ALLIED'S

PARALLEL-RESISTANCE and SERIES-CAPACITANCE CALCULATOR

INSTRUCTION SHEET

Allied's Parallel-Resistance and Series-Capacitance Calculator provides the experimenter, student, serviceman, and engineer, with a fast and accurate means of solving everyday problems involving parallel resistance and series capacitance.

A single setting of the slide automatically aligns all possible pairs of resistances (black figures) which may be connected in parallel, or capacitances (red figures) which may be connected in series, to provide the indicated total resistance or capacitance.

EASY TO USE

A. To find the value of two resistances in parallel:
1. *Use the black figures only.* Move sliding scale so that the two resistance values (one on the sliding scale and the other on the fixed scale) are in exact alignment.
2. The parallel resistances are now indicated by the arrow marked Total Resistance at the right end of the calculator.

B. To find the value of two capacitances in series, follow the same procedure, but *use only the red figures.*

HAS A WIDE RANGE OF USEFULNESS

Basically the Allied Parallel-Resistance and Series-Capacitance Calculator provides a rapid and accurate means of finding the reciprocal of the sum of two reciprocals as expressed by the formula

$$X = \frac{1}{\frac{1}{A} + \frac{1}{B}}$$

Although the calculator is marked with resistance and capacitance readings, the figures on the rule can just as well serve to represent values of inductance, impedance, reactance, or other units which can be handled in a similar manner. Such for instance as:

self inductance in parallel

$$L_t = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} \ldots \text{etc.}},$$

coupled inductance (fields aiding)

$$L_t = \frac{1}{\frac{1}{L_1 + M} + \frac{1}{L_2 + M}},$$

coupled inductance (fields opposing)

$$L_t = \frac{1}{\frac{1}{L_1 - M} + \frac{1}{L_2 - M}},$$

numerical magnitude of impedance

$$Z = \frac{1}{\frac{1}{X_{L1}} + \frac{1}{X_{L2}} + \frac{1}{X_{L3}} \ldots \text{etc.}},$$

where L_t = total inductance,
M = mutual inductance,
L = self inductance,
Z = absolute or numerical value of impedance magnitude,
X_L = inductive reactance.

EXAMPLES

The following circuits, and tabular data on opposite side of page will serve to illustrate in detail, the ease with which reciprocal problems can be solved with this calculator.

Circuit and formulas;

for 2 resistances, in parallel,

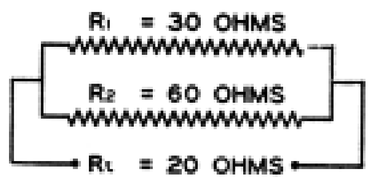

Fig. A

$$R_t = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{R_1 R_2}{R_1 + R_2};$$

for 3 or more resistances, in parallel,

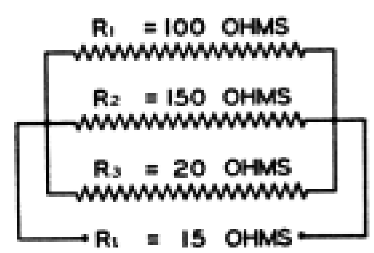

Fig. B

$$R_t = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots \text{etc.}},$$

where
R_1, R_2, R_3 = Resistances connected in parallel,
R_t = Total resistance.

SETTINGS FOR COMPUTING RESISTANCE IN PARALLEL

Use Black Figures Only

Note: The calculation of capacitance in series is made in exactly the same manner as outlined below for resistance in parallel, except *use red figures only*.

GIVEN	TO FIND	PROCEDURE
R_t	All parallel combinations of R_1 and R_2 which will produce the required R_t.	Set slide so as to align the required value of R_t with Total Resistance Index at right end of calculator. Opposite any R_1 value on slide, read resultant R_2 on body. *Example:* Set 20 on slide over Total Resistance Index. Under 25 on slide, read 100 on body; under 28 read 70; under 30 read 60; under 40 read 40, etc., etc.
R_t and R_1	R_2	Set slide so as to align R_t with Total Resistance Index at right end of calculator. Opposite R_1 on slide, read R_2 on body. *Example:* (see fig. A, on opposite side of page) Set 20 on slide over Total Resistance Index at right end of calculator. Under 30 on slide, read 60 on body.
R_1 and R_2	R_t	Set R_1 on slide opposite R_2 on body. Read R_t on slide, opposite Total Resistance Index at right end of calculator. *Example:* (see fig. A, on opposite side of page) Over 60 on body, set 30 on slide. Over Total Resistance Index at right end of calculator, read 20 on slide.
R_t	R_1, R_2, and R_3	Since only two factors may be set up on the calculator at a time, solve first for any two resistances, then consider this resultant to be in parallel with the third resistance and solve for this combination. *Example:* (see fig. B, on opposite side of page) Let us suppose you have need for a 15 ohm resistance, but your nearest available value is 20 ohms. Set 15 over the Total Resistance Index at the right end of the calculator, then below 20 on the slide, read 60. Let us further suppose that you do not have a 60 ohm resistor either, so we'll continue by setting 60 on the slide, opposite the Total Resistance Index. You will now note that among all aligned values which will give you a 60 ohm total, that a 100 and 150 ohm pair can be used, both of which you have. So to obtain the 15 ohm resistance required, you will use a 100, 150, and 20 ohm group in parallel.
R_3	R_t, R_1, and R_2	This is similar to the problem described immediately above. Set R_1 on slide, over R_2 on body, and read resultant total on slide, over Total Resistance Index at right end of calculator. Now set R_t over Total Resistance Index, and under the resultant just computed, read R_3. *Example:* (see fig. B, on opposite side of page) Set 100 on the slide, over 150 on the body. Read 60 on the slide, over the Total Resistance Index. Now set 15 on the slide, over the Total Resistance Index, and under 60 on the slide, read 20 on the body.

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