

Installation



Warning

Dimmer systems contain potentially hazardous voltages and high temperatures. Installation should only be carried out by suitably qualified personnel, safe working practice observed, and caution exercised at all times. Ensure that all Power supplies are properly isolated before gaining access.

General Information

LD90 cabinets are shipped with an installation kit containing the following items:

- Plug-on Connectors for multiplexed control signals.
- Cable Ties
- Earth Terminals

To simplify installation and siting only front and top access is required. A large removable access panel is provided at of the top of the rack for power cable entry.



Caution

Care should be exercised if High Voltage insulation testers (Meggers) are used on this equipment. Test voltages above 500V should not be applied to the electronic circuits.

Installation Planning

Planning an installation is very important. The following sections contain important information which should be read before the installation is undertaken.

Location

Any dimmer installation requires careful choice of location. Dimmers should, if possible, be sited close to the lamp loads to minimise cable runs. Although the design of LD90 reduces the radiated noise common to conventional dimmers, it is important to avoid siting in acoustically 'live' positions in the performance area.

The incoming mains distribution should be sited as close to the racks as practicable, and adequately fused isolators provided close to each rack.

Max rating 100A-3 phase, 300A-single phase.

Allow adequate clearance at the front of the dimmer rack, in order for it to be opened for wiring to the load, supply and control terminals and allow safe servicing of the equipment.

Ventilation

Adequate ventilation must be provided to maintain an ambient temperature within the range 0 to 35°C and humidity of 45-95% non-condensing. Special attention should be paid to the need to maintain ambient

temperature within these limits when an LD90 rack is enclosed in a small room.



Caution

Do not obstruct the ventilation slots.

Typical weights

Rack, empty:	42kg
Rack, loaded with Power Blocks:	76kg
Rack, Packed & Crated:	130kg



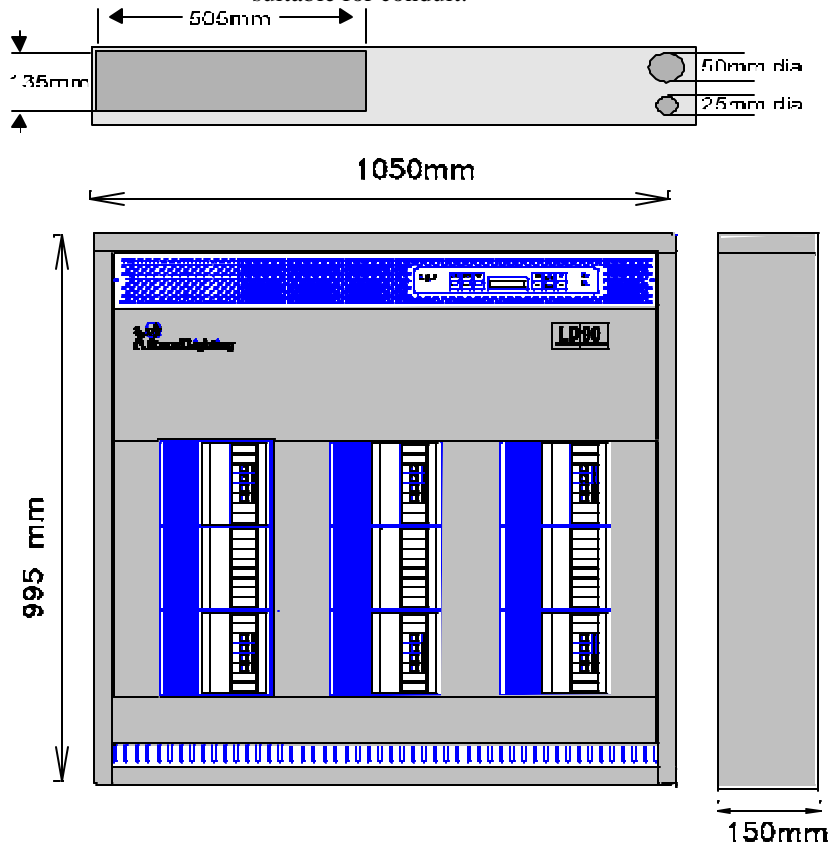
Warning

LD90 dimmers are heavy, take care when lifting

Dimensions

Cable entry dimensions are as follows:

- **Power Wiring** Top left 135 x 505mm flat cover plate. This plate may be removed and punched or drilled to suit the trunking or other wiring method in use.
- **Control Wiring** Top right 1 x 50mm. and 1 x 25mm holes suitable for conduit.



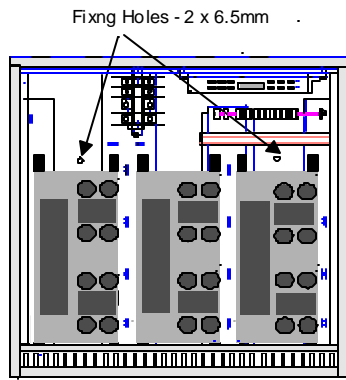
Placement and Fixing

The rack **must not** be left free standing. It must be fixed securely to a suitable sturdy wall, either as a floor mounted unit or, alternatively, wall mounted by means of the optional wall bracket (05 003 14). Fixing in this case is via the top two holes in the rack and the three holes in the wall bracket itself.

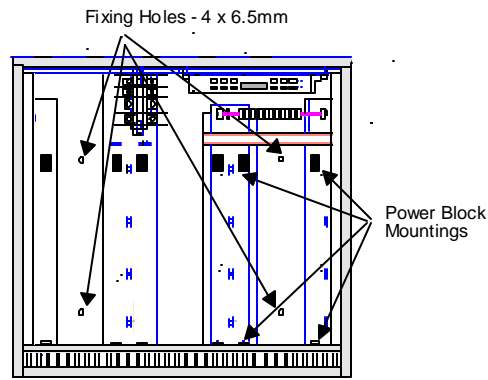


Wall bracket mounting provides the easiest and most secure fixing. Fixing is easiest if the racks are mounted before Power Blocks are fitted.

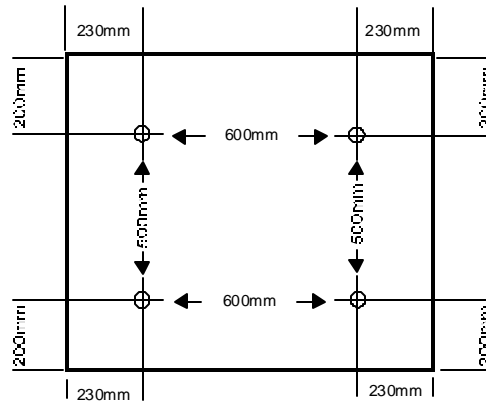
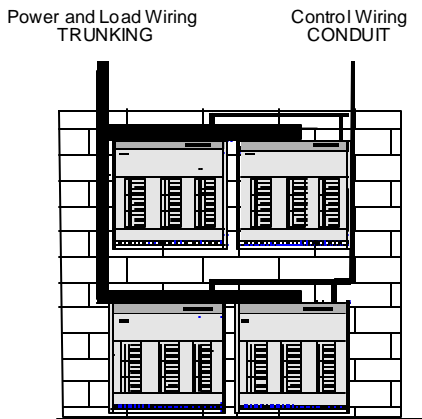
It is possible to stack units as shown in the diagrams below. The racks may also be mounted in a "Back to Back" configuration. **Electrical equipment must not be used in close proximity to flammable materials.**



Pre-configured Rack



Basic Rack



Note: Appropriate fixings should be used depending on the material of the wall. The rack has four clearance holes of 6.5mm diameter whilst the optional wall fixing bracket has three 10mm clearance holes.

Installation Procedure

After unpacking the rack, remove the front panel (2 screws) and the Earth lead attached to it.

The rack(s) should be secured to the wall before installation. Where Power Blocks are to be fitted by the installer, it is advisable fix the rack(s) and to route all wiring through to the the rack via the appropriate apertures before mounting the rack on the wall.

- Power wiring: Top left
- • Control wiring: Top right.

Note: For factory configured racks, go to Section "Power Connections" to continue the installation procedure.

Installing Power Blocks (Non-factory configured racks)

1. Carefully unpack each Block and remove fascia covers by gently pressing the four 'legs' located on each side.

Note: The POWER BLOCK AND ACCESSORY INSTRUCTION leaflet is inside and is required for wiring information later. The termination information is also covered in the Appendix section of this manual.

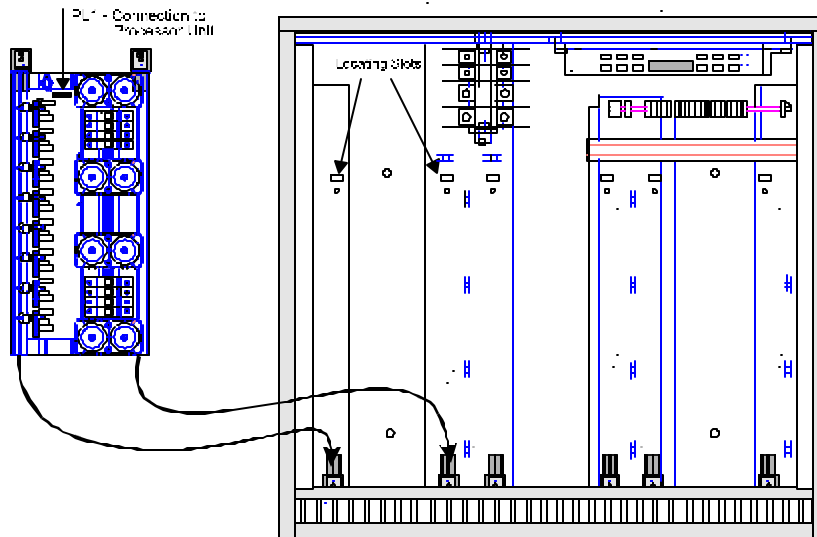
2. The Power Block mountings come attached to the rack. Remove the upper mountings and attach to them to the Power Block extruded runners as shown overleaf. Loosen the lower mountings.
3. Position each block in rack so that it locates on the bottom mountings. Note: Make sure that the load terminals are to the left and MCBs to the right.
4. Fix in position making sure the locating lugs are seated properly, but do not tighten the screws yet.
5. Secure both top and bottom screws securely only when the Block is located properly.
6. Repeat this procedure for all other Blocks.

IMPORTANT



THREE BLOCKS MUST BE FITTED TO EACH RACK. UNUSED PARTS OF THE RACK MUST BE BLANKED OFF WITH CUSTOM BLOCKS (05 002 08)

7. Once all POWER BLOCKS are fitted, wiring can commence.
8. Refer to the POWER BLOCK TERMINATION instructions in the appendix, for wiring instructions. Wiring from the output side of the busbars to the input side of the Power Blocks is factory fitted in pre-cut form and only requires termination to the blocks.
9. Connect ribbon cables to PL1 on their respective POWER BLOCKS. Leave this cable disconnected for Custom (blank) BLOCKS.



Power Connections

LD90 racks are equipped with busbars for Single, Two or Three phase plus Neutral and Earth connections. The busbars are rated at 100A per phase for 3 phase systems or 300A for single phase with the optional single phase kit. The busbars are provided with M12 bolts for the NEUTRAL and PHASE 1 terminals and M8 for 3 PHASE 2 and 3 terminals.



Caution

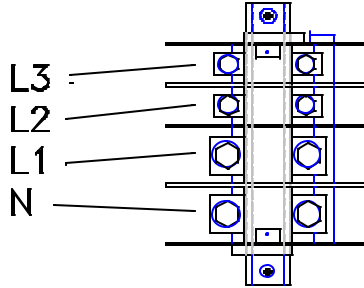
In all cases an adequately fused external isolator must be used for each rack. The supply must not be looped through from one rack to another.

It is imperative to provide an adequate Earth conductor for the rack and load connections. Do not rely on earthing via conduit or trunking.

The main Earth connection is directly on the Earth Busbar, below the Processor Unit (see *Physical Description*). It will take conductor size up to 35mm²

Careful consideration must also be given to the segregation of dimmer power supplies and any supplies provided for sound, video or computer equipment. In particular the Earth and Neutral for the dimmer installation should be kept separate from the technical 'clean' supplies to avoid unwanted interference.

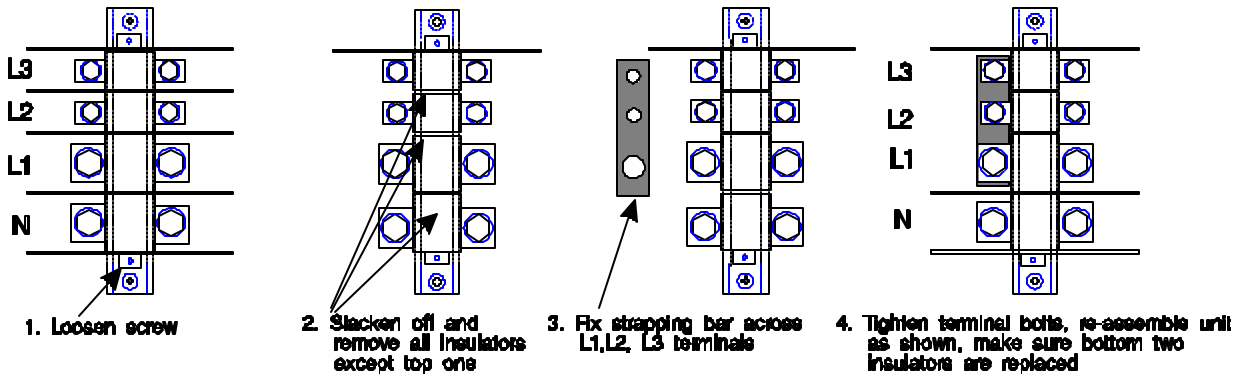
Three Phase Conductor sizes must be chosen to comply with local regulations and are usually calculated to take into consideration cable lengths and types. Typically, wiring for 3 PHASE LIVE conductors should be 35mm² for maximum rack load capacity.



For the NEUTRAL conductor, we recommend a size of at least 1.3 x phase conductor size to allow for the harmonic currents generated by phase control dimmers.

Single Phase Typically wiring for both LIVE L1 and NEUTRAL N should be 95mm² for maximum rack load capacity. For this application use the Single Phase strapping kit (05 003 13).

Fit the strapping bar across the input busbars as shown below:



Load Connections

Two connections for both LIVE and NEUTRAL are supplied at each dimmer output to allow two loads to be connected in parallel without the need to fit two wires in a single terminal. The terminals are located on the Power Blocks. Please refer to the Power Block Termination details in the appendix.

Load terminals allow for wire sizes as follows:

- 2.5kW dimmers Up to 4mm² stranded direct into the terminals and up to 6mm² with supplied "pin crimps".
- 5kW dimmers 6mm² stranded

Earth connections are made directly to the Earth Busbar under the Processor Unit (for location, see *Physical Description*). 24 busbar clamps for up to 10mm² wires are provided in the installation kit and are fitted as required.

IMPORTANT



Dimmer control involves fast waveform switching, and care must be taken to ensure that this does not result in radiated interference or induced fields. It is therefore important that the PHASE and NEUTRAL conductors for each circuit carry equal and opposite current components, and this can be achieved by always running the two conductors together as a pair of equal length. NEUTRAL conductors of different dimmers must not be joined or run as a large common conductor.

Phase Orientation

LD90 provides a powerful way of re-numbering physical dimmers in software. This provides the installer with the ability to accommodate local wiring practices (such as alternating phases for each successive numbered dimmer). Dimmer numbers in the system can be phased as shown as shown in the following diagrams. This is an advanced software function - it is important to realise that physical dimmers on each Power Block are always of the same phase.

Wiring the loads

The dimmer load wiring must be installed in **one** of the circuit orders shown overleaf. When RACK SETUP is performed, the PHASE TYPE must be set to the corresponding letter A, B, or C (see later).

Decide on the phase orientation that suits the installation best, and terminate the loads to suit. Remember the selected mode, A, B, or C, for Rack Setup later, and for labelling the MCB's.



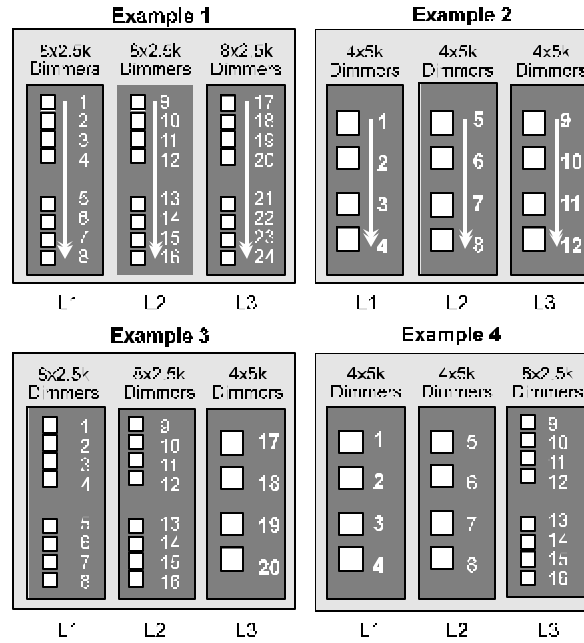
It is easier to install the supplied cable ties in the cable tie landing points and around the Input Busbar - Power Block cables before the load wiring is put in place.



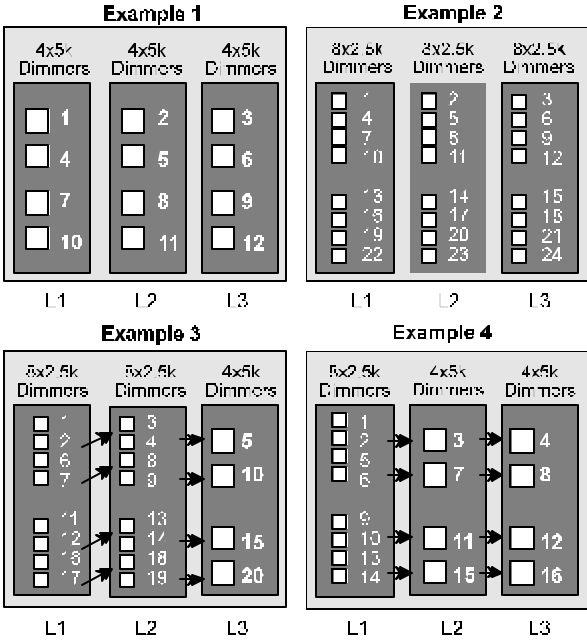
Caution

The load wiring must be attached to the rack and kept free of the Power Block ventilation paths. Ensure that the wiring does not obstruct the top of the Power Blocks, otherwise the rack may overheat and trip the overtemperature switches.

Phase Type A is a straightforward way of allocating dimmers with Power Blocks of the same and mixed power ratings.

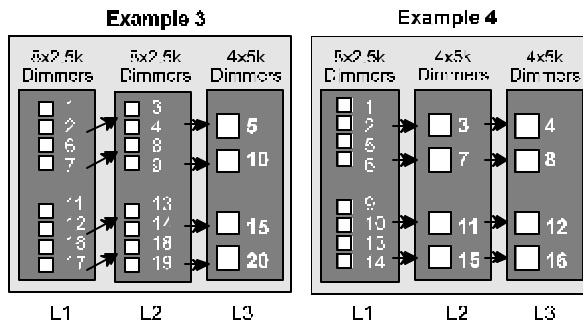
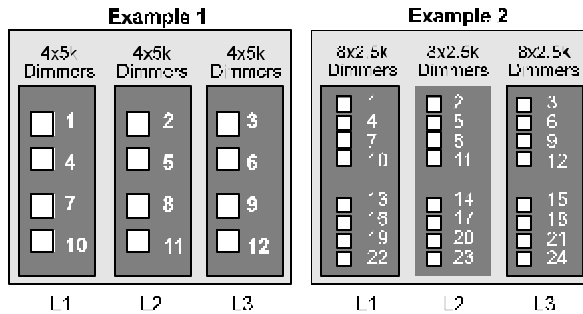
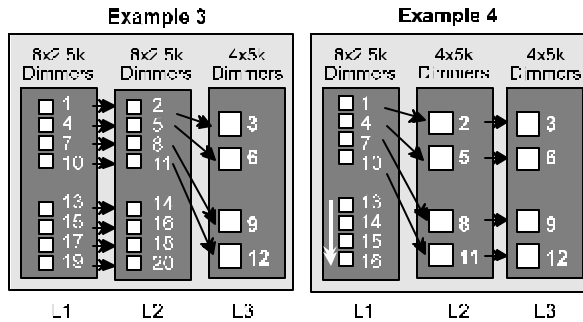
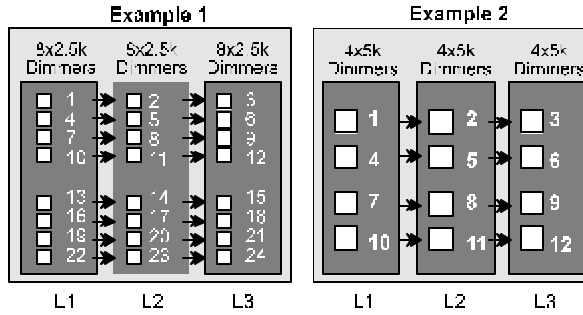


Phase Type C Allocates dimmers across phases sequentially regardless of loading considerations



Phase Type B Allocates dimmers across phases and will attempt to 'Balance' the loading.

Note: This will **not** reduce the size of the required Neutral cable.



Control Signal Connections

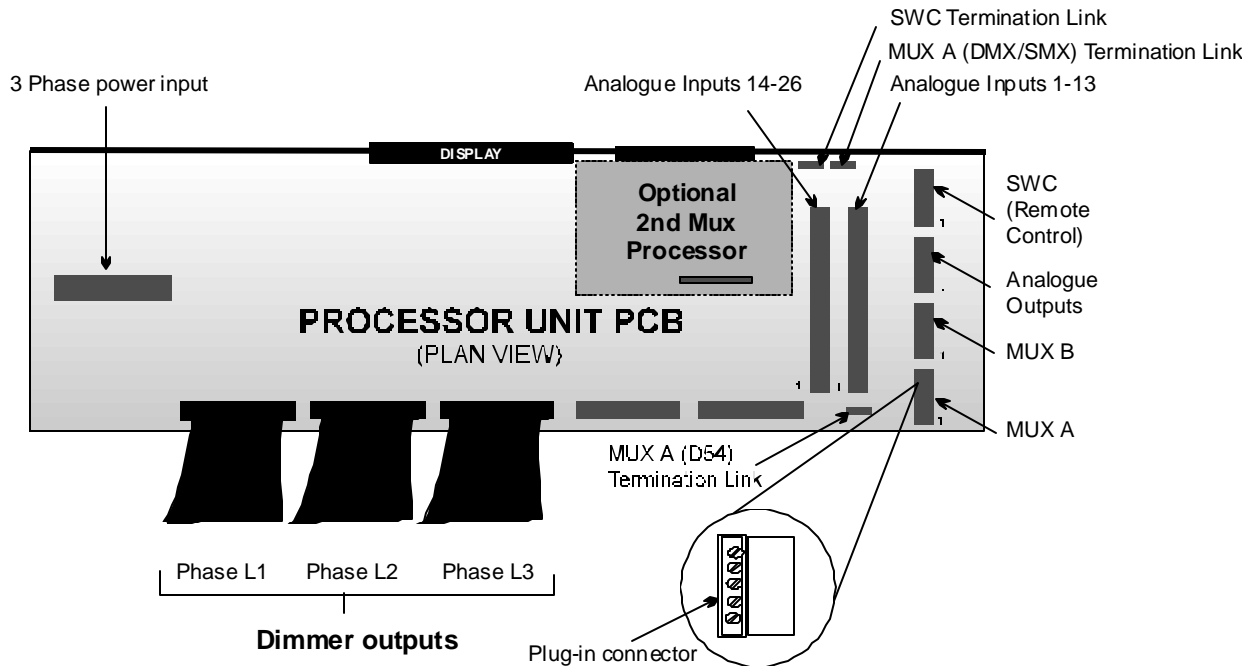
Control connections are made via screw terminals on the plug-in connectors fitted to the Processor Unit PCB.

LD90 accepts the following dimmer control signals without need of adjustment:

- Digital multiplex: DMX512, SMX
- D54
- Analogue: +/-10V (or mixture) one per dimmer + two inputs for auxiliary dimmers

In addition it supports the connection of a remote System Wide Control - either handheld unit(s) or wall-station unit(s) - OR connection to a Personal Computer using the SV90 program for sophisticated remote programming and interrogation.

Diagrams below and overleaf show Processor Unit connections and cable types required.



LD90 racks can be fitted with a second digital multiplex processor PCB, in the position shown, to support simultaneous input from two control consoles (DMX512 or SMX only on the second input).

Information on this PCB is contained in the Appendix.

**DMX512 / SMX and SWC
Control Wiring**

All three of these control signals use the same electrical standard: RS485. This defines the electrical requirements of the cable and the voltages used. The voltages are classed as Safety Extra Low Voltage (SELV). The following table illustrates the relationship between control signals and their parameters:

Control Signal	Data Protocol	Connector	Electrical Standard	Information Transferred
Mux A	DMX512	PL15	RS485	Dimmer levels
Mux A	SMX	PL15	RS485	Dimmer levels
Mux B	DMX512	PL14	RS485	Dimmer levels
Mux B	SMX	PL14	RS485	Dimmer levels
SWC	SMX	PL12	RS485	Dimmer control commands

- CABLE TYPE** Belden 9841/9842 or equivalent cable approved for RS422/485 use.
- MAX. LENGTH** Standard RS485 electrical characteristics apply, including line driver and receiver characteristics, line loading, and multi-drop configurations.

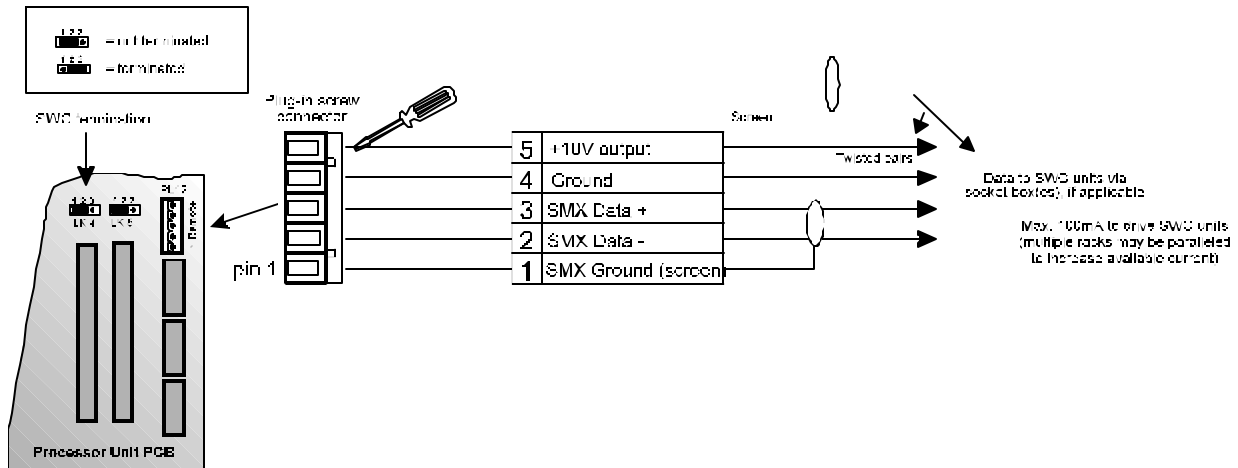
Recommended lengths, < 300m with a maximum of 31 dimmer racks per line.
- CONNECTOR** 5 way terminal block, supplied with the rack.
- TERMINATION** The termination rules for Mux A and Mux B are identical. The termination link must be across pins 1-2 (unterminated) on all racks except the last one. The link must be set in positions 2-3 (terminated) for the final, or single, rack unless the control signal is to be terminated elsewhere.

For SWC and SV90 termination is not generally required. When using SV90, termination may, in some instances, cause problems.

NOTES:

- If Mux control cables are wired to wall boxes for desk connection at alternate positions, it is recommended that the USITT DMX512 pin conventions (above) are used.
- This wiring arrangement applies to both Mux A and Mux B.
- SMX uses the same electrical standard as DMX and should be wired using two-twisted pair wiring, for SWC use the second pair used to power the unit(s).
- If SWC remote socket boxes (66074) are mounted then the pin convention shown in the diagram below must be used.

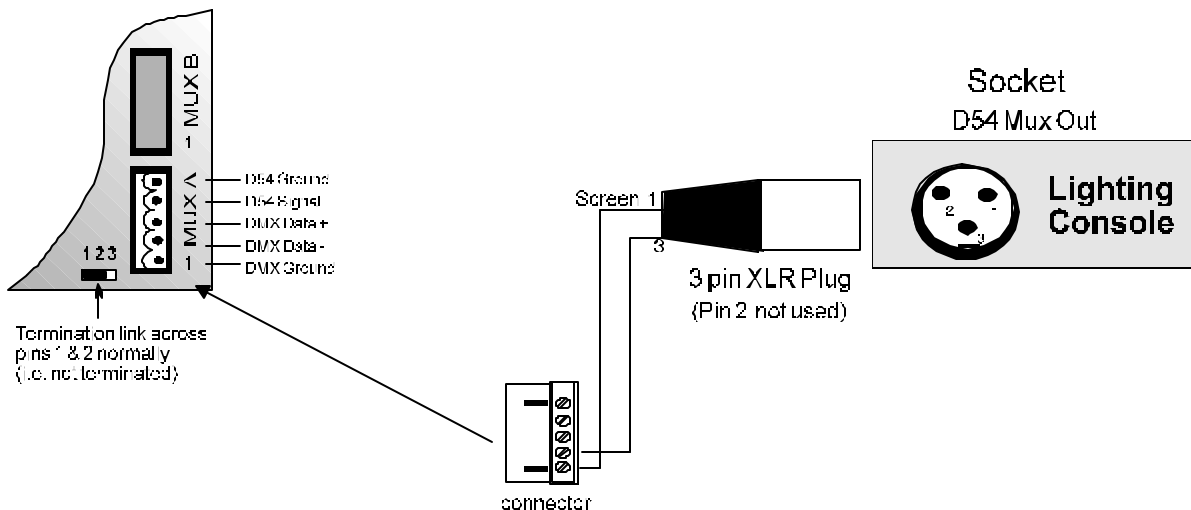
Remote (SWC or SV90) connection



D54 Control Wiring D54 is an unbalanced analogue multiplex signal of amplitude +/- 5V.

- CABLE TYPE** Standard twin screen microphone style cable with minimum 16/0.2 (0.5mm²) conductor size.
- MAX. LENGTH** 300m
- CONNECTOR** 5 pin Terminal block, supplied with the rack.
- TERMINATION** LK6 termination link should be left across pins 1&2 under normal circumstances (no termination). The last rack on the line may be terminated by using LK6 across pins 2-3 if the line is very long or there are particular electrical noise problems.

Processor Unit PCB



Analogue Input Wiring

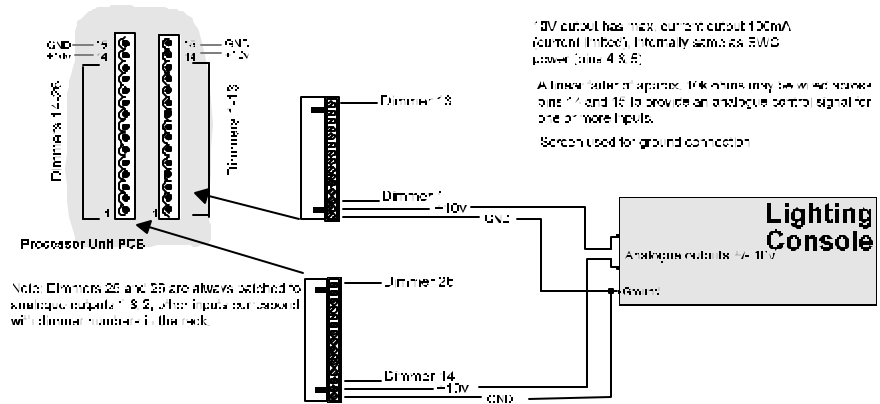
In addition to using multiplex protocols such as DMX, SMX and D54, it is possible to use +/-10V analogue inputs as well using the appropriate *optional* plug-on connectors on the processor unit PCB.

CABLE TYPE Screened multicore, 7/0.2 (0.22mm²) or 16/0.2 (0.5mm²) conductor size.

MAX. LENGTH Depends on how noisy the environment is. This cable should be trained well away from any noise sources. Lengths of 100-200m may be achieved in optimum conditions.

CONNECTOR 2 x 15 pin Terminal blocks, **optional part 05 003 11 (=2 off)**.

INPUT IMPEDANCE



Each input has approx. 100kΩ input impedance. It is filtered with 10mS time constant to eliminate signal noise.

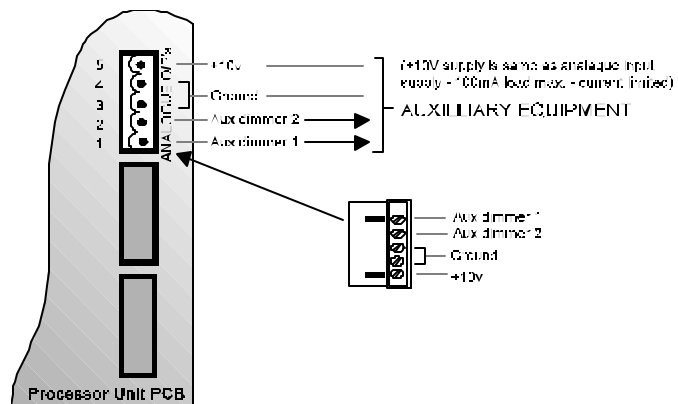
Analogue Output Wiring

A facility exists to drive two auxiliary analogue dimmers or other equipment via the ANALOGUE OUTPUT socket on the processor unit PCB. The plug-in connector is the same as the MUX A/B connectors and is supplied with the rack.

CONNECTOR 5 pin Terminal block, supplied with the rack.

OUTPUT LEVEL 0 to +10V positive.

OUTPUT IMPEDANCE 1 k Ω in series with diode, allowing "pile-on" paralleling with other control sources.



Testing the system after Installation

Before Switching Power On



Warning

After the installation stage is complete, a number of safety and functional tests must be performed. The safety checks must be performed before power is switched on for the first time.

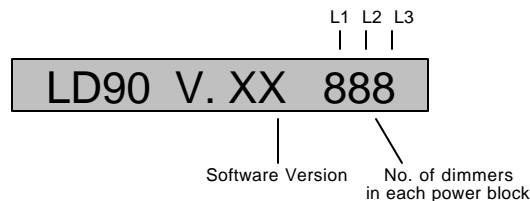
1. Check that all terminals and mechanical fixings are secured.
2. Check for stray wire strands and make sure wires are correctly restrained and not in contact with metal edges or obstructing the power block ventilation paths.
3. Remove any installation debris from bottom of racks as this might obstruct ventilation.
4. Check Earth connections and impedance.
5. Double-check Neutral connections and positively verify phase orientation at the input busbars. Ensure that Neutral has not been confused with a phase - connecting the unit "across the phases" will do severe damage.
6. Replace cover (Rating label) over supply terminals.
7. Make sure all Power Block ribbon cables are connected.
8. If "Neutral Disconnect" blocks are fitted, open **all** circuit breakers **and** Neutral Disconnect terminals to perform insulation tests.

DO NOT test wiring without first isolating the dimmer.

1. Remove protective plastic film from display panel.
2. Replace all fascia panels, reconnect the earth lead to the front panel and re-fit the front panel. Affix fascia labels and mark circuit numbers as required.
3. A full safety inspection of the load wiring should be carried out before power is applied to the dimmer rack.

Testing After Power On

4. Check **L1, L2, L3** LED's are lit.
5. Check display shows **Rack 01**, after the following sign-on message has appeared for a few seconds:



6. The message is useful to verify that the Processor Unit has recognised all the power blocks fitted to the rack.
7. Switch on all circuit breakers and RCDs (if fitted).
8. Check **OK** LED is lit.

IMPORTANT



Should any of the above fail to appear, switch off the supply immediately and check the installation again.

9. Refer to the Rack Set up Procedure (following) and set up the variable parameters on the rack as required.
10. A suitable luminaire should be connected up to each outlet and every dimmer individually checked using the LEVEL control facility or a suitable control console. Any malfunctions should be investigated and corrected at this stage.

Rack Setup Procedure

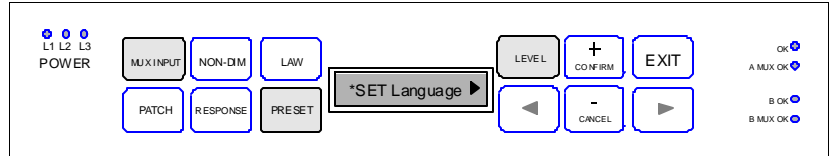
Each dimmer rack is shipped with most parameters set at usable defaults, (see ref. section for these settings). Usually, however, a small number of programmable settings will need to be altered using the keypad. It operates in the following manner:

In most cases + and - keys step through the 'values' which can be set for any parameter.

The < and > keys are used to step through various menu options. EXIT is used to leave a menu and store the changes. Sometimes a confirmation may be asked for. Changes to the settings will appear immediately, but are not stored permanently until the EXIT key is pressed and any necessary confirmation step has been taken.

To avoid tampering by unauthorised personnel, LD90 includes a security mechanism indicated by a 'key' symbol on the right hand side of the display. It is necessary to enter a 'security code' to "unlock" the system before any of the keys will respond. The security lock will be automatically restored after a 10 minute period.

The SET menu is used to alter fundamental system settings. Press the following three keys (shown as shaded) simultaneously and hold them down for approx. 2 seconds until ***SET Language** appears. (This also unlocks the keypad)



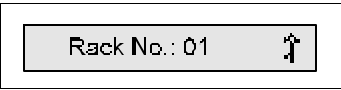
The SET menu The SET menu gives access to the following settings:

- | | |
|----------------------|---|
| LANGUAGE | English is the default language, French and German may also be set. Once changed, all subsequent messages will be displayed in the selected language. |
| RACK NUMBER | For Multiple rack installations this must be set. No two racks should have the same rack number. |
| OUTPUT VOLTAGE | This facility allows the max. output voltage to be set for all or individual dimmers. Set max. voltage to that of your lamps, or, set them 10% lower for considerably improved lamp life. |
| PHASE TYPE | This must be set to the required type: A, B, C as detailed above. |
| MINIMUM DIMMER LEVEL | This is a facility for all or individual dimmers to be held at a minimum level. It may be used for security/safety lighting or as a preheat'. |
| FLUORESCENT SETUP | A facility to allow dimmers to control suitably equipped fluorescent fittings. i.e. those fitted with Strand approved ballasts suitable for phase controlled dimming. |

RETURN TO DEFAULTS

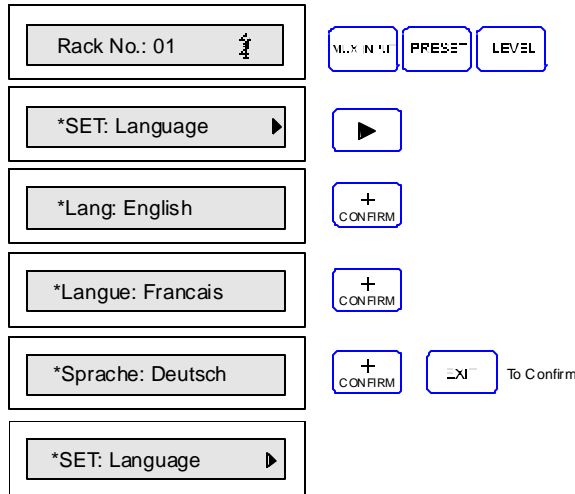
An option to return to the factory settings, useful if errors are made in programming.

Using the SET menu, fundamental racks settings can be programmed as required. The next few pages illustrate the procedures for accessing and modifying the required settings. The **SET** menu can be left by pressing the EXIT key when the display is showing any of the *SET ... menus shown below.

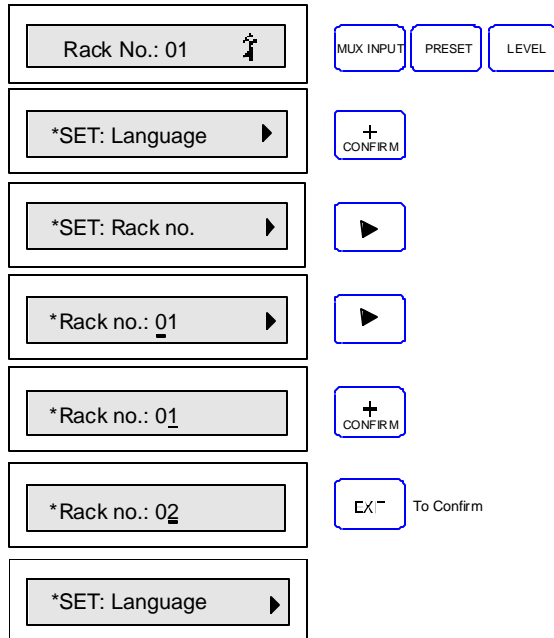


Once at the default display, shown left, the contrast may be set, see the Reference section, "Keypad and display" for details.

Setting Language

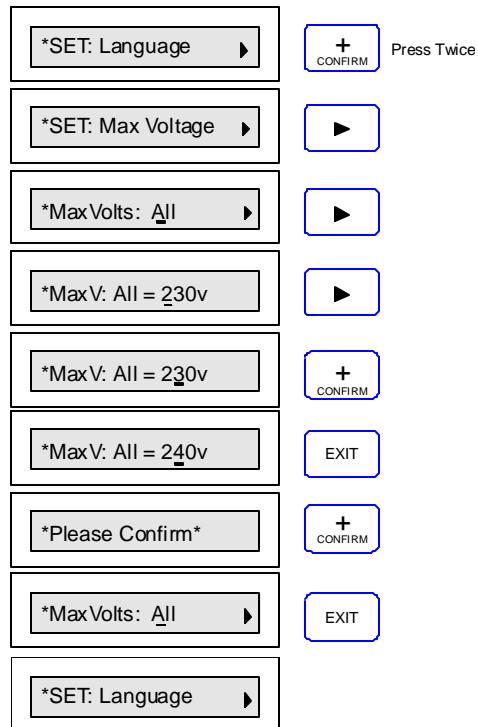


Setting Rack Number

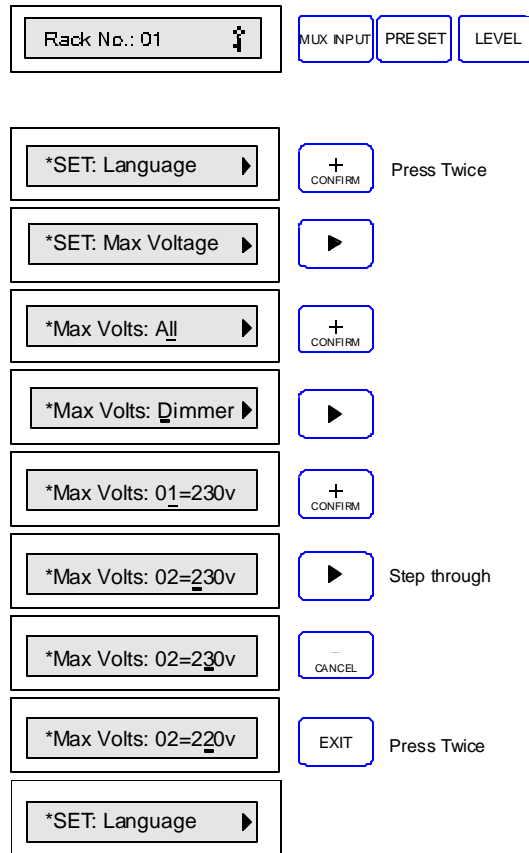


Setting Maximum Output Voltage

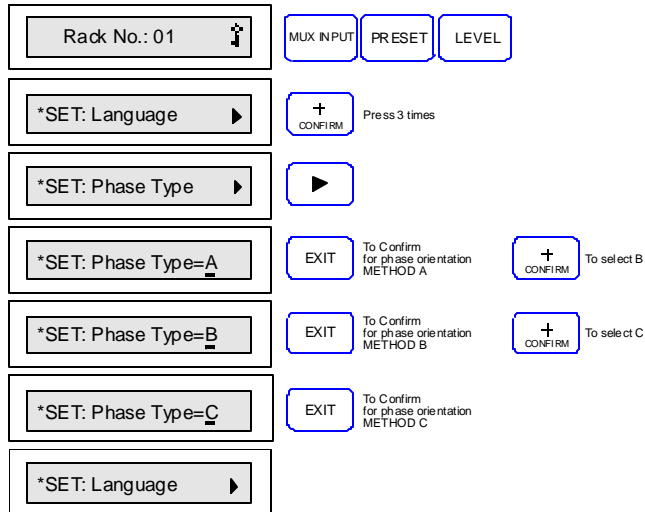
Example 1: Set ALL to 240V



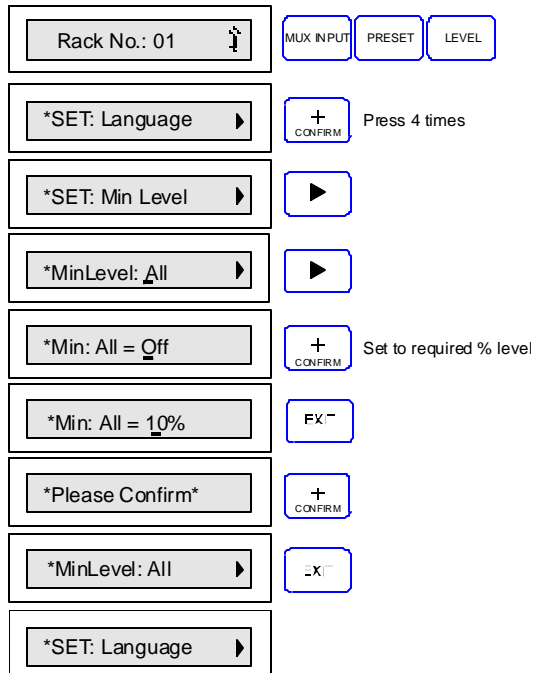
Example 2: Set Dimmer 02 to 220V



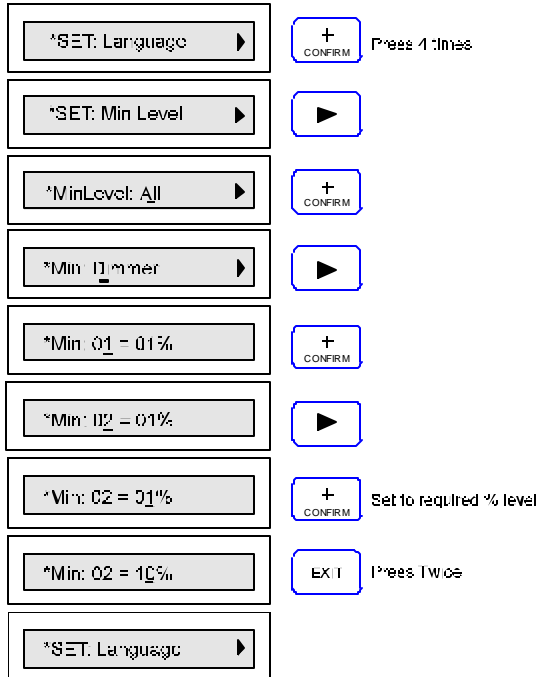
Setting Phase Type Example: Set to Phase Type A



Setting Minimum Dimmer Levels Example: Set ALL dimmers to 10%.

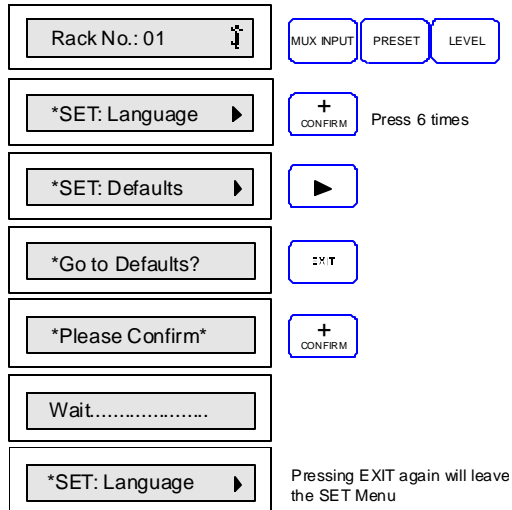


Example: Set only Dimmer 02 to 10% minimum.



Return to Default Settings

Beware - this option returns all programmable settings to factory defaults.



Fluorescent dimmer mode Set-up

The LD90 rack supports both magnetic and electronic fluorescent ballasts. Each dimmer can be set up to be a normal dimmer, a dimmer for magnetic (conventional) ballasts or one for electronic fluorescent ballasts. Magnetic ballasts require heater relays and 12 of these may be driven, via suitable interface electronics, from the Processor Unit. The heater relay outputs are used to drive the fluorescent heaters via a separate "line fixed" supply. See the Appendix for signal connection details.

When set to MAGNETIC, any of the first 12 dimmers will activate relay outputs on the Processor Unit. Each is driven after the dimmer is faded up from zero. The dimmer output itself is delayed by approx. 1 second to allow the tube(s) to warm up.

When set to ELECTRONIC, the "kick-start" mode is activated. This mode drives electronic ballasts directly. They require a voltage surge as the dimmer is faded up from zero to get them to properly control fluorescent loads. The advantage of this type of ballast is that there is no need for relays and the "line fixed" supply as above.

Please note that due to the nature of fluorescents, they operate best (most smoothly) when the dimmer RESPONSE is set to SLOW. The reference section details RESPONSE setup.

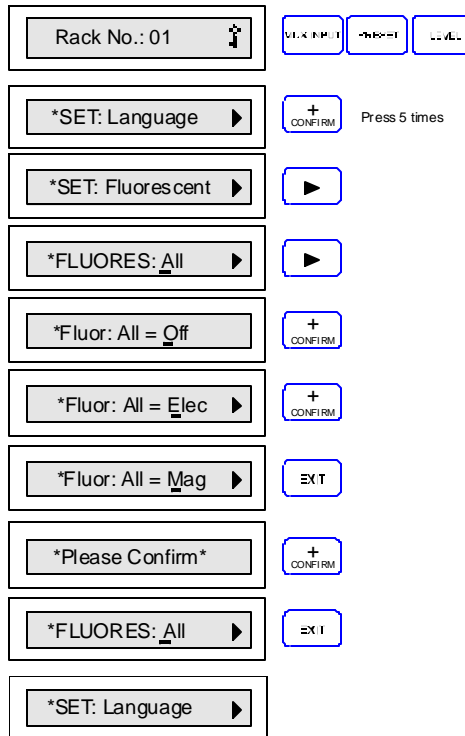
For further information on Fluorescent Dimming refer to Strand Lighting FACT SHEET NO.9: **A Guide to Fluorescent Dimming.**

IMPORTANT

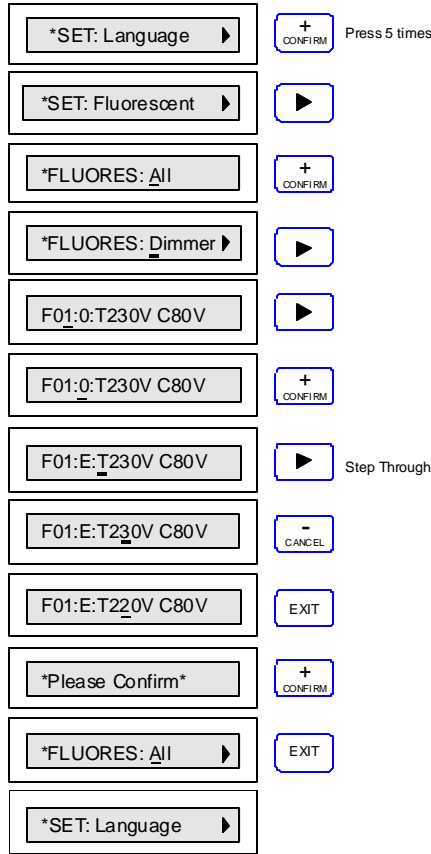


In case of unwanted flashing of electronic fluorescent ballasts, for each dimmer programmed for this application, you may need to remove a link on the Power Block PCB - see Power Block wiring for details. You should be aware that this will remove the RFI suppression (to EN55014) on that dimmer. An alternative means must then be found to suppress any interference caused.

Example: Set ALL dimmers to MAGNETIC type.

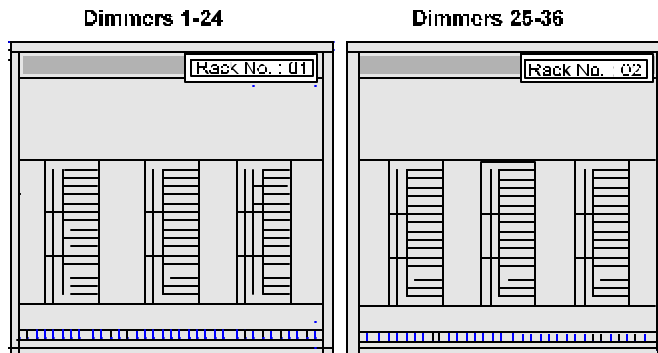


Example: Set dimmer 01 to the following, E (Electronic) T220V (max voltage setting=220V), C80V (Cut off voltage=80V). For an explanation of how and why these settings are required, refer to the fact sheet above.



Multiple Rack Installations


Multiple rack installations require that each rack is individually numbered and dimmers assigned accordingly.




Example: Two racks, one containing 3 x 2.5 kW Power Blocks and the other 3 x 5kW Power Blocks, are to be installed as one complete system. Racks and dimmers are assigned as shown below.

The following procedure should be followed when setting up this multiple rack installation.

Set the RACK NUMBER for the second rack to **02** using its controls, (see above). Dimmers in Rack 02 now need to have their multiplex addresses set up. The first dimmer on rack number two has to be set to 0025.

Press  to take you out of the SETUP menu.

Press  and follow the procedure shown below.

