**Working out LED Series Resistor Values**

The Light Emitting Diode (LED) has become affordable and common place, often being used to replace blown bulbs in the front panels of radios. Sometimes there is also a requirement, for the sake of cosmetic appeal or fashion, to replace existing front panel LEDS to another colour. Not all LEDs require the same forward current to operate correctly so it is important to chose a LED from a catalogue and determine the following:

* Colour (Wavelength)
* Angle of visible light (degrees)
* Brightness (mcd) millicandella
* Forward Voltage (VF or VL in Volts)
* Forward Current (IF in mA)
* Series Resistance (R in Ohms)

The first 3 parameters are a matter of personal choice but the latter 3 need require a few simple calculations to ensure the LED gives full brilliance without reducing its life expectancy. If replacing incandescent lamps behind a radio front panel the supply voltage to the lamp must first be verified by using a voltmeter. If the LED is to be used on a 13.8 volt power supply unit to indicate that the output is “on” round up the 13.8v to 14volts. In the diagram above then VS = 14V.

A high output LED typically has a Forward Voltage (VL) of between 3.0 to 3.6 volts. Assume 3.5 volts. So the series resistor must take the difference between VS and VL (14V – 3.5V = 10.5V)

Typical LED Forward Current (IF) is 28mA.

Ohm’ s Law:

R=V/I
R= 10.5V/0.028A
R= 375Ω

As 375Ω resistors are not generally available we round up to the nearest “preferred value” which is 390Ω. Having determined the value of the resistance we need to calculate the power it will have to dissipate.

P=I2R
P=0.028 X 0.028 X 390
P=0.3watts

In this instance a 0.5watt rated resistor would suffice even in a hot environment. Connect the resistor between the positive (+ve) supply voltage and the “long” lead of the LED and the short LED lead to negative (-ve).