BM PRO DEFINITIONS | WIRING 12V CONNECTIONS

WHAT IS WIRE GAUGE AND WHY DOES IT MATTER?
The term 'wire gauge' refers to a measurement of how thick the wire is. This is measured by using a cross sectional area of the wire. Wire gauge determines how much electric current a particular wire can carry safely as well as the wire's electrical resistance and weight per unit. These are crucial measurements for safe electronic wiring.

There are two main global standards for determining and measuring wire gauge: Metric Wire Gauge (MWG) and American Wire Gauge (AWG). You may also hear the term Brown & Sharpe (B&S) used as an alternative measurement, however B&S is equivalent to AWG.

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As the name suggests, AWG is mostly used within the US. MWG is used outside of America. Both AWG and MWG are determined via the cross-sectional area of the conductor, however the standards represent electrical information differently.

AWG: a list of gauge numbers – the smallest numbers represent the largest wire cross-sectional area (largest diameter).

MWG: gauge numbers represented in mm^2 - the larger the number, the larger the wire thickness (largest diameter).

DIAMETER: the diameter of the wire – the smaller the diameter the more resistance as there is less room for the current to flow through. Larger wires with larger diameters have less resistance.

RESISTANCE: measured in Ohms, is the resistance between two points of a conductor per 1000ft. The smaller the diameter of the wire the more resistance. The longer the wire the more resistance. Consequently, larger and shorter wires have less resistance.

CURRENT CAPACITY (AMPS): measured in amps, current capacity is the amount of current the wire can carry safely without overloading. In general, larger wires - in terms of diameter and length - can carry more current safely than smaller wires. If the amount of current exceeds a particular wire's current capacity, the wire can become extremely hazardous and result in potential overloading, melting and consequent fires.

EQUATIONS

Symbol	Meaning
T	Temperature of wire
A	Cross sectional area
I	Current draw
V_d	Voltage drop
N	Number of individual strands
D	Diameter of wire strands
L	Total length of cable

Cross Sectional Area (cable size)

$$A = \frac{\pi d^2}{4} \times n$$

Cross Sectional Area (cable size)

$$A = \frac{l \times I \times 0.017}{V_d}$$

Voltage Drop (@ 25º)

$$V_d = \frac{l \times I \times 0.017}{A}$$

Voltage Drop (other temperatures)

$$V_d = \frac{l \times I \times 0.017}{A} \times (1 + 0.004 \times (T\text{-}25))$$

COMMON BM PRO DIY INSTALLATIONS

Type of Installation	Cable Length	Current Draw (A)	Required Cross Sectional Area	Recommended Cable Gauge