Application Notes

Output Protection of DC Power Supplies

Output protection is implemented on AC/DC power supplies and DC/DC converters, in order to prevent damage to the power supply or the end equipment.

In case of overload or short circuit protection to the output, a circuit is employed to limit the current or power the unit will supply, protecting both the power supply and the load form excessive current.

Overload protection is typically implemented using one of the techniques listed below.

- Constant current limit
- Fold-back current limit
- Constant power limit
- Hiccup mode
- Fuses or circuit breakers

Here, we discuss some of these techniques.

Constant current limit:

In this circuit the current is held "constant" at a pre-determined level, typically 110-120% of rated output current.

This circuit allows high inrush for capacitive loads, lamps, motors etc to start up and is often utilised in battery charging and standby battery applications. In some instances a reduction in current will occur below a certain voltage limit. The power supply will normally recover automatically, following this curve, when the overload is removed.

The current limit setting is factory set and not normally user adjustable.

Fold-back current limit:

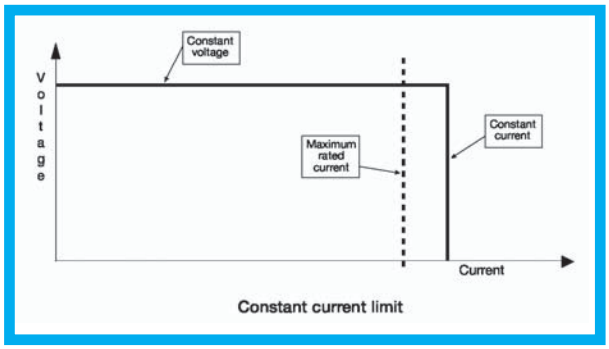
Fold-back current limit decreases both the voltage and the current when an overload condition is detected. The voltage and current decrease simultaneously as the load impedance decreases. This technique is employed extensively on linear power supplies to prevent excessive dissipation in the series pass element and where crowbar over-voltage protection is employed in the power supply, thus limiting the fault current to a very low value.

The output voltage will recover once the overload is removed, following the curve. This technique is not suitable for high inrush or battery charging applications.

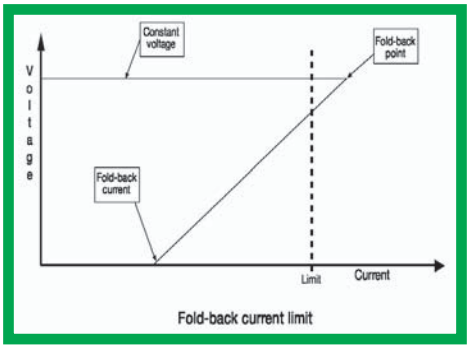
Hiccup Mode:

In this mode, the power supply detects an overload condition and the controller shuts the power supply off for a given time. After this time the power supply will try to start again. If the overload condition has been removed the power supply will start and operate normally. If the overload condition remains, the power supply will switch off again, repeating the previous cycle. This condition will repeat until such time as the overload is removed. The off-time period may vary and the voltage reached will vary with the impedance of the overload.

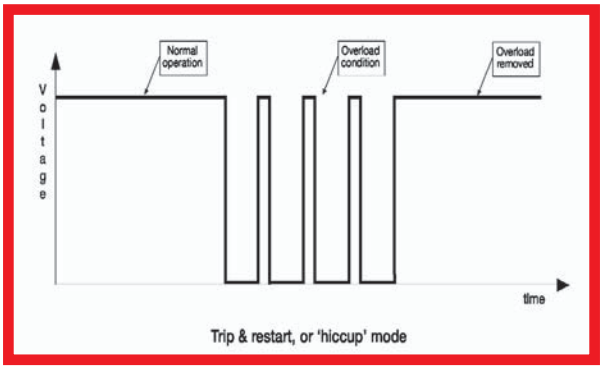
This circuit is currently used in low cost power supplies.



Constant current limit



Fold-back current limit



Trip & restart, or 'hiccup' mode