solution of resonant frequency problems. It will be noted that when the slide is extended to the right only Scale 5 is visible in the window, and, conversely, when the slide is extended to the left only Scale 6 is visible. This arrangement automatically avoids confusion in selecting the proper frequency scale.

To find resonant frequency for a known value of capacity and inductance:

(1) To capacity value on Scale 1 set inductance value on Scale 2.

(2) At index of rear window read resonant frequency.

Example: Find the resonant frequency of 340 micro-microfarads and 300 microhenries.

(1) To 340 μμf on Scale 1 set 300 μh on Scale 2.

(2) At index of rear window read 500 KC.

Universal Resonance Curve

The Universal Resonance Curve is convenient in calculating the ratio of response of a tuned circuit at frequencies small amounts off resonance. Data, in tabular or curve form, for the Universal Resonance Curve is not usually at hand. On the back of the National Union Radio Slide Rule has been printed a short table of Universal Resonance Curve Data.

Knowing the Q of a circuit, the response at frequencies near resonance is:

Universal Resonance Curve

Frequency deviation from resonance	Percentage of resonant response
Fr/2Q	70.7 (— 3.0 db)
Fr/Q	45.5 (— 6.8 db)
2Fr/Q	24.5 (—12.2 db)
3Fr/Q	16.5 (—15.6 db)

Where Fr is the frequency of resonance:

Example: Assume a circuit resonant at 1000 KC and having a Q of 80. From the table Fr/2Q is the frequency deviation from resonance at which the response will be 70.7% of the response at resonance:

$$\begin{matrix} Fr = 1000\ KC \\ Q = 80 \end{matrix} \qquad \frac{1000\ KC}{2 \times 80} = 6.25\ KC \text{ off resonance}$$

For frequency deviation greater than 3Fr/Q the percent response, to a good approximation, is inversely proportional to the fractional deviation.

$$nFr/Q = 50/n \text{ percent when } n > 3.$$

NATIONAL UNION RADIO CORPORATION

New York ● *Newark, N. J.* ● *Chicago*

NATIONAL UNION RADIO SLIDE RULE

NATIONAL UNION RADIO SLIDE RULE

Purpose

This slide rule is designed to permit the rapid determination of:

1. Capacitative reactance when capacity and frequency are known.
2. Inductive reactance when inductance and frequency are known.
3. Resonant frequency when capacity and inductance are known.

As a corollary in each case above, the determination of the unknown quantity, when any two of the three quantities are known, may be readily accomplished.

Conventional slide rule solutions of these problems have in general two drawbacks; namely, the necessity for several settings to find the answer, and no provision for determining the decimal place in the final answer. This slide rule has been designed to overcome these limitations, providing as it does the answer to problems with only one setting of the slide and the position of the decimal place automatically indicated.

The range of scales has been chosen so as to include by far the major portion of values in which the average radio engineer is interested. These ranges are:

Scale 1—Capacity—100 μμf to 100 μf.

Scale 2—Inductance—1μhy to 1 hy.

Scale 3—Frequency—16 cycles to 16 megacycles.

Scale 4—Reactance—100 ohms to 100 megohms.

Scale 5—Resonant Frequency—16 cycles to 16 KC.

Scale 6—Resonant Frequency—16 KC to 16 megacycles.

Four of the scales appear on the front of the rule properly identified by numbers at the left. Scales 5 and 6 are on the reverse side of the slide.

Accuracy

The percentage accuracy of a slide rule is approximately proportional to the length of its scales. A slide rule having 10" scales gives a result accurate to approximately one-tenth of one percent. Total scale length of this radio rule is 10" with this length divided into six cycles or decades, thus giving an effective scale length of slightly over 1½", with a resulting accuracy of approximately three-fourths of one percent. This degree of accuracy is adequate, in view of the fact that knowledge of circuit constants is infrequently better than to an accuracy of one percent. In the infrequent cases, where a very high degree of accuracy is required, this rule will be found extremely helpful as a check on the figures obtained by more laborious means.

How to Use

Scale 1—lower scale on body—is marked in units of capacity, beginning at the left with 100 μμf and progressing to 100 μf at the right. The numbers slope to the right, serving as a constant reminder that the scale is to be read from left to right.

Scale 2—lower scale on front of slide—is marked in units of inductance beginning at the right with the smallest unit; namely, one microhenry and progressing to one henry at the left. The numbers slope to the left as a reminder that the scale is to be read from right to left. At the one henry mark on Scale 2 is an arrow to be referred to as the *left index.*

Scale 3—upper scale on front of slide—is marked in frequency divisions beginning at sixteen cycles at the left and progressing to sixteen megacycles at the right.

Scale 4—upper scale on body—is marked in units of reactance starting at the right as one hundred ohms and progressing to one hundred megohms at the left. At the one hundred ohm mark on Scale 4 is an arrow referred to as the *right index.*

To find the reactance of a known capacity at a known frequency:

(1) To known capacity value on Scale 1 set *left index* of Scale 2.

(2) At known frequency on Scale 3 read reactance on Scale 4.

Example: Find reactance of 0.01 μf at 800 cycles.

(1) To 0.01 μf on scale 1 set left index of Scale 2.

(2) At 800 cycles on Scale 3 read 19900 ohms on Scale 4.

To find reactance of a known inductance at a known frequency:

(1) To right index on Scale 4 set known frequency on Scale 3.

(2) At known inductance value on Scale 2 read reactance on Scale 4.

Example: Find reactance of 150 mh at 2.5 KC.

(1) To right index on Scale 4 set 2.5 KC on Scale 3.

(2) At 150 mh on Scale 2 read 2350 ohms on Scale 4.

Resonance

Scales 5 and 6, on the back of the slide and visible through the rear windows, are used in conjunction with Scales 1 and 2 for the