

# FRANCE

## LIGHTING SOLUTIONS

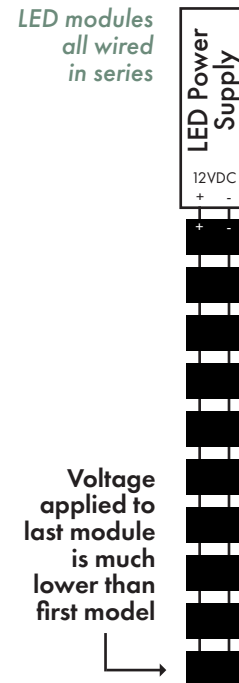
### LED MODULES

#### Series vs. Series/Parallel Connection

##### Series Connection

If all the LED's are wired in one single string (that is, "in series"), the load they present to a power supply will be significantly less than expected. This is caused by voltage drop in the wiring connecting each LED module to the next. Since each module in the string only draws its full rated power if 12 volts is applied to it, the second module and each successive module will consume less and less power since the voltage being applied to each is less and less.

Because of this, the total watts drawn from the power supply by the LED string will be less than the rated power of each module times the number of modules. This effect becomes more pronounced if the wiring between the power supply and the first LED module in the string is long since the longer wires add even more resistance to the string, causing an even larger voltage drop to the individual modules. In one extreme example, a string of 120 one-watt modules only drew 58 watts from the power supply. This effect can occur in constant-current LED's as well. These modules require a minimum input voltage to maintain constant current through the LED's on the modules. If an excessive number of modules are used in series, or excessively long wiring is used to connect the power supply to the first module or between sections of the sign, the last modules in the string will no longer regulate current in the LED's.



##### Series/Parallel Connection

If the single series LED string is split into three, four, or more parallel sections, the voltage at the beginning of each branch will be near 12 VDC (in this example). Also, since the current being drawn from the power supply by each branch is less, the voltage drop between the first and last module in each branch is less. Because of this, each module in every branch sees closer to its rated input voltage (i.e. 12 VDC), so the total power drawn by the series/parallel wiring method is significantly higher than the same number of LED modules all wired in series.

The diagrams to the right shows the series and parallel configuration.

