

For full instructions in the use of
Slide Rules we recommend

SLIDE RULE MANUAL

By B. A. SIMM

The study of this text book will enable you to derive the maximum assistance from your slide rule. It is written in a manner easily understood and contains illustrations, examples and exercises on various phases of slide rule manipulation.



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BRIEF INSTRUCTIONS

in the use of the

> **W & G** <

"DUALFACE" Comprehensive

SLIDE RULE

Model 432

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MELBOURNE, AUSTRALIA

The "DUALFACE" Comprehensive SLIDE RULE

Model 432

Manufactured by > W & G < Melbourne, Aust.

FEATURES OF THE RULE

The "DUALFACE" Slide Rule marks a new era in calculating rule technique, embracing as it does the following features:

All graduations and figures uniformly ENGRAVED, and filled with special enamels in distinctive colors.

Hair-line accuracy throughout.

Polished xylonite surfaces.

The scale layout on the "DUALFACE" enables the embodiment of a complete range of logarithmic, trigonometrical, electrical efficiency and voltage drop scales, arranged so that all calculations can be done with the minimum of movements of either the slide or cursor.

A quick and efficient method of adjusting perfectly the tension on the slide.

On one side of the rule will be found the *A*, *B*, *C*, *D* and *Reciprocal* scales in their usual locations; and the two commonly called *Log-Log* scales. Also on this side are scales for obtaining the logarithm, cube or cube root of any given number; setting of the cursor being the only movement necessary in order to read off on the appropriate scale the answer required.

On the other side of the "DUALFACE" Comprehensive rule, will be found an entirely new set-up of Trigonometrical and Electrical scales.

On earlier types of slide rules, several difficulties are encountered when attempting to find accurate sine and tangent values. The slide has to be set, with consequent risk of error and loss of time, with considerable confusion as to just where to read off the value required. Also as the numbering on the front of the rule is such as to be suitable for the multiplication and division of numbers above unity, whereas trigonometrical values on a slide rule are always below unity, the correct location of the decimal point is a problem. Furthermore, the angle scales are set out logarithmically, with the result that accurate sine values become increasingly difficult to obtain, and on the high angles quite impossible. It will be seen at a glance, that the layout of trigonometrical scales on the "DUALFACE" rule overcomes all of the above difficulties.

Taking first the *Tangent* and *Cotangent* scales, the values are evenly divided over the length of the rule, and then adjoining this is a specially plotted scale of angles 0 to 45° constructed in such a way that the tangent value of any angle is found directly opposite the angle. Then as regards the *Sine* and *Cosine* scales it will be noted that the angles 0 to 90° are evenly divided, which means that the value of any of these angles can be found with absolute accuracy, because right adjoining the *Angle* scale is another specially constructed scale on which the values are read.

Of interest to the electrical engineer, are the *H.P.* and *Kw.* scales, also the small *Variation of Resistance with Temperature* scale at the right hand end of the slide. These scales are graduated so as to be in conformity with *British Standard Specifications*. Readings on the *Voltage Drop* scale are taken by means of the hair line on the cursor, and on the *Efficiency* scales by using the red arrow in conjunction with the hair line.

CARE AND ADJUSTMENT OF THE RULE

It must be remembered at all times that the "DUALFACE" slide rule is a precision-made instrument, and whilst it is particularly robust in its construction to ensure long service, nevertheless it must be treated with a reasonable amount of care.

It must not be subjected to extremes of either heat or moisture, as these will cause warping of the stock and slide,

with the result that the rule will not operate smoothly.

Spirits of any kind must never be used as a cleaning agent on the xylonite surfaces; however, benzine can be used with reasonable freedom.

A simple method to remove dust that has collected on the underneath side of the cursor glass is to slip a piece of thin paper under the glass and then, holding the paper firmly, pass the cursor over it. Two or three drops of benzine on the paper will further assist this operation.

To overcome changes in climatic conditions, and also to permit users to adjust the slide tension to suit their own particular standard, the "DUALFACE" rule has been designed to permit easy adjustment of the slide tension by means of screws at both ends of one side of the stock. These can be loosened, the adjustment made, and then tightened again. Obviously, it is most important to check the line-up of scales *A* and *D* during the adjustment.

The cursor also is capable of adjustment should a severe blow cause the hair line to be rendered out of square to the rule. Loosen slightly the four screws on the affected side, adjust the glass so that the hair line gives a correct reading on the scale indices, then re-tighten the screws.

A little talc is a good medium for lubricating the slide in the stock. Wax in its various forms is not recommended, as it will frequently impede rather than promote smooth movement.

INSTRUCTIONS IN THE USE OF THE RULE

MULTIPLICATION

EXAMPLE: $x \times y = z$

Set 1 on the *B* scale to x on the *A* scale and move the cursor line along to y on the *B* scale and above this on the *A* scale will be found the answer z .

EXAMPLE: $w \times x \times y = z$

To multiply three or more factors the procedure is as above except that no notice is taken of the intermediate results. Thus set 1 on the *B* scale to w on *A*, move the hair line to x on the *B* scale, reset the slide so that either 1 or 10 on the

B scale is under the hair line, and read off z on the *A* scale opposite y on the *B* scale.

The principle governing the choice of either the 1 or 10 in the last setting is that y must of course be brought within the limits of the *A* scale.

DIVISION

EXAMPLE: $x \div y = z$

Set x on the *A* scale in conjunction with y on the *B* scale. Read off z on the *A* scale opposite 1 on the *B* scale.

EXAMPLE: $w \div x \div y = z$

Proceed on the same principle as above dividing by each factor in turn and reading off z on the *A* scale opposite either the 1 or 10 on the *B* scale, whichever happens to be in contact with the *A* scale when the series of divisions is completed.

Scales *C* and *D* can be used in a similar manner to *A* and *B* for problems of multiplication or division.

SQUARE AND SQUARE ROOTS

Any point on the *A* scale represents the square of the corresponding point on the *D* scale, and of course on the *D* scale, the square root of the *A* scale.

CUBE AND CUBE ROOTS

Any point on the *Cu.* scale represents the cube of the corresponding point on the *D* scale, and any point on the *D* scale, the cube root of the *Cu.* scale.

RECIPROCAL

To ascertain the reciprocal of a number, set the hair line to the required point on the *C* scale and read off the answer on the *Reciprocal* scale.

LOGARITHMS

Any point on the *L* scale represents the mantissa of the logarithm of the corresponding point on the *D* scale.

Naperian logarithms are obtained in a similar manner, using the *LL* scales in conjunction with the *D* scale.

INVOLUTION

EXAMPLE: $x^y = z$

Set 1 on the *C* scale to x on the *LL* scale, bring the hair line to y on the *C* scale and corresponding with this is z on the *LL* scale.

EVOLUTION

EXAMPLE: $\sqrt[y]{x} = z$

Set y on the *C* scale to x on the *LL* scale and corresponding with 1 on the *C* scale is z on the *LL* scale.

SINES AND TANGENTS

The sine or tangent values of angles are ascertained on their respective scales.

ELECTRICAL PROBLEMS

Problems of dynamo and motor efficiencies and kindred problems can be solved on the electrical scales of the "DUALFACE" rule.

For example, what is the efficiency of a dynamo giving 14.5 kilowatts with an input of 20 horsepower?

Set 2 on the *H.P.* scale to correspond with 14.5 on the *Kw.* scale and below the red indicating arrow read off the answer 97% on the *Efficiency* scale.

A typical problem to be solved on the *Voltage Drop* scale would be as follows:—

What is the voltage drop when 25 amps flow along a conductor 50 yards in length having a cross sectional area of .006 sq. ins.?

The method of solution would be to set the hair line to 2.5 on the amps scale, i.e. 25 amps, and bring the 6, i.e. .006 sq. ins., on the slide to correspond with it. Move the hair line along to 50 yards and read off the corresponding value on the *Voltage Drop* scale of 5.03 volts.

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