

2-WIRE FLUORESCENT DIMMING

Until now, fluorescent dimming has meant three wires plus earth between the dimmer and light fittings.....

It ain't necessarily so.....

Control gear is now available which permits dimming of T8 or T12 tubes without use of an extra 'Line Fixed' conductor. Its no great secret that these ballasts are manufactured by Helvar of Finland. There are limitations as to performance (e.g. 10% cut-off), and to dimmer compatibility, but nevertheless this type of control-gear has achieved popularity in the market both with Helvar's and with other of our competitors' dimmers. We are often asked if we can dim fittings already equipped with Helvar gear. The answer is 'Yes', but one very important point must be observed:

* Commissioning of the dimmer is ESSENTIAL for correct operation and to avoid damage to tubes or ballasts *

Control gear of this type can be supplied by Strand (itemised as 'Electronic Dimming Ballasts') or on some projects it may already be specified for others to supply.

In each case, the dimming solution is an ENVIRON dimmer, correctly adjusted at the commissioning stage by Strand or Strand authorised personnel. After dimmer set-up, the usable dimming range is 10 - 100% (approximately the same as for U.D.T.s). The dimmer itself does not necessarily need to be of fluorescent type: the important requirement is for correctly set separate Top and Bottom adjustments.

Environ TECHNICAL BULLETIN

Technical information on the Environ range of dimmers marketed by Strand Lighting

A BASIC GUIDE TO FLUORESCENT DIMMING

It is important to recognise that good performance can only be expected if all recommendations are observed. By far the majority of fluorescent dimming problems in the past have been directly attributable to either incorrect installation; unsatisfactory commissioning; or due to the fittings, control gear or tubes being of unsuitable types.

Factors which might not seem important often are. So please observe the guidelines which follow.

The common types of tube are:

TYPES OF TUBE	T12 TUBE: Conventional 38mm (one and a half inch) diameter T8 TUBE : Newer 'thin' 26mm (one inch) diameter COMPACT FLUORESCENT: Recently introduced high efficiency types such as 2D or FL.
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T12 TUBES

T12 TUBES	Argon filled T12 tubes continue to provide the best quality dim. The choice is available to dim any of the normal lengths of tube up to 6 foot (1,800mm). The 8ft (2,100mm) length tube is not dimmable.
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BEST PERFORMANCE	Generally, the shorter the length of tube, the lower the level to which it can be smoothly dimmed. The very best performance is obtained with the 4 foot (1,200mm) length. In this, as in every other case, it is ESSENTIAL that appropriate Control Gear is used in the fittings. For T12 tubes the only way to be sure of the best results and of compatibility with the dimmer, is to use ENVIRON DIMMABLE BALLASTS.
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TUBE WATTAGES	Occasionally, the only information available about the type of tube to be used on a dimming project is its rated wattage. This value must <u>not</u> be used to calculate dimmer loading (see later); but the figure does normally give an indication of the tube type and length. Common T12 types are as follows:
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Strand Lighting

<u>RATED TUBE WATTS</u>	<u>LENGTH</u>	<u>CONTROL GEAR*</u>
20W	2FT (600mm)	Each pair requires one 09 320 06
40W	4FT (1200mm)	Single 09 320 06
65W	5FT (1500mm)	Single 09 310 09
85W or 75W	6FT (1800mm)	Single 09 300 01

* 240 volt versions for U.K. standard tubes.

OTHER TYPES OF T12 TUBE T12 tubes are also available (mostly overseas) with alternative types of cathode. These operate on a lower heater voltage and therefore need a different type of Ballast. For these, or for 220 Volt versions of the above Ballasts, please consult Strand.

ENVIRON T12 BALLASTS Environ Ballasts are conventional low power factor dimmable ballasts with integral preheat transformer, tapped choke, and internally fitted ringing components (or 'tickler circuit'). As such, the ballast replaces all other components within the fitting.

TWIN ADAPTORS In the case of a Twin 5ft or a Twin 6ft fitting, an Adaptor can be used in conjunction with the Environ Ballast. (Note: The combination of Adaptor plus Ballast provide a more economic solution, but if close matching of tube outputs at low levels is required then an individual Ballast per tube is recommended).

PERFORMANCE (T12) Provided all recommendations are observed, 4ft tubes will dim down to virtual extinction, though because of variations between tubes it may be necessary to limit the lower level to a few percent of full output.

5ft tubes perform well, though the bottom end cut-off usually needs to be set slightly higher to maintain low level stability.

6ft tubes are the least easy to dim, with a minimum usable level typically around 10%. In all cases a smooth cut-off is obtained by adjusting the dimmer 'Bottom Set' for stable operation of the tubes.

INSTALLATION

SPECIAL WIRING REQUIREMENTS (T12 OR T8) Four conductors are required between dimmer and fluorescent fittings. These are Neutral, Earth, Line Fixed, and Line Variable. It is most important that the two line conductors are separately identified and it is therefore recommended that these are run in different coloured cables. MICC cable is not recommended for this application. Any deviation from the instructions for wiring of the installation is liable to cause unpredictable results. A good standard of electrical contracting is therefore necessary. The electrical supply to the installation must be adequately rated for at least the full rated current of the dimmer(s).

TYPE OF FITTING

FLUORESCENT FITTINGS

The type of fitting is of more importance than may seem immediately obvious. The factors needing consideration are as follows:

EARTHING

An earthed metal surface should be provided to run parallel to each lamp along its full length, as close as possible to the lamp (12mm maximum). This earthed metal should be at least 20mm wide. Many fittings have a gear tray cover which fulfils this condition, but the spacing and the earth continuity need to be verified. An alternative is to use lamps with earthing stripe (MCFA), in which case proper earth connection must be made to the stripe via contacts on the lampholders.

LAMP-HOLDERS

It is essential that lampholders maintain a firm, low-resistance contact with the pins of the lamp at all times. Good quality lampholders are therefore required, otherwise both dimming performance and lamplife may suffer.

DESIGN OF BODY

The body of the fitting must of course be suitable to physically accommodate the Ballast.

At cold temperatures, fluorescent tubes become difficult to strike, and at high temperatures dimming performance may be impaired. Ideally, the wall of the tube at its mid-point should be within 30°-50°C. Exceptionally, this may need consideration if the installed environment for the lamps does not permit them to run within these temperature constraints.

NOISE

All Ballasts emit some noise and this is increased by dimming. The Environ Ballast is designed to minimise noise. Unwitting amplification of any noise present can be avoided by choosing fittings of robust construction.

For the vast majority of applications, noise levels emitted by Environ Ballasts are of no practical significance. Only in the most sensitive of quiet areas might remote siting of ballasts be worth consideration - if doing so, please consult Strand for guidelines.

ELECTRICAL TERMINATIONS

Wiring within the fitting should employ good low-resistance connections, and the four terminals LV, LF, N and E should be clearly marked.

T8 TUBES

T8 DIMMING RANGE

Environ fluorescent dimmers can be used to dim T8 (krypton-filled) tubes down to around 10% light, and once again it is essential that compatible control gear is used in the fittings. This gear is different from the T12 versions.

UDT PLUS CHOKE

The requirement is that each T8 tube to be dimmed is connected to one Universal Dimming Transformer and a standard Choke. The same Universal Dimming Transformer (U.D.T) is used irrespective of tube length, but the

standard Choke must be matched (in the normal way) to the tube in question. The standard Choke is an ordinary switch-start ballast, and should not be confused with the Environ Ballast. If an ordinary fluorescent fitting is being converted for dimming, the Choke already in the fitting will often be suitable, provided it is of standard type (not 'Slimline', 'Low-Loss' or cheap 'high T^o' versions).

U.D.T's and Chokes for common types of T8 tube are available from Strand as follows:

<u>RATED</u> <u>TUBE WATTS</u>	<u>LENGTH</u>	<u>CONTROL</u> <u>GEAR</u>
36W	4FT	* UDT (09 212 40) <u>plus</u> 36W Choke (09 213 14)
58W	5FT	UDT (09 212 40) <u>plus</u> 58W Choke (09 213 15)
70W	6FT	UDT (09 212 40) <u>plus</u> 70W Choke (09 213 16)

* 240 volt version.

(NB If required, the UDT and Choke combination can also be used to control T12 tubes)

MINIMUM LEVEL FOR T8s Most of the guidelines in the preceding sections apply equally to T8 dimming; the main difference being that the setting of the minimum level light output is predetermined within the U.D.T. and can not therefore be taken any lower by adjusting Bottom Set.

2Ds OR PLs COMPACT FLUORESCENT
2-pin versions are inherently non-dimmable. The 4-pin versions have a theoretical potential for dimming, though no actual projects have been reported to date and control gear is as yet unproven. Pending further development, these tubes are therefore not recommended for dimming.

LOADING CALCULATING DIMMER LOADING
The rated wattages marked on the tubes are not applicable in calculating maximum dimmer load. The true lamp current is instead used to produce the following table:

<u>DIMMER</u>	<u>MAXIMUM NUMBER OF TUBES</u>		
	<u>4FT TUBES</u> (1200MM)	<u>5FT TUBES</u> (1500MM)	<u>6FT TUBES</u> (1800MM)
5 AMP	10	7	6
6 AMP	14	9	7
16 AMP	38	24	20
32 AMP	76	48	40

Notes: 1. A pair of 2ft tubes is equivalent to a single 4ft tube.
2. Other twin fittings are equivalent to two singles.

PFC
CAPACITORS

POWER FACTOR CORRECTION

Normal practice in undimmed installations is to connect capacitors in each fitting, of a value calculated to 'counterbalance' the inductive effect of the Choke.

In the dimmed situation, the inductive component needing compensation varies widely according to the point on the dimming curve. In view of this, power factor correction is frequently ignored on dimming projects (i.e. no capacitors fitted).

If on larger projects p.f.c. is called for, the capacitors must be connected at the mains input side of the dimmer. On no account must capacitors be connected to the output terminal LV of the dimmer. (This applies equally to any capacitors intended for interference suppression).

DIMMER
FEED

Power Factor Corrected values of loading should never be used to calculate the current rating of the dimmer feeder cable.

COMMISSIONING

The dimmer must be disconnected from any wiring subject to insulation tests (Megs etc.) as the high voltage used will damage internal components.

Just one ballast wrongly connected can cause all tubes on a whole circuit to flicker. Before switching on therefore, it is advised that the following procedure is carried out to verify correct wiring of every fitting:

WIRING
CHECKOUT

1. Disconnect the LV cable at the dimmer or alternatively remove the higher rated of the two dimmer fuses (the LV fuse).
2. Switch on and raise the dimmer to some intermediate level between 'off' and 'full'.
3. T12 Tubes: Every tube heater (both ends) should now show as a dull red glow. Any fitting showing discharge (white light) is liable to have its LV and LF cables transposed. Do not proceed until all heaters are visible.

T8 Tubes: All tubes should be on at approximately 10% light.

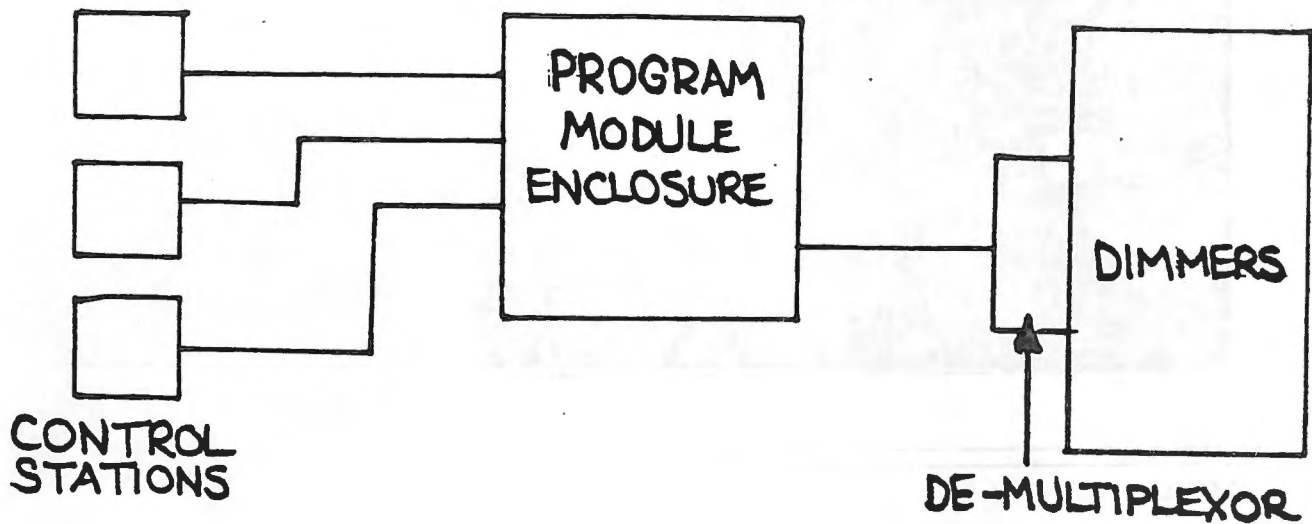
4. Restore the LV supply and check that all fittings will dim.*
5. Adjust dimmer 'Bottom Set' for a smooth dim to 'off'.

* Fluorescent tubes are subject to many manufacturing variations which only become apparent when they are dimmed to a low level. Therefore, it is not unusual that a small percentage may be rejected from any batch of tubes used for dimming. Brand new tubes perform better once they have been 'burnt-in' for a period of time. If practical, the system should be run at maximum for 100 hours and then re-adjusted if necessary once the tubes have settled in.

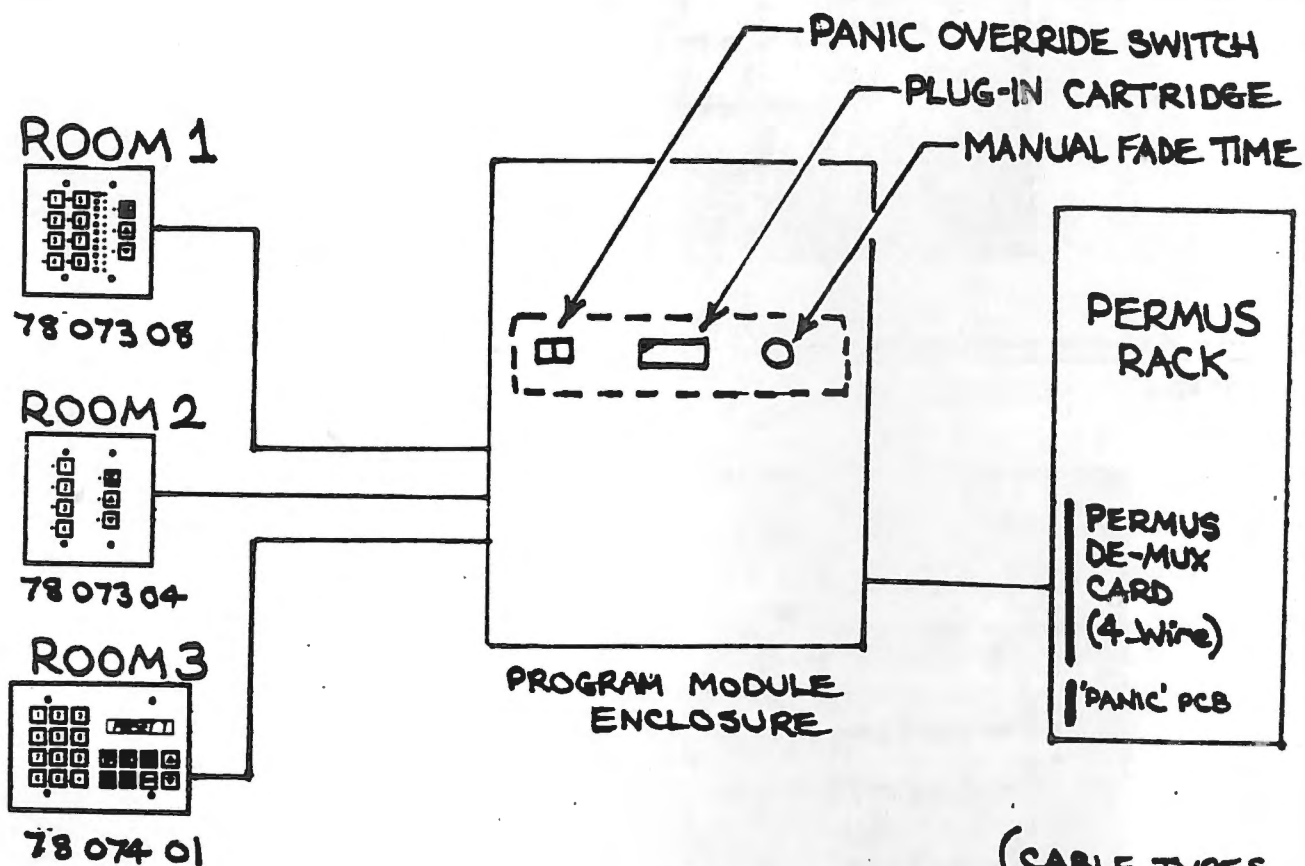
Environ Programmable

The Environ Programmable Data Sheet places its accent on the facilities available from the Control Stations. A sketch is included overleaf which may help to clarify the actual hardware involved in a typical system. The dimensions of the standard Program Module Enclosure are 500mm(h) X 500mm(w) X 200mm(d), with a front door which is hinged on the right.

ENVIRON PROGRAMMABLE



BASIC CONFIGURATION



TYPICAL SYSTEM

(CABLE TYPES AND ROUTINGS TO BE AS SPECIFIED BY STRAND.)