

Chapter 1 – Introduction

1.1 The Parts of a Slide Rule:

The following are the names we will be using throughout this book to describe the various parts of a Slide Rule.

1. Upper Body – or Stock
2. Lower Body – or Stock
3. Slide
4. Cursor
5. Hair Line

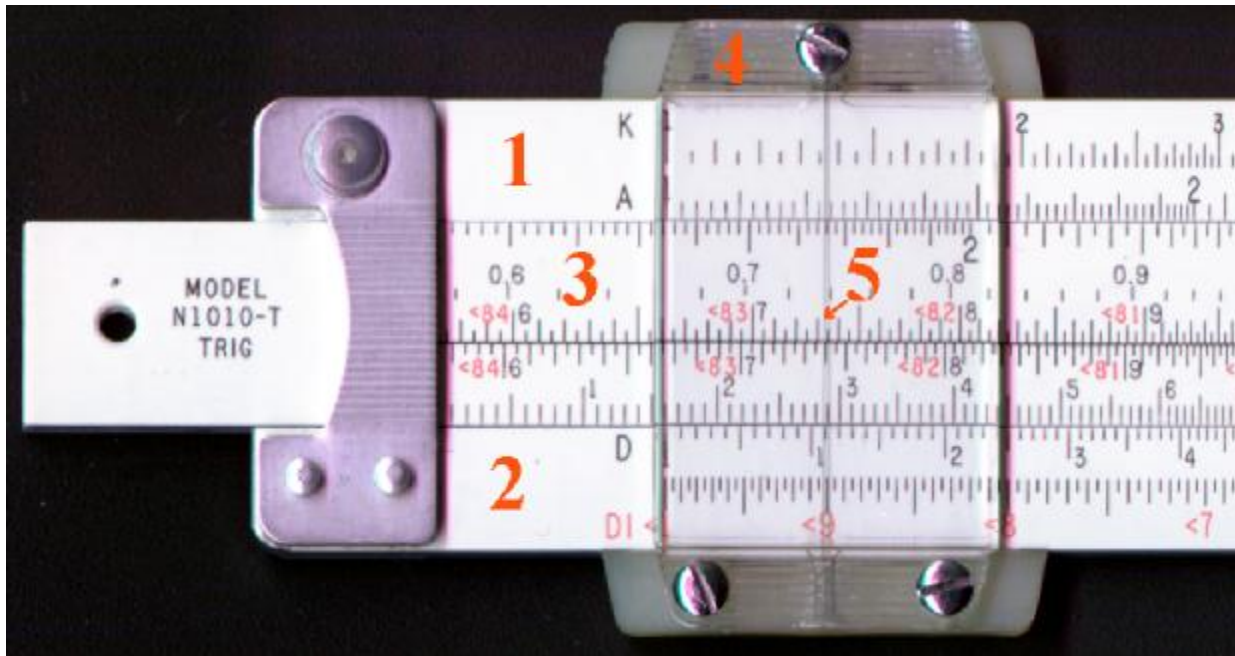


Fig 1-1

1.2 The C and D Scales

These two scales are the basic scales of the Slide Rule. The C scale is found on the lower edge of the slide and the D scale on the upper edge of the lower body. We will use the C and D scale for multiplication and division, and in later units we will see that all of the other scales on the Slide Rule are related directly to them.

For the first four units of this book we are going to forget all other scales and learn about the form and uses of the C and D scales.

The C and D scales are labeled from left to right beginning with the Left Index of 1 to the Right Index of 10. (Some Slide Rules may have the divisions extended past these values, and this is an advantage).

In Fig 1-2 you will notice (as on your Slide Rule) that the Primary Graduations (numbers) from 1 to 10 on the C and D scales are not evenly spaced. These scales are what we call logarithmic scales. That is, although the labeling is according to ordinary numbers the spacing or divisions between these are the logarithms of the numbers. You do not have to know about logarithms to use your Slide Rule, but if you have a knowledge of logarithms you will be able to understand how these scales work. If we check with a logarithm table we would find that: -

$$\begin{aligned}\text{Log}_{10}1 &= 0.0000 \\ \text{Log}_{10}2 &= 0.3010 \\ \text{Log}_{10}3 &= 0.4771 \\ \text{Log}_{10}5 &= 0.6990 \\ \text{Log}_{10}10 &= 1.0000\end{aligned}$$

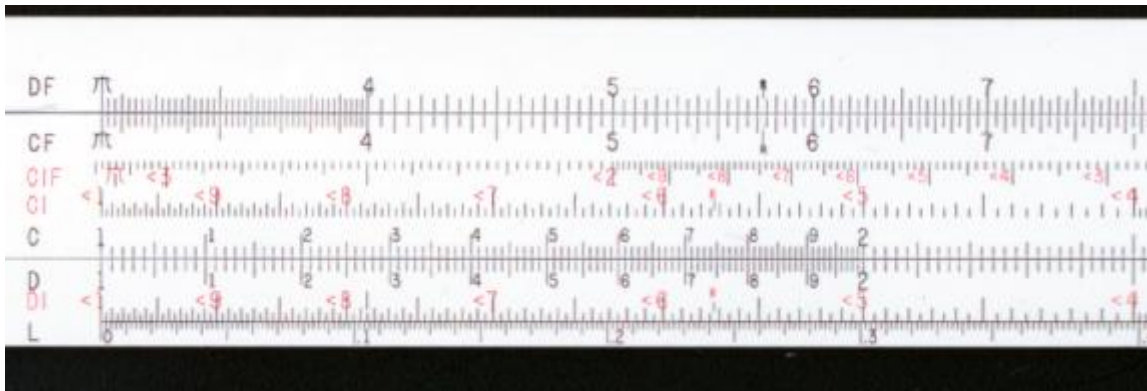


Fig 1-2

Thus when the numbers 1, 2, etc are placed on the C and D scales, their position is according to their logarithm. That is, 1 is no distance along, 2 is at the point .3010 of the distance along the scale, 3 is placed 0.4771 on the distance along the scale, and 10 is at the extreme end. This if your Slide Rule scale was exactly 10 inches long, you would find 2 at 3.01 inches, 3 at 4.771 inches, 5 at 6.99 inches and 10 at 10 inches.

1.3 Reading the C and D Scales

The upper scales in Fig 1-2 show the C and D scales divided into the Primary Graduations, that is 1, 2, 3, . . . 10. In the lower scales in Fig. 1-2 you will note that these have been further divided into tenths or Secondary Graduations. The graduations immediately after 2 thus reads 2.1, or the graduations immediately before 7 reads 6.9.

On your Slide Rule you will notice that there are still further subdivisions. These divisions are called the Tertiary Graduations and they vary along the scale as shown in fig. 1-3.

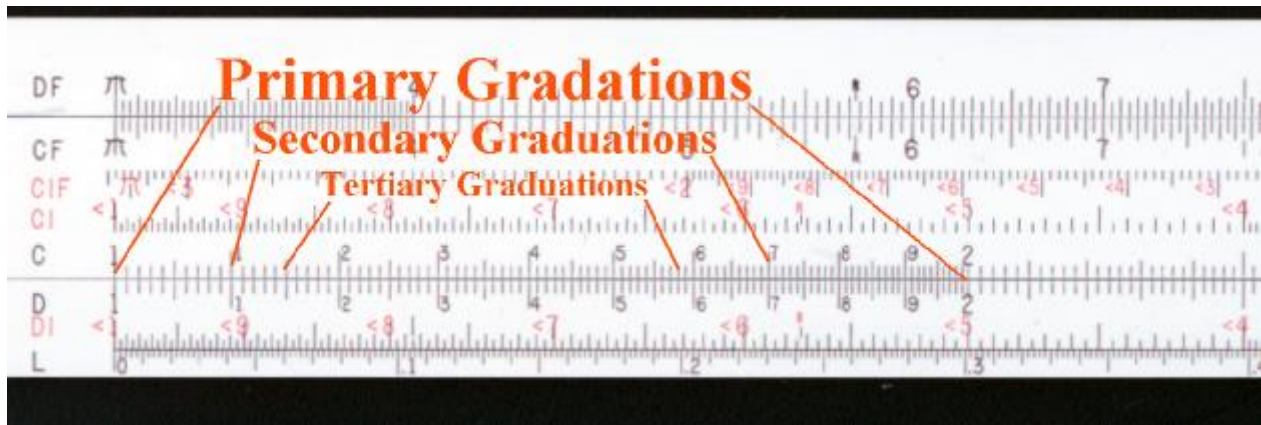


FIG 1-3

The C and D Scales are in Three Sections

- (i) From 1 to 2 each small division is 0.01.
- (ii) From 2 to 4 each small division is 0.02.
- (iii) From 4 to 10 each small division is 0.05.

Thus the graduations immediately after 15 is 151, the graduation immediately before 3 is 298 and the graduation immediately following 7 is 705.

It is not just a case of learning off by heart these variations of scale divisions, but also practice at reading them. It is the same as reading a ruler with different divisions such as eighths, tenths, etc.

Even though the C and D scales are labeled from 1 to 10, this does not restrict us to this range of numbers. We can think of 1 as being 10 and 10 as being 100, then 3 is read as 30, 7 as 70, etc. Or if we take 1 as 100 and 10 as 1000 then 2 is read as 200, 4 as 400, etc. On the other hand if we take 1 at 0.1 and 10 as 1, then 5 is read as 0.5 and 9 as 0.9, etc. We treat .025, 2.5, 25, 250 etc. all as the same point on the C and D scales. The positioning of the decimal point for answers will be discussed at length in Chapter 2.

Exercise 1(a)

Find the following values on your C and D scales by using the Hair Line or Cursor.

- | | | | |
|-------|---------|--------|-------|
| (i) | 114 | (vi) | 5.75 |
| (ii) | 0.163 | (vii) | 755 |
| (iii) | 19.8 | (viii) | 0.009 |
| (iv) | 2700 | | |
| (v) | 0.04125 | | |

1.4 Accuracy of the Slide Rule

With a ten inch Slide Rule we can generally read off three significant figures from the C and D scales. This is sometimes a little difficult at the right hand end, while at the left hand end sometimes we can manage four figures. Always try to estimate the value of the number you are reading when it does not fall exactly on a graduation.

Three significant figures means the error is about one part in one thousand of 0.1%. For all practical engineering purposes this is well within accepted limits. Of course a smaller Slide Rule is less accurate and a 20 inch one would give four significant figures or 0.01% error. Ten inch Slide Rules such as the Faber-Castle 2/N83 have 'root scales' ('W scales') which are 20 inch scales split and fitted on a 10 inch rule. These scales give the accuracy of four figure logarithm tables.

In later units we will note that by decreasing the number of moves required in a calculation, or by eliminating the need for reading a value off one scale and then finding it on another, we will increase our accuracy noticeably.

It is very important to avoid error due to Parallax. Because the hair line on the cursor is raised above the scales, error will result in reading values from an angle to either side. *Always read your Slide Rule from immediately above the hair line.*