Electric Blasting Circuit: Resistance and Firing Current

Resistance of electric detonators in series, parallel or series-in-parallel with the lead wire, and the current from a blasting machine of given voltage.

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of detonators	40.000	
Number of parallel series (1 = straight series)	2.0000	
Resistance of one detonator with its legwires	1.6000	Ω
Lead and connecting wire length (both conductors)	500.00	ft
Wire resistance per 1,000 ft	2.6000	Ω
Blasting machine voltage	450.00	V

Calculated results

Parameter	Value	Unit
Resistance of one series	32.000	Ω
Resistance of the detonator network	16.000	Ω
Wire resistance	1.3000	Ω
Total circuit resistance	17.300	Ω
Total current	26.012	A
Current through each detonator	13.006	A

Notes for this case

• Series resistances add and equal parallel branches divide; balance the series so each carries the same current. Compare the current per detonator with the manufacturer's recommended firing current, and test the circuit with a blasting galvanometer, not an ordinary meter.

Formula and method

$$R_s = \frac{n}{p} R, \quad R_c = \frac{R_s}{p}, \quad R_w = \frac{L\,R_{1000}}{1000}, \quad I = \frac{V}{R_c + R_w}, \quad I_d = \frac{I}{p}$$

Variables

n	Number of detonators	-
p	Number of parallel series (1 = straight series)	-
R	Resistance of one detonator with its legwires	Ω
L	Lead and connecting wire length (both conductors)	m
R_{1000}	Wire resistance per 1,000 ft	Ω
V	Blasting machine voltage	V
R_s	Resistance of one series	Ω
R_c	Resistance of the detonator network	Ω
R_w	Wire resistance	Ω
R_{total}	Total circuit resistance	Ω
I	Total current	A
I_d	Current through each detonator	A

Method and standards

Series and parallel resistance (Ohm's law).

Assumptions and limits

- Resistive circuit; capacitor-discharge machines deliver a pulse, so compare with the maker's rating.

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/mine-design/blasting-circuit-resistance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.