial grade circuit board that was designed by Mark Cason. The original intent was for Mark to be involved in selling this design as part of a suite of EEF that covered a range of resistance values. The plan was put on hold when it was discovered that customers had difficulty figuring out which model to use. Since the intent was to sell fully assembled boards, no parts list was supplied.

Title: Measuring Small Resistances, version 1.2
Date of last update: 12/4/2012
Number of pages: 11
URL: http://rick.sparber.org/electronics/kelvin.pdf
Description: Using a Harbor Freight Multimeter , a resistor, and a battery, a person can measure very low resistances. The original intent was for potential customers of the LEEF to use this procedure to figure out which model they needed. We discovered that the resistance varied over time so the data was not useful.

I welcome your comments and questions.

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