

This simple idea gives light dimming with no RFI

Add a Bright/Dim Switch to your lights

Here is a useful idea for those people who wish to dim their room lights on occasion, but do not want to install a fully variable light dimmer. All that is required is a standard dual wall switch and a silicon power diode. Substitute them for the normal light switch, and you can have the lights either bright or dim at will.

There are many occasions in the home when the full brilliance of the room lamps is not required: when watching television, listening to music, dining in an intimate setting, or during parties. Perhaps the most versatile answer to this problem is a wall-mounted variable light dimmer.

Fully variable dimming is not always needed, however. There may also be a problem of radio interference with such dimmers, due to the voltage pulses or "spikes" generated by the phase-controlled Triac circuitry. Operation is usually quite satisfactory in metropolitan areas where the signal from broadcast stations is strong, but real problems can arise in outlying country areas.

The idea presented here represents a different approach to light dimmers. In principle, a switch is used to connect a semiconductor diode in series with the mains input, so that in the "dim" position, the lamp is fed only with alternative AC half-cycles. This has the effect of considerably reducing the lamp brilliance.

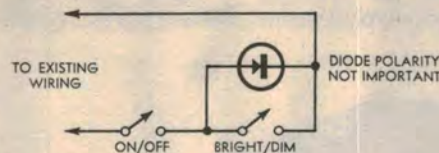
Assuming an AC mains supply of 240 volts, the RMS value of a half-wave rectified sine wave is 170 volts. With typical incandescent lamps which have a very non-linear V-I characteristic, the power input under these conditions is reduced by 25 to 30%, and the brilliance reduced to less than half normal.

Besides simplicity, this arrangement has the advantage that it generates no radio interference. With a conventional dimmer, the Triac switches considerable amounts of power in very short time intervals and it is this which generates the interference spikes. Typically, the Triac switching time is of the order of one microsecond. By contrast, a silicon diode is virtually a "zero-voltage switch" because it begins to conduct heavily with a mere 0.6 volts forward bias. As a result, virtually no interference is generated by this simple dimmer circuit.

On the debit side, there is a tendency

for the lamp to flicker. Under normal conditions with a sinusoidal mains input voltage, incandescent lamps are pulsed at 100Hz. The persistence of vision of the human eye and the thermal inertia of the lamp filament conspire to make any flicker unnoticeable. However, when half-wave rectified AC is applied to incandescent lamps, the flicker is at 50Hz and tends to become more noticeable. Just how noticeable the flicker becomes depends on a number of factors. If the lighting is indirect, generally no flicker is apparent. If the observer looks directly at the lamp, flicker may or may not be noticeable, depending on the filament temperature. However, some flicker is usually apparent if the observer looks at the lamp "out of the corner of his eye".

Having installed one of these dimmers in his home, the author has found that

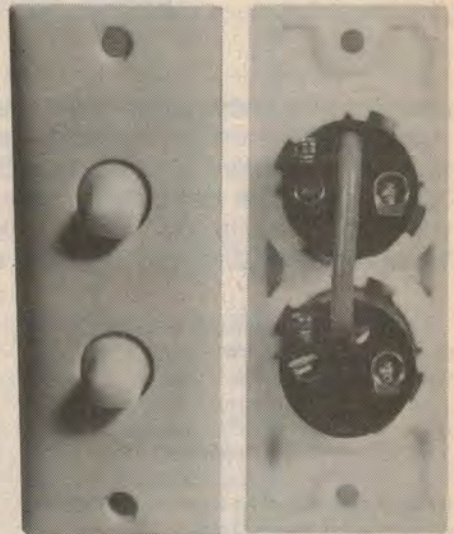


This could be the simplest circuit we have ever published but it works.

the flicker is not irritating and that he is generally quite unaware of it.

The diode used should have a peak inverse voltage (PIV) rating of at least 400 volts. It would be wise, however, to select a diode with a rating of 600 or 800 volts to ensure that it is not damaged by occasional "spikes" and surges which may be superimposed on the mains supply.

An even better idea is to use a "transient protected" diode which will safely withstand most spikes superimposed on the mains by breaking into a "controlled avalanche" discharge. These diodes are made by General Electric and have type



number 1N5061 (600 PIV) or 1N5062 (800 PIV). Both diodes have a forward current rating of 2.5 amps.

Two factors must be taken into account when calculating the maximum incandescent lamp load which can be handled by a rectifier. The first is that, due to its severe non-linearity, an incandescent will actually draw more current (on an RMS basis) when connected to a lower voltage than it does when operating at the full rated voltage.

Also related to the non-linearity of the incandescent lamp is the very high surge current at initial switch-on. This must be within the surge capabilities of the diode used.

When both these factors are taken into account, a 1-amp rectifier diode such as a 1N4006 (800 PIV) may be used with incandescent lamp loads up to 220 watts (nominal) while the 2.5 amp transient-protected 1N5062 may be used with loads up to 550 watts.

Note that this method of dimming cannot be used with fluorescent lights.

The most convenient way of installing the dimmer is to purchase a dual wall switch. The diode is shunted across the lower switch. A link of insulated wire is connected between the two switches, and the whole assembly is installed in place of the existing light switch. The upper switch is then the main ON/OFF control, and the lower switch BRIGHT/DIM.