Multiplier and Shunt

Any voltmeter will be designed so that when a known magnitude of voltage appears across it, this voltage produces a full-scale deflection (FSD) of the pointer.
Any ammeter will be designed so that when a known magnitude of current passes through it, this current produces a full-scale deflection (FSD) of the pointer.

Multiplier and Shunt

In order to extend the upper limit of either of these instruments, a resistor is connected in series with the voltmeter or a resistor in parallel the ammeter. In the case of a voltmeter, the resistor is known as a **multiplier**; in the case of an ammeter, it is known as a **shunt.**

For Shunt:

$I \ Rshunt = Rm \ FSD$

whence:

$Rshunt = IRm \ FSD$

For Mutiplier:

$FSD \ (Rmult + Rm) = V$

and so:

$Rmult = (VFSD) - Rm$

Where:

FSD = Meter Full Scale Deflection

I = Current Range

V = Voltage Range

Rshunt = Shunt Resistance

Rmult = Multiplier Resistance

Rm = Meter Resistance