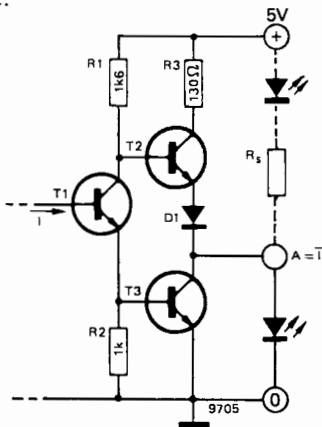


72 The accompanying figure shows the output circuit of a normal TTL gate.

The usual way to drive an LED from such an output is shown dotted: the LED and a series resistor are connected between the positive supply and the TTL output. The LED is on when the output is 'low'; T3 is in saturation, so the series resistor is needed to limit the current.



However, if the LED is connected between the TTL output and supply common, as shown, the series resistor can be omitted. When the TTL output tries to go 'high' (T1 and T3 are blocked) the internal resistor R3 will limit the output current to a safe value. Note that this circuit can only be used with 'normal' TTL gates. It should not be tried at flipflop outputs, open collector gates, etc. Furthermore, not more than two outputs of one chip should be loaded in this way.

It should also be noted that the output in question cannot be used to drive other TTL circuits: it will not give a true 'high' level output.