microbridge

APPLICATION NOTE

Rejustor™ Calibration Guidelines

Integrating the ***Rejustor*** – High-Precision Adjustable Resistor

1 Introduction

The ***Rejustor***, an adjustable analog micro-resistor, from Microbridge Technologies represents a major technological improvement for analog compensation. ***Rejustors*** provide adjustment capability in both down and bi-directional mode. Down adjustment decreases the resistance of the ***Rejustor***, in a range from 0 to at least 30% below the as-manufactured resistance. Bi-directional adjustment can be used to increase or decrease the resistance of the ***Rejustor***, over a more limited range. The bi-directional adjustment range is dependent on position within the adjustment range. The maximum bi-directional adjustment range is 5% when the resistance is typically 30% below the as-manufactured value.

2 Going Down

Overall down adjustment range is from the as-manufactured resistance to at least 30% of that resistance. For example, a 10KΩ ***Rejustor*** has a down adjustment range from 10KΩ to below 7KΩ.

Figure 1, below, shows three examples of down adjustment. Sample 1 was adjusted by 29%. Sample 2 was initially adjusted 19%, and then adjusted down an additional 9% from that value. Sample 3 was adjusted 10% down. All three samples could be subsequently bi-directionally adjusted from those end-points. Samples 2 and 3 could be further adjusted down.

A ***Rejustor*** can be reduced to 70% of its as-manufactured value with a typical precision of 0.1% (as determined by Microbridge ***Rejustor*** Calibration Tools). However, practically speaking, in the first (upper) 10% it is only possible to decrease the resistance of the ***Rejustor***. Bi-directional adjustment is easier after the ***Rejustor*** has traversed this first 10%.

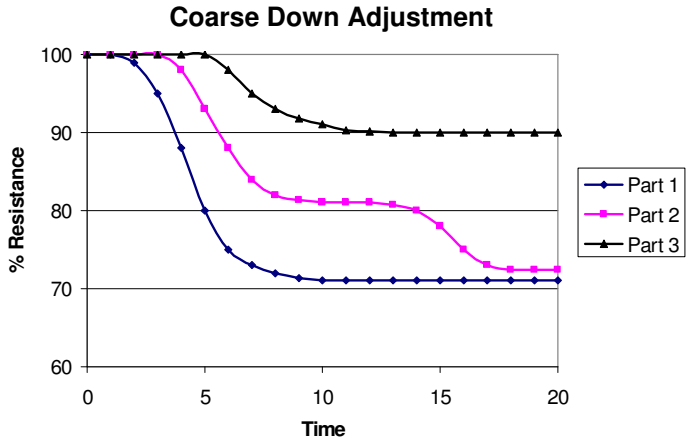

Figure 1: Example of *Rejustor* Adjustment

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3 Bi-directional Adjustment

Bi-directional adjustment is used for precision adjustment of the ***Rejustor*** and can be performed many times within a finite range. The bi-directional range depends upon the difference between the present resistance and the as-manufactured resistance. The bi-directional range increases as this difference increases.

This behavior is summarized in Figure 2. The initial portion of the graph shows a resistance decrease from the as-manufactured, in several steps (similar to Figure 1) to an overall decrease *'**a**'*. After the resistance reaches the desired target range (shown by the square at *point '**e**'*), bi-directional adjustment is possible within a range **above** that limit (the red line through *points '**c**' and '**e**'*). *Range '**b**'* is the bi-directional range, which is dependent upon the size of *'**a**'*. If the ***Rejustor*** is further reduced lower than the line at points *'**c**'* and *'**e**'* a new bi-directional range will be defined from that point.

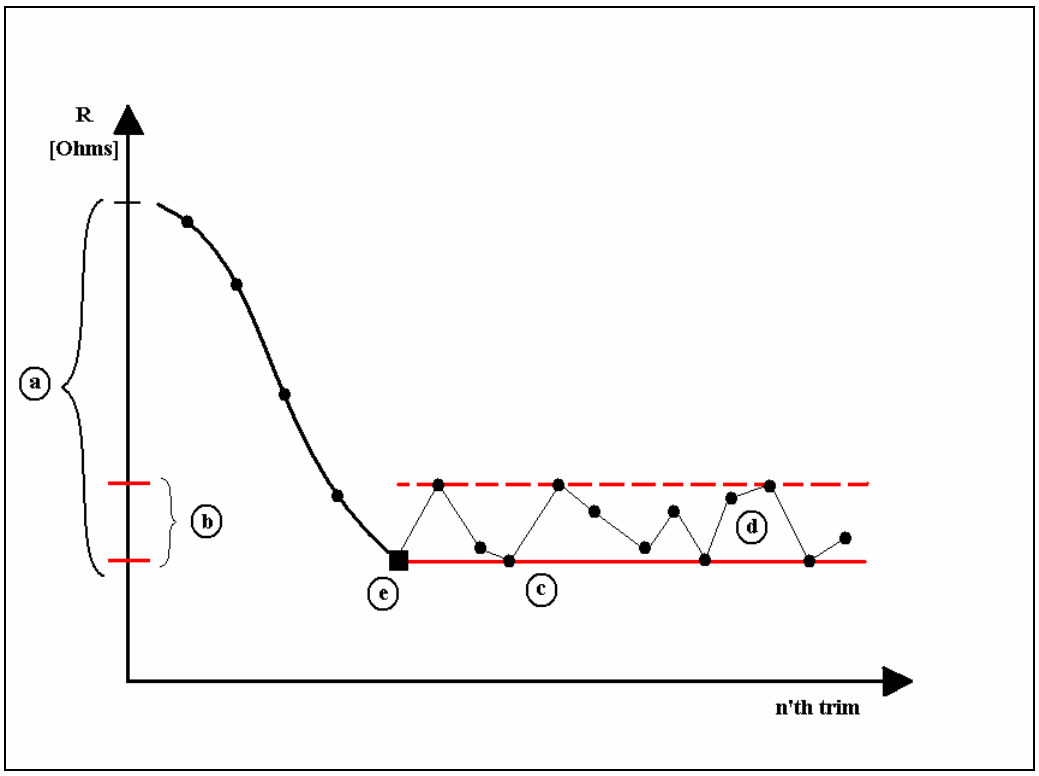

Figure 2: Bidirectional Range - Example 1

Variations in the resistance adjustment range for a ***Rejustor*** are shown in Figure 3. Assume *Range '**a**'* represents the ~30% range of a ***Rejustor*** and *Range '**b**'* is the 5% bi-directional range near the bottom of that 30% zone. In that case ***b'*** and ***b"*** represent the bi-directional ranges available at ~15% and ~10% down from the as-manufactured resistance, respectively.

The bi-directional range at ***b"*** is limited since this is the transition from the upper 10%, where bi-directional adjustment is slower. The bi-directional range at ***b'*** is approximately 2 to 3% of the overall resistance of the ***Rejustor***. (E.g. for a 10KΩ sample, the bi-directional range at ***b'*** is approximately 250Ω.)

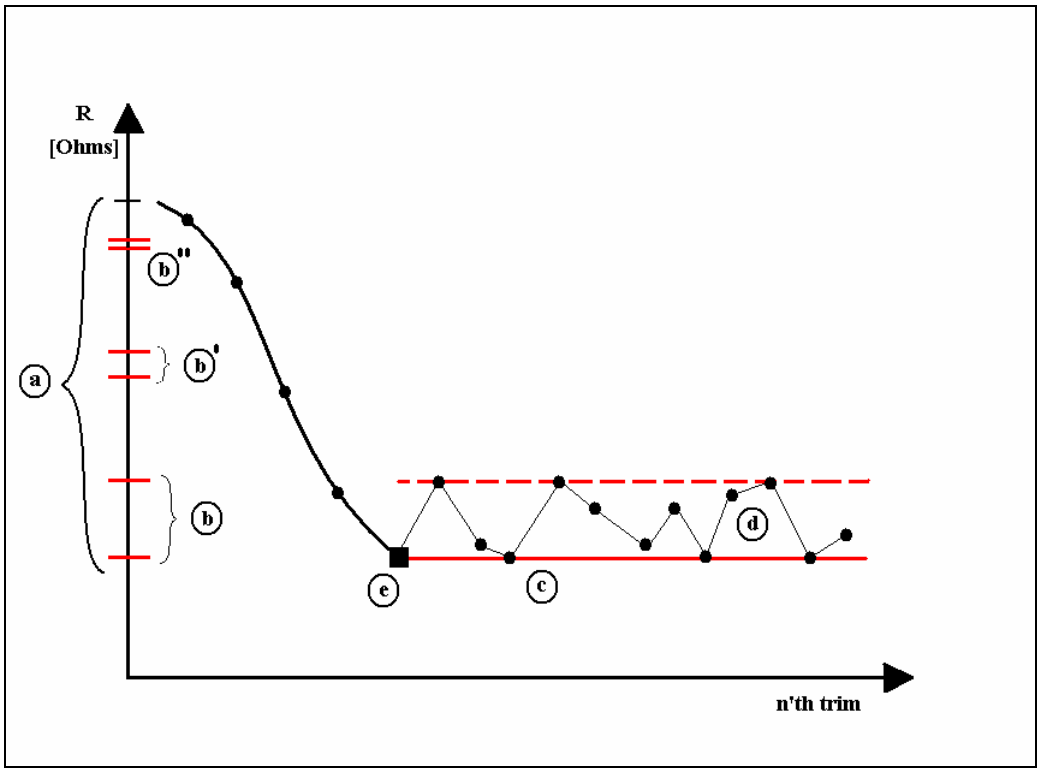

Figure 3: Bidirectional Range - Example 2

The relationship between bi-directional range and the amount of down adjustment from the as-manufactured value is shown below. The chart is based on a small number of samples, and should be viewed as a rough guideline to ***Rejustor*** bi-directional adjustability range.

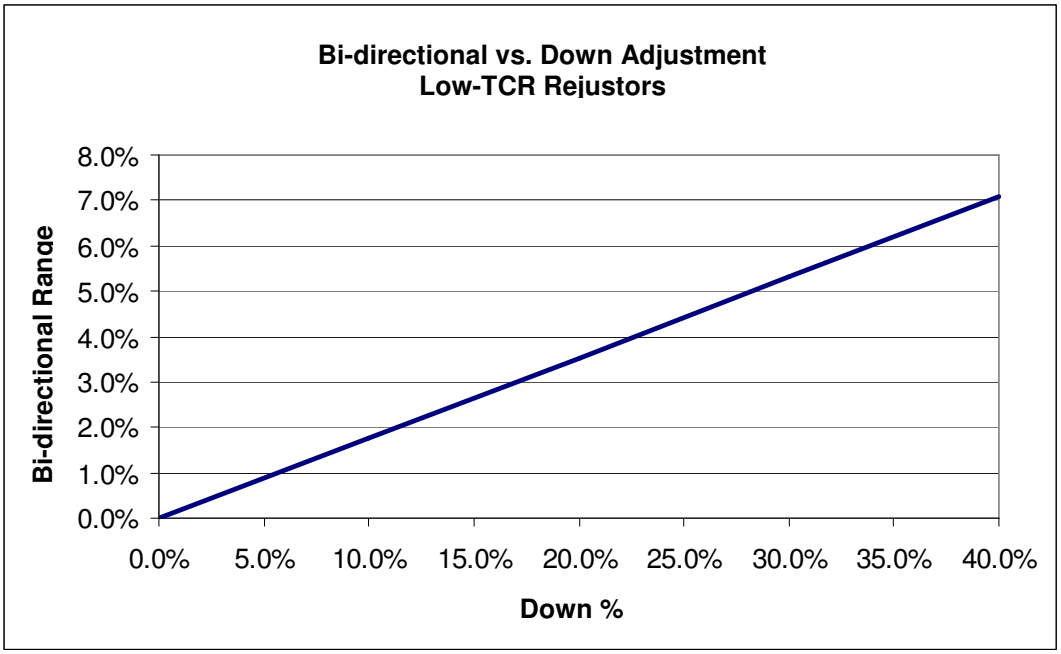

Figure 4: Bi-directional Range versus Down Adjustment

4 Summary

The resistance of ***Rejustors*** is adjustable up or down in a range from the as-manufactured value to at least 30% lower. Bi-directional adjustment is generally available only after traversing the first 10% from the as-manufactured resistance. The bi-directional range increases as the difference between the present resistance and the as-manufactured resistance increases. ***Rejustors*** can be adjusted up 1.5% to 5% of the amount they were reduced from the as-manufactured value. Bi-directional adjustment can be performed many times without compromising range or precision.

Rejust-it software algorithms are designed to adjust slightly below the target and then fine-adjust to a precise target. The software enables up and down adjustment with down being easiest and quickest. It is important to understand ***Rejustor*** behavior when establishing targets, precision and pre-trim (if applicable).

Using *Rejust-it* software with reasonable care will ensure the adjustment process does not overshoot the target to such an extent that bi-directional adjustment to the target is no longer possible. These algorithms have been designed to achieve typical precision of 0.1% or better anywhere within the adjustable range.