Strand Lighting

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LD90 OPERATION AND AGENTS MAINTENANCE.

CONTENTS PAGE

Introduction

All Approved Service Centres will be supplied with one copy of this technical training handbook. This copy are supplied for information only. Strand Lighting will not approve the use of information contained within this handbook by persons who have not attended training courses at Strand Lighting.

The front cover, the contents pages and this introduction page form the header document for this handbook. This header document has a unique document number which should always be quoted when referring to the whole handbook.

Each time there is a change or an addition to the handbook a supplement will be written. The supplement will be put at the end of the main text and will have another document number.

Each time a supplement is written the header document is updated. The supplement is added to the contents pages and the issue number of the header document is incremented.

To check that your copy of this handbook is up to date contact Strand Lighting Engineering Service and quote the number and issue of the header document. If your document is not the latest issue you will be sent the latest header document and the missing supplements.

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The information within this handbook is believed to be correct and complete, however if you discover any omission or error, please contact Strand Lighting.
Strand Lighting accepts no responsibility or liability for any errors or omissions which may have occurred during the preparation of this guide.
Strand Lighting accepts no responsibility or liability for any damage, loss or injury, however caused from the use of information contained within this guide.

Electricity at Work Regulations - 1989.

The Electricity at Work Regulations 1989 require :-

"No person shall be engaged in any work activity where technical knowledge or experience is necessary to prevent **danger** or, where appropriate, **injury**, unless he possesses such knowledge or experience, or is under such a degree of supervision as may be appropriate having regard to the nature of the work." (Guidance on regulations - published by HSE)

"It is for the employer to judge the level of competence required, and to ensure that no person is called on to carry out work for which he does not have the required competence. This is very much a matter of individual judgement, but the employer must always bear in mind the fact that he may be required to justify his decisions before a court of law in the event of an accident." (Guide to Electrical Safety at Work - John Whitfield - Published by E.P.A. Press)

Successful completion of the course and the assessment does not, by itself, necessarily provide the trainee with the knowledge or experience to comply with this requirement.

To satisfy the requirement the following three stages must be completed.

1.   Pre-Qualification.

Before attending a course at Strand, the trainee must be able to demonstrate "adequate knowledge of electricity" and "adequate experience of electrical work". This knowledge and experience will probably have been gained from a BTEC, City and Guilds or other vocational qualification.

2.   Theory and Identification of Hazards.

The course at Strand Lighting will include understanding of the system to be worked on, understanding of the hazards which may arise during the work and any precautions which need to be taken.

3.   Practical Experience.

Finally the trainee must gain practical experience of the class of system which is being worked on. He must also be able to recognise at all times whether it is safe for work to continue. These requirements are not taught at Strand Lighting.

All maintenance courses are assessed. Engineers who pass the assessment will have demonstrated that they have the required theoretical understanding of the system, understanding of hazards and the precautions to be taken. The engineer may now proceed to the next stage which involves gaining practical experience of the type of electrical equipment covered in the course.

Engineers who have attended courses prior to the introduction of the assessments, and have had regular experience of the product, should still have sufficient understanding of the system and understanding of the hazards. Engineers who have not had regular experience should attend a refresher course and take the assessment.

Strand Lighting

LD90 Operation and Agents maintenance.

Section 1.   Operation quick reference.

1.1   Power up.

1.1.1   LCD Displays.

At power up the LD90 will display
the following message :

```
LD90 V.A1     888
```

V. A1   The software version fitted to the LD90 processor.

888   The types of memory block fitted in each of the three positions.
0 = No memory block fitted.
4 = 5K memory block fitted.
8 = 2.5K memory block fitted.

The message will then change to :

```
Rack No.: 01      ↕
```

NOTE.

If the message   "ERROR 06032 >" appears   press "Cursor Right" for more
information. The message will change to show "MODULE CHANGED !". This
message will always appear when a module is changed or the processor is moved to a
rack with different modules fitted. It is not an error message. Press "EXIT" to
continue.

1.1.2   Indicators.

On power up the three LED's marked L1, L2 and L3 will light. These indicate power
on each phase.

On power up the OK LED will flash on then switch off for a second whilst the
processor comes out of reset. The LED should then remain on. A flashing LED
indicates overheat on one of the power modules.

The B OK LED is only available on circuit boards with the second mux processor
fitted. The LED will light when the processor has completed its initialisation.

MUX A and MUX B LED's will light when the processor detects a valid source of
MUX.

1.2 Unlocking the display.

There are three methods of unlocking the display on the LD90 processor.

1.2.1 Unlock only.
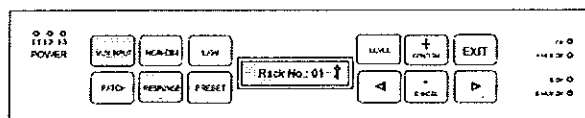
Hold the MUX INPUT and RESPONSE keys down for 2 to 3 seconds.

1.2.2 Unlock and enter rack set-up.
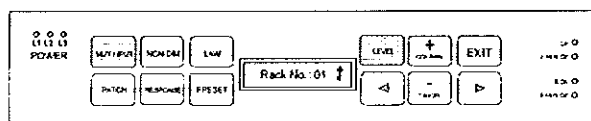
Hold down the MUX INPUT, PRESET and LEVEL keys. After two seconds the key symbol will disappear. Keep the three keys held down until the rack set-up menu appears.

1.2.3 Unlock and enter service menu.

(AT SAME TIME)
Hold down the MUX INPUT and PATCH and LAW keys. After two seconds the key symbol will disappear. Keep the three keys held down until the service menu appears.

1.3 Basic Operation.

Follow the steps in section 1.2.1 to unlock the keypad/

1.3.1 MUX INPUT.

The menu for Mux Input B is only available when the LD90 processor detects that a Mux Slave processor has been fitted.

Mux input B will not accept a D54 Mux input.

Selection of the wrong mux input protocol may cause error messages to occur.

```
Mux  Input  A :  D54
                 DMX512
                 SMX250K
                 SMX62K5
                 SMX19K2
                 SMX9K6
                 SMX2K4


Mux  Input  B :  DMX512
                 SMX250K
                 SMX62K5
                 SMX19K2
                 SMX9K6
                 SMX2K4
```
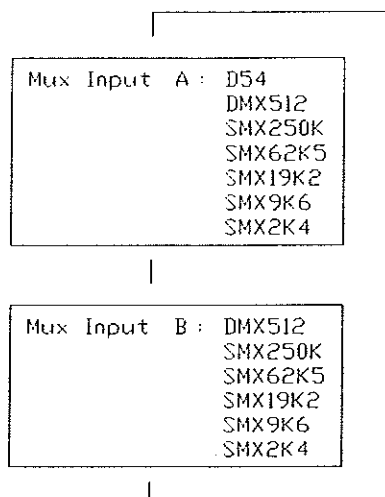
1.3.2 NON DIM.

This option will allow any dimmer, except the two analogue outputs, to be made Non Dim.

On software version B1 or later a Non Dim dimmer can be used to control a relay instead of a dimmer. The dimmer must also be set to Max Volts = 250V. See section 1.4.3 for details.

```
Non  Dim:  01  =  DIM
           02     01%
           03     02%
            |      |
           24     90%
```

1.3.3 LAW / CURVE

The name of this button changed from LAW to CURVE with software version B1.

On software versions B1 or earlier the Fluorescent dimmer law options only appear on the Rack Set-up Menu. (See section 1.4.8 for the earlier version).
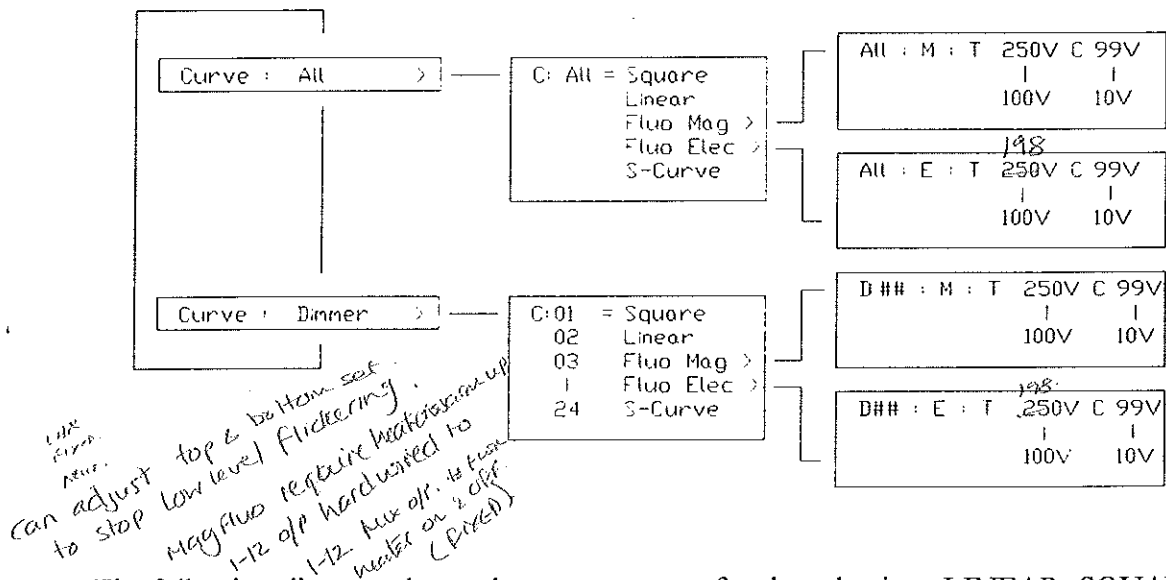
The following diagram shows the output curves for the selections LINEAR, SQUARE and S-CURVE.
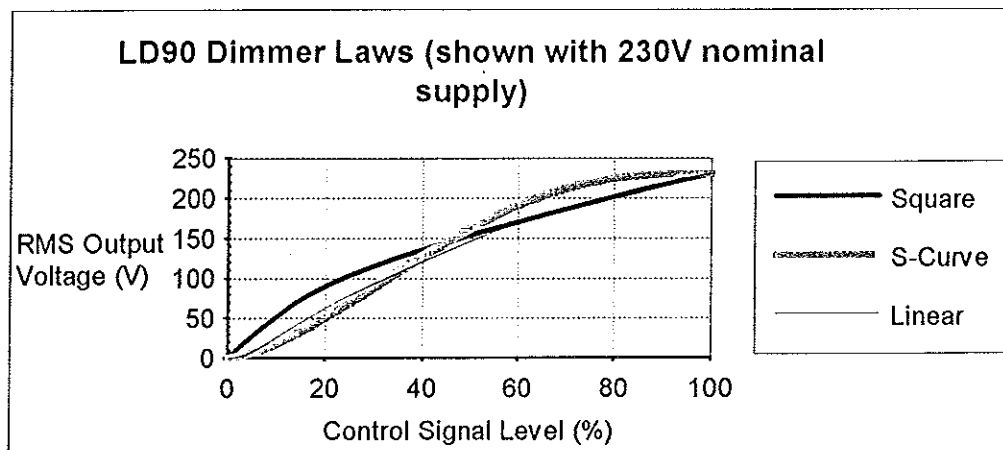
The fluorescent options are split into Magnetic and Electronic.

Magnetic dimming ballast's require a variable and a fixed voltage. If Magnetic Fluorescent is selected on dimmers 1 to 12 then the 12 AUX outputs of PL5 can be used to drive relays. These relays will provide the fixed voltage. If Magnetic Fluorescent is selected on dimmer 13 or over then an alternative fixed voltage must be found. (Full details can be found in section 5.7)

When High Frequency Electronic Ballast's are used the dimmer must be set to Fluorescent Electronic. 24 ballast's can be controlled as there is no need for "Line Fixed". The maximum voltage setting is critical. Incorrect setting can result in poor lamp life or damage to the ballast. (full details can be found in section 5.8)

The T value is the maximum voltage sent to the fluorescent ballast.
The C value is the minimum voltage. Below this value the dimmer will switch off.

1.3.4   PATCH.

The Architectural patch is for use with "OUTLOOK" only. It is not available on software versions B1 or earlier.

Option Mux B is only available when a slave Mux processor is fitted.

The maximum number of channels is fixed by the mux protocol selected.

Although 15 channels are available in each of the 16 OUTLOOK rooms, the largest fader or master outstation available is 12 channels.

The default Channel ID is the dimmer number.
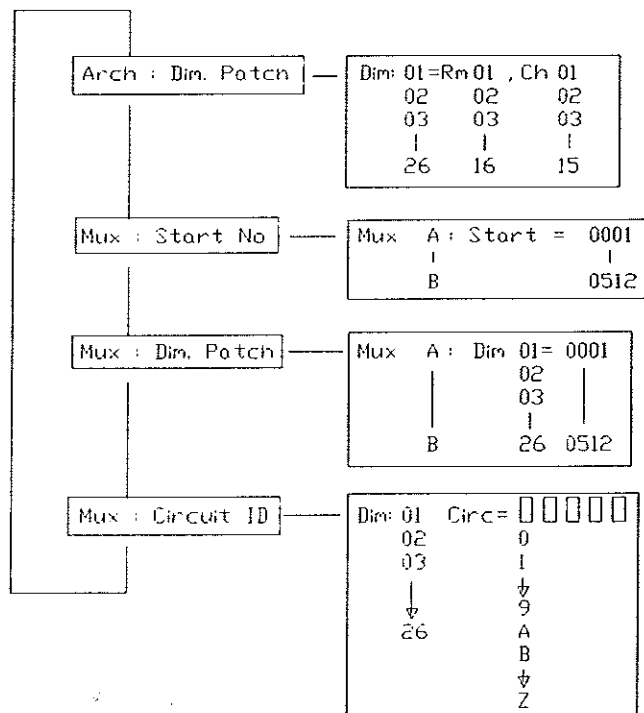
IMPORTANT INFORMATION.

D54 PATCH.

When D54 protocol is selected the LD90 processor will only read 52 consecutive dimmer levels. This means that the gap between the first D54 channel selected on the patch menu and the last D54 channel can not exceed 52.

With DMX selected, when the patch is programmed it is possible to patch any channel to any dimmer. If the range is above 52 when the protocol is changed to D54 then the MUX OK LED will switch off and no channels can be controlled.

There is a fault with version B1 software. When patching D54 the processor will not allow the user to patch beyond a range of 26 channels. To overcome this problem select DMX protocol when you wish to change the patch. Make sure that the range of channels does not exceed 52 then change the protocol back to D54. This fault has been cleared in version C1.

CIRCUIT ID.

The CIRCUIT ID is very important if the SV90 Hand Held Programmer is to be used. When the programmer selects a channel it will use the ID programmed into every LD90 dimmer.   AS IT DOESN'T USE THE PATCH.
                                    EACH RACK DEFAULTS TO 1-24 MUST PHYSICALLY CHANGE IT.
The default ID is a number sequence starting at 1 for dimmer 1 and counting up through all existing dimmers. Every LD90 will start at CIRCUIT ID = 1.

The ID will not change when a patch is entered. Every dimmer must be programmed with its new ID one at a time.

5 numbers or characters can be entered as an ID for each dimmer. If the SWC hand held is being used this can only enter 4 characters therefore the last number or character is ignored.

It is possible for the user to program a character from A to Z into the ID. If this is done then the hand held remote can never control this dimmer because the remote does not have any character keys.

Only enter characters if SV90 computer software is going to be used. This is the only software that will use these CIRCUIT IDs.

1.3.5   RESPONSE.

Slow = 300ms
Medium = 100ms
Fast = 30ms

The response time is the time between the processor detecting a change in level and that change going to the dimmer output.

```
+------------------+        +-----------------------+
| Response : All  >|  ----  | Res : All = Medium    |
+------------------+        |             Fast      |
                            |             Slow      |
                            +-----------------------+

+------------------+        +-----------------------+
| Response : Dimmer >| ---- | Res : 01 = Medium     |
+------------------+        |       02   Fast       |
                            |       03   Slow       |
                            |        |              |
                            |       24              |
                            +-----------------------+
```
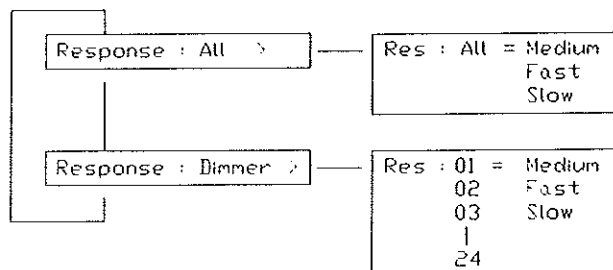
1.3.6 PRESET.

The Outlook menu is only available on software versions C1 or later.

On versions B1 and earlier the PRESET button moves directly into the SWC menu.
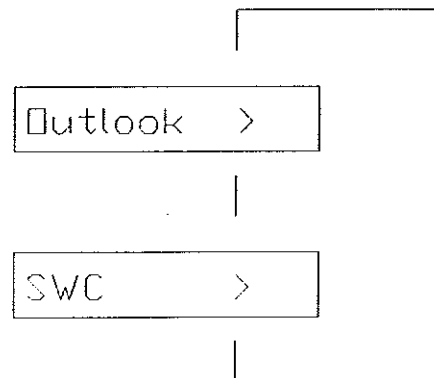
Outlook >
SWC >

Outlook menu.

Preset 01 to 08 can be recorded and played back.
Preset 00 is always a blackout.
Preset 09 is always full on and is only available on a slider station. .

All functions described in this diagram should be programmed from the Outlook wall stations. If the programming is done from the LD90 processor the commands must be repeated for each rack.

The maximum fade time when programmed from the rack is 10 minutes. The maximum time then can be programmed by the wall station is 4 minutes.

The power up preset will always appear because the Architectural preset will operate on Highest Takes Precedence with all other control inputs.

Preset View >
View : Rm 01 02 | 16 Pre 00 01 | 09 MAN
Preset Record >
Rec : Rm 01 02 | 16 Pre 01 02 | 08
Channel Levels >
Rm 01 02 | 16 Ch 01 02 | 15 = Input Off 01% | 99% Full
Preset Time >
Time : Preset >
Rm 01 02 | 16 : Pre 01 02 | 08 = 00:00 | 10:00
Time : Manual >
Room : 01 02 | 16 = 00.00 | 10.00
Time : Room >
Room : 01 02 | 16 = 00.00 | 10.00
Time : All Room >
Time : All = 00.00 | 10.00
Power Up Preset >
Power up to 00 01 | 09
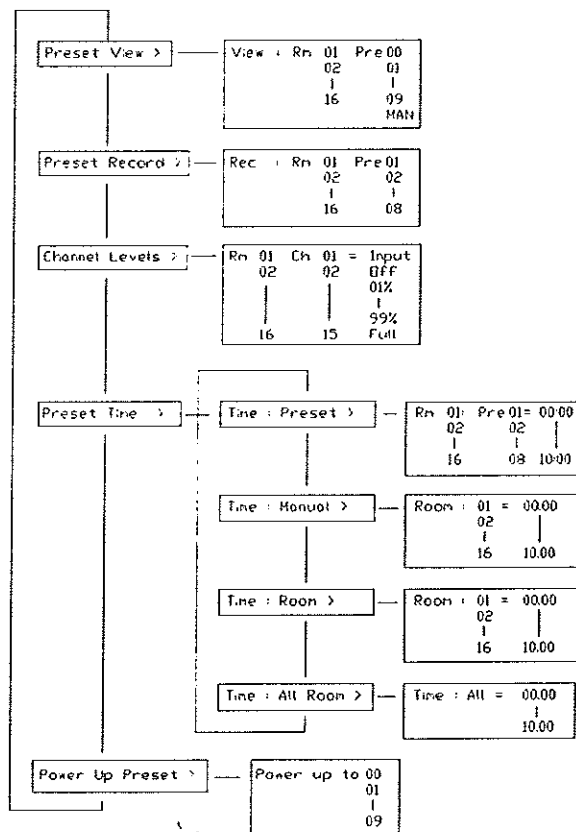
New LD90 default is
preset 0.
default preset 1
in every room.
all channels @ full. HTP with
everything else.
so with out outlook connected you
cannot switch them off.
so set to preset 0 which
is blackout.

SWC menu.

Presets are usually recorded from the System Wide Control backup panels or hand held remote. If the LD90 processor is used for recording, the procedure must be repeated on each LD90 dimmer.

Preset times can be recorded to all racks at the same time by using the SWC. hand held remote.
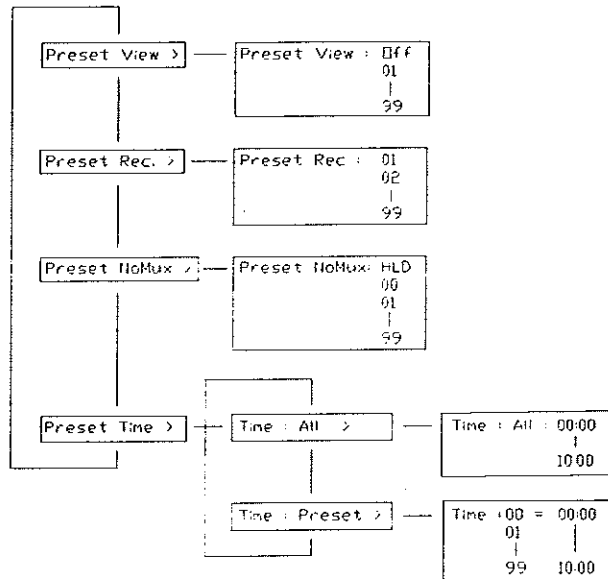
When using VIEW the dimmer output will change as the operator cursors through each number.

If the MUX input fails then the LD90 can be programmed to hold forever (HLD) or fade to a blackout or to a recorded preset.

```
┌─────────────┐      ┌──────────────────┐
│ Preset View >│ ──── │ Preset View : Off │
└─────────────┘      │              01   │
       │             │               |   │
       │             │              99   │
       │             └──────────────────┘
┌─────────────┐      ┌──────────────────┐
│ Preset Rec. >│ ──── │ Preset Rec : 01   │
└─────────────┘      │              02   │
       │             │               |   │
       │             │              99   │
       │             └──────────────────┘
┌──────────────┐     ┌───────────────────┐
│ Preset NoMux >│ ─── │ Preset NoMux: HLD  │
└──────────────┘     │               00   │
       │             │               01   │
       │             │                |   │
       │             │               99   │
       │             └───────────────────┘
┌─────────────┐      ┌────────────┐     ┌─────────────────────┐
│ Preset Time >│ ─┬── │ Time : All >│ ─── │ Time : All : 00:00   │
└─────────────┘  │   └────────────┘     │               |      │
                 │                      │             10:00     │
                 │                      └─────────────────────┘
                 │   ┌──────────────┐   ┌─────────────────────┐
                 └── │ Time : Preset >│ ─ │ Time :00 = 00:00     │
                     └──────────────┘   │        01   |        │
                                        │         |            │
                                        │        99   10:00     │
                                        └─────────────────────┘
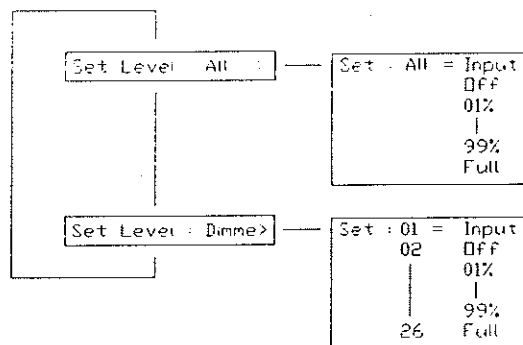```

DEFAULT   0 SECS .   BLACKOUT ,

OR   FOREVER ,

99 BACKUP STATES.

### 1.3.7 LEVEL.

The dimmer output levels will change as the operator moves through the range of output levels.
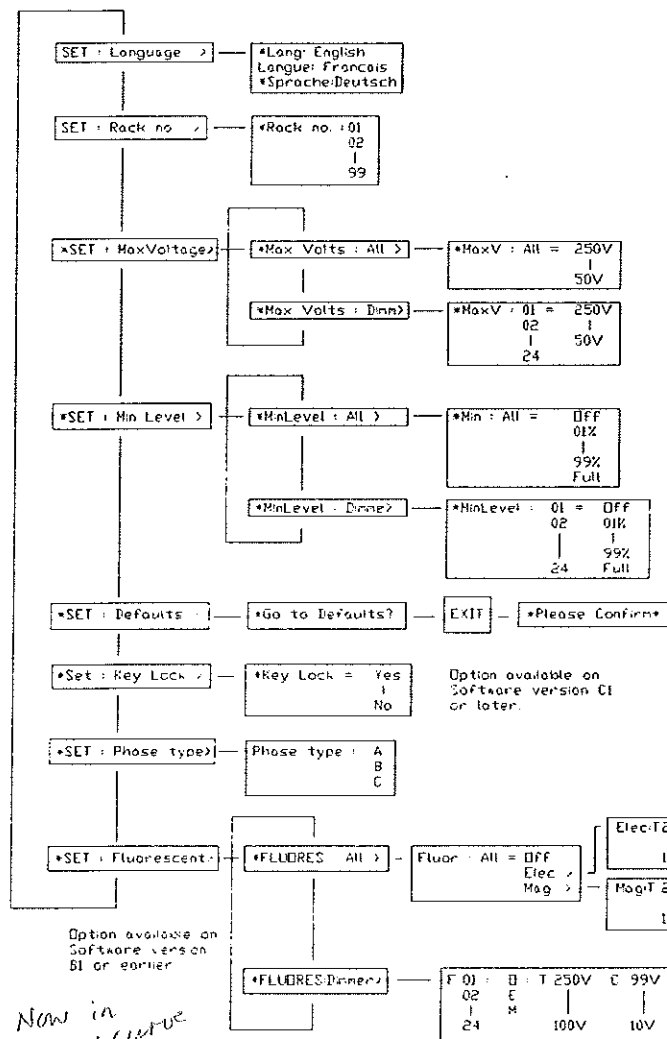
The selection of Input will return the LD90 to Mux control.

Control of dimmers with this method of operation will override all other control inputs.

```
┌──────────────────┐   ┌─────────────────┐
│ Set Level : All   │ ─ │ Set : All = Input│
└──────────────────┘   │            Off   │
        │              │            01%   │
        │              │             |    │
        │              │            99%   │
        │              │            Full  │
        │              └─────────────────┘
┌──────────────────┐   ┌─────────────────┐
│ Set Level : Dimme>│ ─ │ Set : 01 = Input │
└──────────────────┘   │       02   Off   │
                       │            01%   │
                       │             |    │
                       │            99%   │
                       │       26   Full  │
                       └─────────────────┘
```

1.4 Rack Set-up Menu.

To enter the rack set-up menu follow the instructions given in section 1.2.2.


```
SET : Language  >  ── ♦Lang· English
                      Langue: Francois
                      ♦Sprache·Deutsch

SET : Rack no  >  ── ♦Rack no. :01
                       02
                        |
                       99

♦SET : MaxVoltage> ── ♦Max Volts : All  > ── ♦MaxV : All =  250V
                                                              |
                                                             50V
                        ♦Max Volts : Dimm> ── ♦MaxV : 01 =  250V
                                                      02      |
                                                       |     50V
                                                      24

♦SET : Min Level  > ── ♦MinLevel : All  > ── ♦Min : All =   Off
                                                            01%
                                                             |
                                                            99%
                                                            Full
                        ♦MinLevel : Dimm> ── ♦MinLevel : 01 =  Off
                                                         02    01%
                                                          |     |
                                                          |    99%
                                                         24    Full

♦SET : Defaults · ── ♦Go to Defaults? ── EXIT ─ ♦Please Confirm♦

♦Set : Key Lock > ── ♦Key Lock = Yes        Option available on
                                   |          Software version C1
                                  No           or later.

♦SET : Phase type> ── Phase type :  A
                                    B
                                    C

♦SET : Fluorescent· ── ♦FLUORES  All  > ── Fluor · All = Off    Elec·T250V C 99V
                                                 Elec ·           |        |
                                                 Mag  > ──       100V    10V
                                                                Mag·T 250V C 99V
                                                                 |        |
                                                                100V     10V

       Option available on
       Software version
       B1 or earlier           ♦FLUORES·Dimm> ── F 01 :  D : T 250V  C 99V
                                                  02     E    |        |
                                                   |     M    |        |
                                                  24        100V     10V
```

[Handwritten note:] Preheat on' dimmer.

[Handwritten note:] DEFAULT UNLOCK·

[Handwritten note:] Now in Dimmer Curve menu·

1.4.1 Language.

Only English French and German are currently available.

1.4.2 Rack No.

Any number from 1 to 99 can be entered. It is important that no two racks have the same number.

1.4.3 Maximum volts.

The maximum voltage from the LD90 will always be lower that the supply voltage. This automatic top set ensures that the thyristors never fully conduct as this would greatly reduce the life of the thyristor.

Maximum Voltage = 240V

Supply Voltage

240v

Max Output Voltage

Setting a maximum voltage will ensure that the dimmer stops at a maximum level even if the supply voltage continues to rise.
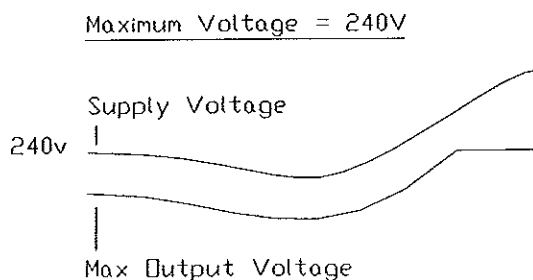
The Maximum voltage will only be accurate if the LD90 has been correctly calibrated. The processor is designed to calculate the supply voltage so that it can control the exact voltage output.

If there is a difference between the actual voltage supplied to the rack and the voltage the processor thinks is being supplied then there will be an error on the maximum voltage output.

Follow the instructions given in the Service menu to check the voltage calibration.

Relay control.

When a Non Dim dimmer is switched on the output of the LD90 processor to the power device on the power block will look as follows.

OFF   OFF   OFF

ON   ON   ON
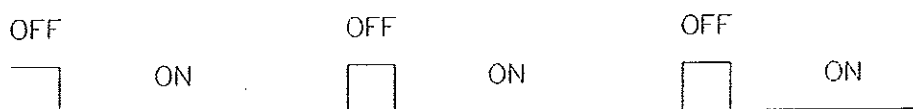
There are short periods when the output is off in order to protect the thyristor pack. If a relay is fitted instead of a thyristor the relay will chatter. By setting the Non Dim channel with Max Volts = 250V the LD90 will know that a relay is fitted and it will output a steady ON level. This option is only available on software version B1 or later.

Genuine   Non Dim.

1.4.4 Min Level.

The minimum level for one or all dimmers can be set. This will provide a useful preheat facility.

1.4.5 Defaults.

This option returns the LD90 dimmer to its factory defaults. Mux protocol will become DMX512, the patch will become 1-1 starting a channel 1. All calibration done on the Service menu will be lost.

1.4.6   Key Lock.

The Key lock ON/OFF option is only available on software version C1 and later.

1.4.7   Phase Type.   *Racu moveu*

This option will change the way in which the automatic patch sequence moves from dimmer to dimmer.

Type A.

Type B. C

Type ~~C~~ B .

Example 1

| 8x2.5k Dimmers | 8x2.5k Dimmers | 8x2.5k Dimmers |
| L1 | L2 | L3 |

Example 2

| 4x5k Dimmers | 4x5k Dimmers | 4x5k Dimmers |
| L1 | L2 | L3 |

Example 3

| 8x2.5k Dimmers | 8x2.5k Dimmers | 4x5k Dimmers |
| L1 | L2 | L3 |

Example 4

| 8x2.5k Dimmers | 4x5k Dimmers | 4x5k Dimmers |
| L1 | L2 | L3 |
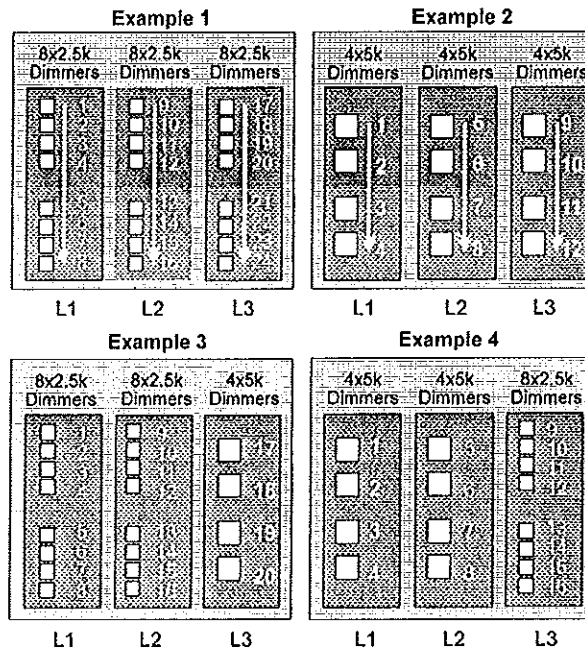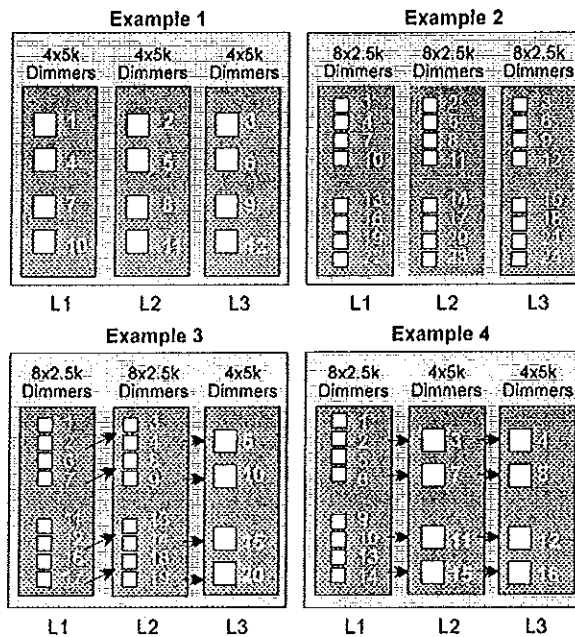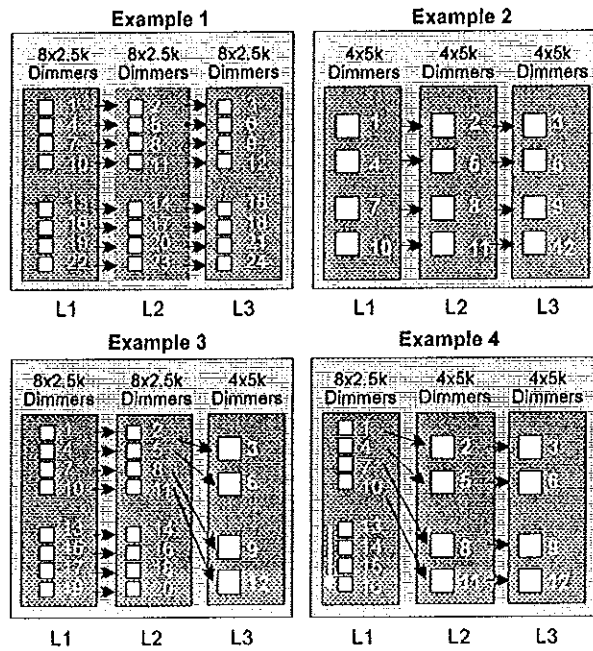
1.4.8   Fluorescent.

The Fluorescent option shown on this menu is only available on software versions B1 or earlier. On version C1 the fluorescent option has moved to the CURVE menu.

For details of this option see section 1.3.3.

1.5 Service Menu.

To enter the Service Menu follow the instructions given in section 1.2.3.
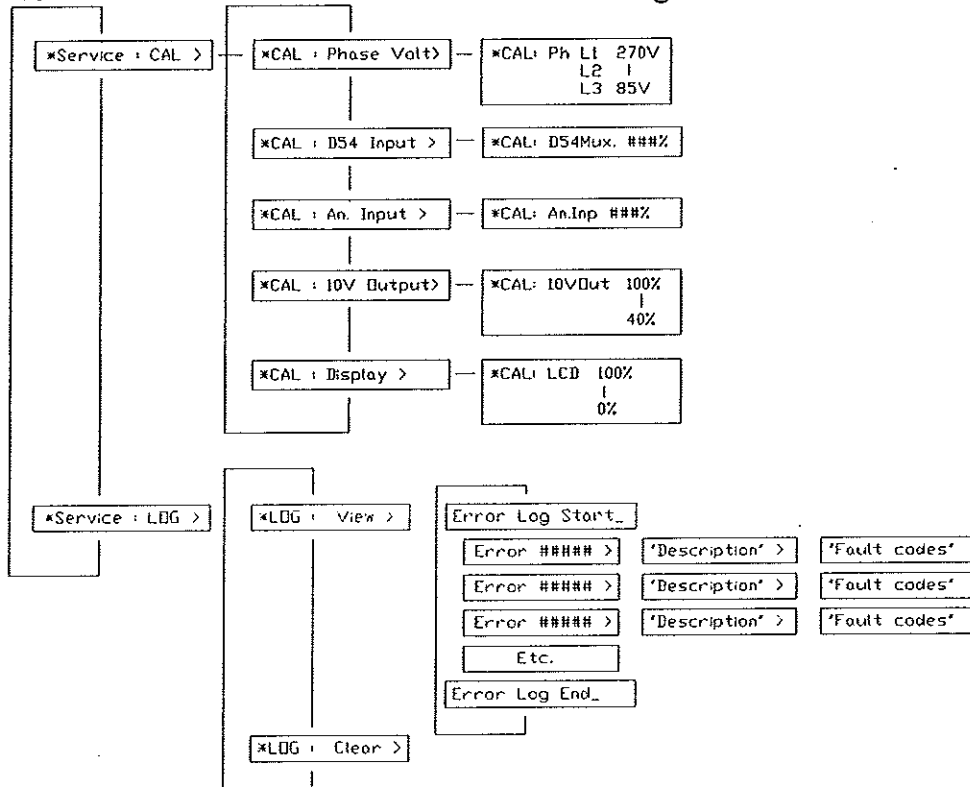
1.5.1 Phase calibration.

It is important to ensure the LD90 knows the correct supply voltage. If there is a difference between the displayed voltage and the supply voltage then the "Maximum Voltage" output will be wrong.

Measure the actual supply voltage and enter the values against phase L1, L2 and L3.

3 DIGITS.

1.5.2 D54 Input.

This calibration requires a D54 mux input with dimmers 1 and 2 set at full. The LD90 must also be set to mux input D54.

When > is pressed the LD90 will display the scaling factor, in %, that the processor needs to apply to the analogue level in order for D54 to drive a dimmer to full.

If the D54 level is exactly 5v the LD90 will display 100%. If the level is below 5v this value increases to compensate. The maximum adjustment is 179%. If the scaling required is higher the LD90 will report "Invalid Scaling".

A scaling value of 400% indicates an error. D54 is not selected, D54 is not connected, or dimmer levels 1 and 2 are not at full.

D54 from Multimux Backup. C2 of 1798 wont work because of Action Only, because of Special program for Video Channel 1 to sort out Timing problem.

1.5.3   Analogue input.

Set analogue fader inputs 1 and 2 to full. (+10v or -10v). _NEED TEST RIG_
MUST HAVE I/P 1 & 2 TO FULL
THATS AVERAGE OF THE 2.
When > is pressed the display will show the scaling factor in %. If the analogue voltage _TO CALIBRATE._
is less than +10v or more than -10v the scaling will increase.

179% is the maximum permitted. A value of 400% means that the processor does not detect an analogue input.

1.5.4   10V Output.

The voltage of outputs 25 and 26 is 10V maximum. This value can be reduced as a percentage to 40%.

1.5.5   Display.

The display contract can be changed from 0% to 100%. The default is 68% and the display will become impossible to read long before the value reaches 0% or 100%.
400 DISPLAY LEFT THE FACTORY. WITH FAULTS .

1.5.6   View error log.

If there are no errors you can not enter the error log.

The errors are in three parts. The error number, the error description and the error codes. The Start and End of the log is also shown.

1.5.7   Clear error log.

The error log is cleared as soon as > is pressed. There is no confirmation request.

Section 2.   System Wide Control Operation.

2.1   Backup preset panels.

The rotary switch on the back of the preset panel will select the range of presets that the panel will be able to control. It is also used to select whether the preset record facility is on or off.

Switch setting	8 way panel: preset range	16 way panel: preset range
0	1 - 8 with record	1 - 16 with record
1	9 - 16 with record	17 - 32 with record
2	17 - 24 with record	33 - 48 with record
3	25 - 32 with record	49 - 64 with record
4	33 - 40 with record	65 - 80 with record
5	41 - 48 with record	81 - 96 with record
6	49 - 56 with record	97 - 99 with record
7	57 - 64 with record	NO FUNCTION
8	1 - 8 NO record	1 - 16 NO record
9	9 - 16 NO record	17 - 32 NO record
A	17 - 24 NO record	33 - 48 NO record
B	25 - 32 NO record	49 - 64 NO record
C	33 - 40 NO record	65 - 80 NO record
D	41 - 48 NO record	81 - 96 NO record
E	49 - 56 NO record	97 - 99 NO record
F	57 - 64 NO record	NO FUNCTION

To playback a backup preset press a backup button. The button will light. The backup preset will operate with all other inputs on a highest takes precedence basis.

To switch off a backup preset press the preset button a second time. The light will turn off and a fade to preset 0 will start. Preset 0 is always a blackout. Preset 0 will also operate with all other control inputs on a highest takes precedence.

To record a backup preset, providing the option is enabled, press the required preset button and hold it down until the light flashes. The current lighting output of all LD90 dimmers will be recorded into this backup preset.

The backup times can not be changed using the backup panel.

2.2   SWC Hand Held Programmer.

2.2.1   Modes of operation.

Select the mode of operation by pressing MODE. Select the mode number then *.

Mode 1   will make the channel control and the preset recording functions mimic Galaxy / Gemini operation.

Mode 2   will make the channel control and preset recording functions mimic Lightboard M Operation.

Mode 3   will make the channel control and preset recording functions mimic Lightpalette operation.

2.2.2 Backup presets.

To start the fade to a backup preset enter the number of the preset then press GO. The preset will fade up using the recorded time. The preset will operate on a highest takes precedence basis with all other lighting control input to the LD90.

To start a fade to the next preset in sequence press GO again.

Preset 0 is always a fade to blackout. Highest takes precedence with all other control inputs still applies.

To playback a preset with a different fade time type "N" TIME "T" GO. Where N is the preset number and T is the time.

Time is always entered as minutes then seconds. For example 2 minutes and thirty seconds must be entered as a number 230. If the time is entered in seconds e.g. 70 then the controller will give an error and remind you of the correct time entry format.

To record a preset first set up the required lighting. This may be done using the Hand Held Controller or using another control input to the LD90.

To record without changing the existing fade time press   "N" REC. (Modes 1 & 2)
                                                             REC "N" * (Mode 3)

To record and change the time press "N" TIME "T" REC (Modes 1 & 2)
                                    REC "N" TIME "T" * (Mode 3)

To change the time only press   "N" TIME "T" REC TIME. (Modes 1 & 2)
                                     REC TIME "N" TIME "T" * (Mode 3)

2.2.3 Circuit Control.

IMPORTANT. The hand Held controller will control dimmers using their programmed circuit ID. This must be done before the controller can be used. The hand held controller can not access the 5th digit of the LD90 circuit ID. The controller can not access any dimmer with a circuit ID containing letters of the alphabet.

All Circuit control operations take priority over other control inputs to the LD90. To release control of a circuits back to the other inputs use one of the following.

For a single circuit or group of circuits select the circuits then @ INPUT * (The *is only required for mode 3).

To release all circuits just press RET.

Circuits can be selected individually or in groups using + and THRU.

Circuits can then be sent to Full using @FULL.
or sent to 0 using @0.
or sent to 70% using @ ON.
Or sent to a given level, e.g. 50%, using   @ 5   (Mode 1)
                                            @50   (Mode 2)
                                            @50*   (Mode 3)

▲   Will increase the level of the last circuit or circuits by 5%.

▼   Will decrease the level of the last circuit or circuits by 5%.

REM DIM   At the end of the command will switch off all other dimmers.

CHECK +   Sets the next circuit in sequence on to a level equal to the last level
                   entered on the controller.

CHECK -   The reverse of Check +.

CLEAR   Clears the last key entry.

ALL CLEAR   Clears the whole command line.

2.3   Communication errors.

It is possible for errors to occur if two users press different presets on two preset panels at the same time. The same error may occur if a preset is pressed at the same time as a command is given by the hand held programmer. The LD90 will give an error and the command must be repeated.

If SV90 software is in use the backup preset panels and the hand held programmer MUST NOT BE USED. The SV90 software will give serious communication errors which may require the LD90 rack to be switched off and back on before the errors are removed.

2.4   Remote connections of LD90 backup preset panels.

It is possible to build a remote backup preset panel which can be plugged into a socket box mounted on the wall. (Not available as a standard stock item)

The 6 pin XLR socket box for the hand held programmer can not be used to connect the backup preset panel because there is no -12V available.

Use the Outlook remote socket box. This 5 pin XLR provides Data +, Data -, +12V and -12V. Inside the socket box there is a rotary switch which must be set to the required preset panel option. (See section 2.1). This setting will override the switch setting on the remote preset panel.

Section 3.   Outlook quick reference guide.

3.1   Overview.

Every dimmer in the LD90 can be assigned to one of 15 channels in one of 16 rooms. If the room has a panel with manual faders then each fader will control one channel. More than one dimmer may be assigned to a channel in a room.

(Note. A 15 channel fader panel is not available. The maximum number of faders is 12 therefore channels 13 to 15 are never used.)

The levels of the channels in that room can be programmed into one of 8 presets.

(Note. The outlook presets are in no way connected to the System Wide Control backup presets)

Preset 0 is always a blackout and preset 9 is always full on.

All presets, including blackout and full on can be programmed with a fade up / fade down time. The Manual button can also be programmed with a fade time.

(IMPORTANT) All output presets control the LD90 dimmers on a highest takes precedence basis. If channels are on as a result of the mux input then the preset and the mux control are superimposed to give the highest level. The blackout button will not force a blackout in the room.

Programming the channels in each room must be done on the LD90 processor. The menu can be found in section 1.3.6.

Using the LD90 processor to record room presets is not recommended. If presets are recorded on the outlook panels then the command is sent to all LD90 dimmers. If the processor is used then the record command must be repeated on every LD90.

Rooms can be combined. When two or more rooms are combined none of the recorded presets change. Pressing preset 1 in the first room will fade up preset 1 in that room and preset 1 in every connected room.

When rooms are combined the manual channel fader will control the same channel number in each room to the same level.

The ability to record presets can be locked on a single panel or on all other panels in a room.

3.2   Panel Operation.

3.2.1   Remote Preset Station.

Stations are available with 1, 4 or 8 presets. The rotary switch on the back selects the room number.

Pressing a button will light it and start the fade up of the room preset. Pressing the button again will switch off the light and start a fade to preset 0.

3.2.2   Fader station.

Fader stations come with 3, 6, 9 or 12 manual faders. The rear rotary switch selects the room number.

When Manual is pressed the lighting in the room will fade to the levels set on the channel faders. Moving any fader will cause the fade to the manual level to complete instantly.

The lit bulb will bring up preset 9 "full on".
Pressing the dark bulb will bring up preset 0 "Blackout".

3.2.3   1 Room Combine Station.

This panel will join two rooms when the button is lit.

The first room to be joined is selected on the rear rotary switch. When the button is lit this room and the next room number will be joined.

3.2.4   3 or 8 Room Combine Station.

The first room to be combined is selected using the rear rotary switch.

Hold down the button for the first room until it flashes. Press the button for each room which is to be joined to the first and it will light. Press the first room button again to finish the combine command. All combined rooms remain lit.

A second set of rooms can be combined on the same panel. Press another room until it flashes then press the rooms which are to be combined to it. Press the flashing button again to complete the sequence.

The panel now shows lots of rooms lit. To find out which rooms are joined you can interrogate the room combine panel. Press and quickly release a room button. The room indicators will change to show only the rooms joined to the selected room. When the button is released the other room indicators come on again.

3.2.5 Infra Red Preset Station.

Set the rotary switch on the back of the IR receiver for the room number.

Press a button to select a preset from 1 to 7. Button 8 is used as a fade to blackout.

3.2.6 Infra Red Room Combine Station.

Combine rooms in the same way as the 8 room combine station. Only one group of rooms can be combined using this panel.

3.2.7 Audio Visual Interface.

There are 10 inputs which can be triggered by closing a simple contact. These operate the 8 presets, off and full on.

There are also 10 outputs for driving mimics when contacts are made.

The interface can also be set up as a room combine panel for automatic room combine when room partitions are fitted with open / closed contacts.

3.2.8 Master Station. - basic operation.

The rotary switch on the back of the panel selects the room number.

The dark bulb symbol will start a fade to preset 0 "Off".

The Manual button will start a fade to the positions set on the manual faders. Moving any fader will change the fade time to instant.

Pressing a button 1 to 8 will start the fade to a recorded room preset.

After selecting a preset press the preset again and hold the button down. When the preset indicator flashes the recorded preset can be faded down proportionally using the master manual fader.

3.2.9 Master Station - recording presets and times.

LIVE RECORD.
To Live Record a preset first set up the lighting in the room. This can be done using the manual faders and/or using a lighting desk connected to the LD90. These two controls operate on highest takes precedence. When the lights are set up press Enter then press a preset button 1 to 8.

BLIND RECORD.
Blind Record will allow the manual fader levels to be recorded into a preset whilst the lighting in the room is being controlled from another source. The lighting in the room must be under the control of a preset or the blackout button. If a lighting desk is also connected it will operate on a highest takes precedence basis. Set the required levels on the manual faders, press Enter, press a preset number 1 to 8 then press Enter again to complete the recording.

ABORT A RECORD.
There are two methods to abort a record sequence without recording. The Enter indicator will flash whilst the panel waits for the operator to press a preset button and record a preset. After 10 seconds the button times out and switches itself off. The record can also be cancelled by pressing the Enter button a second time.

COPY A PRESET.
To copy a recorded preset into another preset. Hold down the preset button until the indicator flashes. If required the recorded level can be proportionally changed using the master manual fader. Press Enter followed by the destination preset button. The input from a control desk if fitted will also be recorded using highest takes precedence.

RECORD TIMES.
To record times. Hold down ENTER until it flashes. Set the time on the time fader between 0 seconds and 4 minutes. Press a preset button 1 to 8 or the blackout button, or the manual button. The time can be recorded into several presets. Press Enter again to return the panel to normal operation.

RECORD LOCKOUT.
To switch the record facility on a panel off hold down blackout and press Enter until the Enter indictor switches off. Release the buttons and the record has been disabled.

RECORD UNLOCK.
To switch the record facility back on hold down Blackout and Enter until the Enter indicator switches on. Release the buttons and the record has been enabled again.

TOTAL LOCKOUT.
It is possible to switch off all other panels in a room so that they will only mimic the operation of the selected panel. This includes panels in rooms which are currently combined, Hold down Manual and press Enter until the Manual indicator flashes. The Manual indicator will continue to flash all of the time unless manual operation is being used, in which case it remains lit all of the time.

REMOVE TOTAL LOCKOUT.
Hold down Enter and Manual until Manual stops flashing. Lockout is now released.

3.2.10 Receptacle Station.

A six pin XLR socket used for connecting portable panels. Set the rotary switch on this station to the correct room number. The LD90 will use this number instead of the room number on the panel that is plugged into this station.

Section 4.   SV90 Operation.

4.1   SV90 Connections.

SV90 can only be used to communicate with the LD90 dimmer via the REMOTE option.

The remote option allows the SV90 computer to communicate with all of the racks using an RS485 communication link. This allows connection to the System Wide Control input of each LD90.

The SV90 Remote option is supplied with the following items.

Software	Version A3 is required.
Dongle	Software protection device which is connected to the parallel printer port.
Protocol Converter.	RS232 to RS485 protocol converter.
Power Supply	To provide 9v for the protocol converter.

IMPORTANT.   When SV90 is in use the SWC Hand Held Control and the SWC backup panels must not be used.

Make sure that there is no risk of earth loops when the SV90 computer is connected to the LD90 system. For more details see section 8.

4.2   SV90 Configuration.

A copy of the SV90 configuration file can be found in Appendix C.

Before SV90 can be used with the LD90 racks the configuration file must be programmed. The file is called "SV90.CFG".

To configure the file a text editor is required. If your computer is supplied with DOS 5 or 6 then the program called EDIT can be used. There are many different edit programs available.

The most important lines are as follows.

-rEC90   This line must be set to EC90 even when LD90 is being used.

-x 1, 1, 1   This tells SV90 how many dimmer racks are connected. If the SV90 software does not know that extra racks exist it will never try to communicate with them.

For two racks type	-x 1, 1, 1
	-x 2, 1, 2
For three racks type	-x 1, 1, 1
	-x 2, 1, 2
	-x 3, 1, 3 ETC.

-s "SUPPLY_1,3,100,1"   This line is not important. It sets the maximum current which a rack is permitted to draw. The LD90 dimmer can not sense output current so this option is not used. Do not use option F4 "SUPPLY" in the SV90 software.

-mREMOTE   This line must be set to REMOTE when connected to the LD90 racks.

or.   -mOFF   Can be selected for off line editing away from the racks.

All other configuration options are not important for the correct operation of the SV90 software.

Start the software by moving to the SV90 directory.

    CD "DRIVE LETTER" \ SV90   <ENTER>

Then run the program.

    SV90 <ENTER>

4.3   SV90 Operation.

REMEMBER   SV90 software is written for the EC90 dimmer and many functions will not work.

Use the space bar or the + and - keys to change options. If a number is to be entered then type the new number as normal.

4.3.1   Rack.

Save Mode.   Changes that are made to this screen can be saved to a single rack or to the whole system.

Every rack must have a unique rack number.

The number of crates can not be changed. All dimmers will automatically be shown in crate 1. The two analogue outputs are always shown in crate 2.

SUP protocol is always fixed on SMX.

SMX address is fixed by the configuration file and should always be the same as the rack number.

MUX A protocol and MUX B protocol will offer the following options

AUTO, D54, DMX512, SMX.

AUTO   Not available on the LD90. If saved the LD90 it will ignore the command and will not change from its previous configuration.

D54,   Not available on MUX B. If saved to MUX B the LD90 will ignore the command and remain at its original selection.

DMX512,   Will be accepted on both MUX inputs.

SMX   Will be accepted. The SMX speed must also be entered.

SMX SPEED   Can be set at the following Baud rates.
250K, 62K5, 19K2, 9600, 2400.

The lower half of this screen shows the voltages supplied to each rack and the current being drawn. This current reading will always show 0.

The screen will show the MUX status. If MUX card B is not fitted this area remains blank.

The FANS will always show OK even through there are no fans fitted.

4.3.2 Patch.

Option F4 under the RACK screen.

When you enter this screen the existing patch is read and displayed. Use page up and page down to move between racks.

When entering a new patch remember the D54 rule. The range of channel numbers must not exceed 52. SV90 software will not warn you if there is an error. After you have saved the setting the MUX OK LED will switch off and the dimmer can not be controlled by the desk until the patch is fixed.

To enter a 1 to 1 patch use option RE-PATCH - F7. The software will ask for a start number then patch through all existing dimmers starting from that number.

Before saving the patch use option F4 SELECT MUX. Each time it is pressed the section "Patch for Mux" will change between A, B or A & B.

Before saving decide if you wish to also change the Circuit ID to be the same as the patch. Press F5 and the option "Change circuit ID" will switch between YES and NO.

The last thing to decide before saving is whether to save all crates or one selected crate. Press F6 CRATE to change the crate option.

To save press F3 SAVE.

4.3.3 Errors.

The error screen is option F5 under the RACK screen.

This option will display the error log held within the LD90 dimmer. The errors are shown one crate in one rack at a time.

The errors can also be shown as the number of times an error has occurred. Use F2 ERROR COUNTS.

These errors are designed for use by Strand Lighting R&D and are of little use to customers.

4.3.4 Dimmer.

Dimmer can be selected either using RACK / CRATE / DIMMER number or using the circuit ID. When the DIMMER SET-UP screen is selected the LOAD function F2 will load the information on the dimmer selected. When CIRCUIT SET-UP screen is selected the LOAD function will load the information on the selected circuit ID. To change between these screens use F6 - CIRC / DIM.

IMPORTANT. The Circuit ID option will not work until the option "LEARN CIRCUIT ID" is used on the SYSTEM menu.

When using this screen first select your dimmer / circuit then load the current information. The information can then be changed and saved.

Before saving check the Save Mode option. The following options are available.

DIMMER	All information is saved to the selected dimmer. Press F3 to save then a second time to confirm.
CRATE	Press F3 then F3 again to confirm. A box will then appear next to every dimmer function. Move the cursor to the function you wish to save to the whole crate then press space. A tick will appear. Press F3 again to save all options with a tick to the whole crate.
RACK	Save to the whole rack. Follow the instructions for CRATE.
SYSTEM	Save to all racks. Follow the instructions for CRATE.

The following dimmer options can not be changed.

> Enable = ON
> Reporting = ON
> Control = A HTP B
> Analogue Input = ON
> Analogue Number = N   (N = Dimmer number)
> Auto Compensation = ON
> Cable Resistance = 0.005 Ohms

The patch for MUX A and MUX B can be changed. Remember to use the 52 channel rule when patching D54.

Response will display options FAST, MEDIUM SLOW. Medium appears as Normal on the LD90.

Max Voltage will operate correctly.

Dimmer Law has a different selection to the LD90.

SQUARE,	Will work correctly.
LINEAR,	Will work correctly.
S-CURVE	will work correctly.
NON DIM	will make the LD90 dimmer turn NON DIM on at 25%.
FLUORESCENT	will select Fluorescent Electronic on the LD90. The max voltage and cut off voltage will not change.
USER LAW 1-5	Not available. The LD90 will ignore these options.

Manual Level will work in the same way as the SWC Hand Held Controller. "F4 SET MANUAL" will take control of these dimmers / Circuits. They will no longer be Highest Takes Precedence with other controllers. Control must be released using "F5 SET NORMAL" to return to normal operation.

NOTE.   The output level displayed on the status screen at the bottom is always one step behind. To see the true level output select F2 LOAD again.

The dimmer type shown on the bottom of the screen will be either LD13 or LD25 depending on the module fitted.

The dimmer status will only show OK or Overheat. No other errors are available.

4.3.5   Supply.

This option is F4 on the title screen

This screen is of no use to systems with only LD90. It shows the current drawn on each phase of each voltage supply. LD90 dimmers will not report current output.

4.3.6 Log.

This option is F3 on the title screen.

This is a log of errors which have been detected by the computer. These errors have nothing to do with the error log in each LD90 processor.

If SV90 is not used for 3 minutes then the program will automatically change the screen to display the error log. This time can be changed in the configuration file.

4.3.7 Status.

This option is F2 on the title screen.

If dimmer status is selected then all dimmers in one rack are shown.

If circuit status is selected then a list of all Circuit IDs is shown. (This option will not work until "Learn Circuit ID" has been carried out on the System menu.)

Two dots means the dimmer exists and that there are no errors.

The only error that LD90 will report is an overheat on one module. When a module has overheated all dimmers in that module will display OV-HT on this screen. The error is added to the error log.

When the error has cleared this is also shown on the error log.

4.3.8 System.

The PRINT menu will allow most of the options and set-up of the dimmers to be printed. Printing directly from a rack can take up to 15 minutes per page because this communication is a low priority. It is better to record the information onto disc then print from disc at a later time using SV90 in OFF LINE mode.

TRANSFER options will not work on LD90.

LAWS can be written but will not be accepted or used by the LD90.

The BACKUP screen will allow only 32 backup states to be previewed or recorded. The time for these 32 states can also be recorded. LD90 backup states 33 to 99 can not be accessed. A MUX FAIL backup can be recorded but the MUX FAIL TIME will not be used.

DISC options will allow the patch from each dimmer to be saved to disc. Dimmer laws are not used and therefore can not be transferred.

LEARN CIRCUIT ID must be carried out before they can be used for the patch or for the Circuit Status screen.

Section 5.   LD90 Installation.

5.1   Phase and Load connections .

All details of the LD90 Phase and Load connections can be found in the LD90 operation manual. There are no additional notes which can be added at this time.

5.2   DMX / SMX control.

DMX and SMX dimmer data use the same connectors on the LD90 processor.

MUX A   PL15   Pin 1   =   DMX / SMX Screen.
                  Pin 2   =   DMX / SMX Data -
                  Pin 3   =   DMX / SMX Data +

MUX B   PL14   Pin 1   =   DMX / SMX Screen
                  Pin 2   =   DMX / SMX Data -
                  Pin 3   =   DMX / SMX Data +

The DMX / SMX screen input provides a limited amount of isolation between the 0v of the screen and the GND of the LD90 processor.

Do NOT connect the screen to the Ground pin (Pin 5) of connector PL14 or PL15. This will short the dimmer screen to the analogue GND of the processor and can cause errors to D54 dimmer levels.

The DMX / SMX data must be connected to all racks in a daisy chain.

If the LD90 processor is the last processor on the DMX line then the DMX must be terminated. To terminate MUX A fit link LK5 between pins 2 and 3. To terminate MUX B fit link LK4 between pins 2 and 3. If the DMX line is terminated on a processor before the end of the DMX line then the DMX data will stop working on all racks after the termination.

The standard socket for DMX / SMX input is a 5 pin XLR plug.

Pin 1   =   DMX / SMX Screen
Pin 2   =   DMX / SMX Data -
Pin 3   =   DMX / SMX Data +
Pin 4   =   Not used.
Pin 5   =   Not used.

The recommended DMX / SMX cable is Belden 9841 / 9842

Maximum length of cable is 300m. This length can be increased by using higher quality cable. The maximum number of racks on one dimmer line is always 31 unless a DMX buffer box is used.

5.3 D54 control.

D54 is only available on MUX A. Connect the D54 cable to PL15 on the following pins.

        Pin 4   =   D54 Signal.
        Pin 5   =   D54 Ground   (Use for D54 screen).

Processor Unit PCB
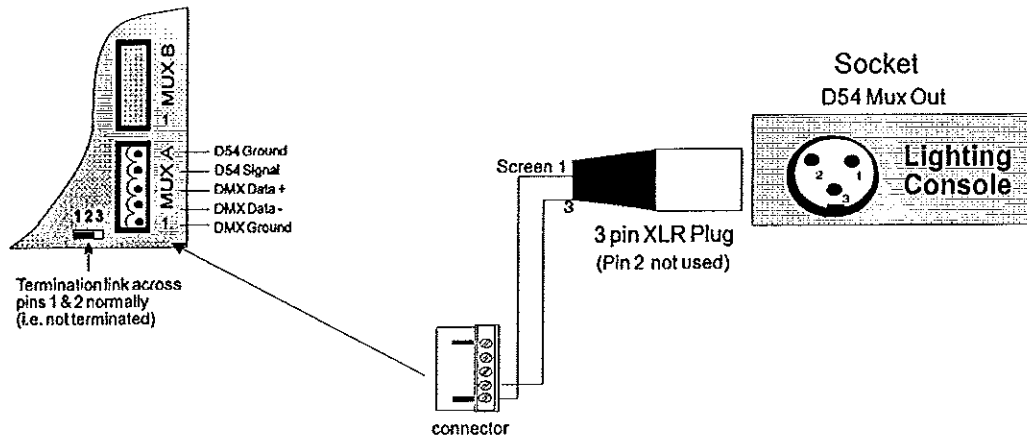
If electrical noise is interfering with the dimmer levels then the D54 termination link can be fitted. To terminate the D54 fit link LK6 between pins 2 and 3. Only terminate the last rack on the D54 line.

When a customer chooses D54 protocol it is important to remember that a dimmer patch must not exceed a range of 52 dimmers.

Important.   LD90 software will prevent the user entering a patch which is exceeds a range of 52 channels. Software versions B1 restricted the user to a patch of 26 channels. To use the 52 channel patch on B1 software, the user must select DMX protocol, enter the patch, then return to D54 protocol.

The standard socket for D54 input is a 3 pin XLR plug.

        Pin 1   =   D54 Screen.
        Pin 2   =   Not used.
        Pin 3   =   D54 signal.

Use good quality twin screen microphone cable for the dimmer data. The cable should be minimum 0.5mm² conductor size.

5.4 AMX Control.

AMX 192 is not available on the LD90 dimmer.

5.5 Analogue inputs.

The LD90 processor will accept 26 analogue inputs. Inputs can range from 0v to +10v or 0 to -10v.

These analogue inputs will operate on a highest takes precedence basis with all other control input. The only LD90 controls which can over ride the Analogue input commands are LEVEL inputs from the LD90 keypad and "Channel Level" commands from the LD90 hand held remote.

These inputs can not be patched onto different dimmers.

e.g. Analogue 1 = Dimmer 1
      Analogue 2 = Dimmer 2.
             etc.
      Analogue 24 = Analogue 24
      Analogue 25 = Analogue output 1
      Analogue 26 = Analogue output 2

5.5.1 Connection details.

10V output has max. current output 100mA (current limited), internally same as SWC power (pins 4 & 5)

A linear fader of approx. 10k ohms may be wired across pins 14 and 15 to provide an analogue control signal for one or more inputs.

Screen used for ground connection

Note: Dimmers 25 and 26 are always patched to analogue outputs 1 & 2, other inputs correspond with dimmer numbers in the rack.

5.5.2 Recommended cable type.

A screened multicore cable is recommended. The installation engineer must ensure that the GND point on the analogue input connector is attached to the 0v of the analogue source. This GND point must not be connected to mains earth at any point other than within the LD90 processor. Connecting mains earth to the GND line at the analogue source may cause earth loops.

Only 100mA is available from the 10V output of the analogue connector. This value will reduce if the 10V supply is also being used to power the LD90 hand held programmer, or being used by the two 10v analogue outputs.

All analogue inputs have an input impedance of 100KΩ. Inputs also have a filter with a 10ms time constant to remove spikes from the analogue line.

A value of 10K is recommended for the potentiometer value.

For details of analogue input calibration see section 1.5.3.

5.6   Analogue outputs.

There are two +10v analogue outputs available.

Control is available from.
          Outputs patched to a channel on MUX A or MUX B.
          Analogue inputs 25 and 26.
          The LEVEL button on the LD90 processor.
          Channel control on the LD90 hand held programmer.
          Levels recorded in backup lighting states.
          Levels from Outlook faders.
          Levels recorded in Outlook presets.

The 10v output is rated at 100mA. This value will decrease if the 10v output is being used for the hand held programmer or for analogue inputs.

Each 10v output has a 1KΩ resistor in series with a diode, to allow the output to be in parallel with another control system.

The LD90 connections are shown below.
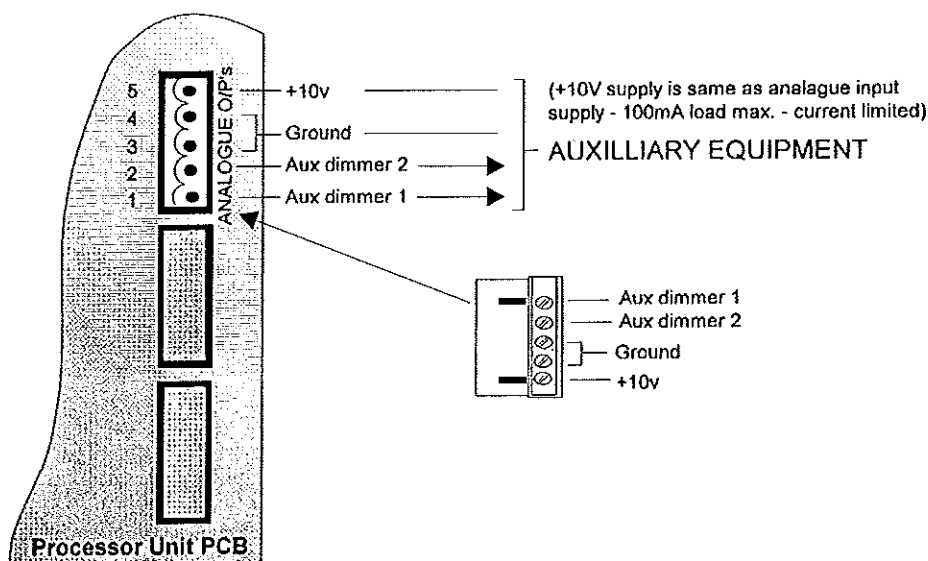
5.7   Installing Magnetic Fluorescent loads.

Fluorescent loads which are driven by magnetic ballast's require two live inputs. A fixed voltage input which is used to power the heaters at each end of the fluorescent tube (Line Fixed) and a variable voltage input which is used to dim the fluorescent tube (Line Variable).

The LD90 will control a maximum of 24 magnetic fluorescent loads. The first 12 dimmer outputs will provide the variable voltages, and by using connector PL5 to drive 12 relays, they can also provide 12 fixed voltages. Dimmers 13 and over can be set up for magnetic fluorescent loads but there is no fixed voltage output. The customer has to provide an alternative method of getting a fixed voltage supply.

Relay drive 1 is always used in conjunction with dimmer 1, drive 2 is for dimmer 2, etc.

To operate the Magnetic Fluorescent dimmer, from off to any level, the LD90 will switch on the appropriate relay drive 1 second before it switches on the selected dimmer. The relay output does not switch off when the dimmer output reaches full.

The dimmer outputs are shown in the following table.

The connector is a 20 pin IDC (ribbon) style

Pin	Function	Pin	Function
1	Relay drive 1	11	Relay drive 7
2	GND	12	GND
3	Relay drive 2	13	Relay drive 8
4	GND	14	GND
5	Relay drive 3	15	Relay drive 9
6	Relay drive 4	16	Relay drive 10
7	Relay drive 5	17	Relay drive 11
8	Relay drive 6	18	Relay drive 12
9	+8V unregulated (do not short circuit	19	+8V unregulated (do not short circuit
10	No connection	20	No connection

Each dimmer output will sink 5mA. The 8v supply is provided to power these relays. Relay interface designs are not supplied in the LD90 operation handbook.

5.8   Installing Electronic Fluorescent loads.

5.8.1   Operation information.

A Fluorescent tube with an electronic ballast only requires one input voltage. The electronics within the ballast will boost the input voltage up in order to power the heaters in the tube.

When the tube is switched on to a low level the LD90 will first "Kick Start" the tube. The output will switch to approx. 50% for 1 second whilst the heaters warm up then the level fades down to the correct value for the dimmer. The tube can now be faded up and down as normal. The dimmer must be switched off then back on for the Kick Start to be repeated.

All 24 dimmers can be assigned to electronic fluorescent loads.

5.8.2   Hardware modifications.

The fluorescent electronic ballast can generate RF interference. To prevent this noise returning down the load cable and back into the mains supply a link should be removed on the power block.

On the 25A power block remove links 1 to 4 for dimmers 1 to 4 respectively.

On the 13A power block remove links 1 to 8 for dimmers 1 to 8 respectively.

SOFT FIRED · NOT HARD FIRED. EXPECT FLICKERING .

5.8.3   Setting the T parameter.

The T parameter on the setup option sets the maximum voltage sent to the ballast. Due to resonance, caused by the high frequency switching of the ballast, the voltage sent to the lamp can be much greater than the supply voltage.

Incorrect setting of this value may result in reduced lamp life or damage to electronic ballast's.

Fluorescent luminaires reach their maximum light output at an input voltage of approximately 190V. The exact value depends on the loading of the dimmer.

To find the optimum value for the maximum level measure the voltage at the lamp. This must be done using a **TRUE RMS** meter. Adjust the T value until the reading on the lamp is the same, or slightly below, the full mains voltage at the site.

5.9 Installing the second MUX processor.

The second MUX card will only accept DMX and SMX protocols.

First switch off the power to the rack. Remove the LD90 processor from the rack. Remove the metal protective cover. Fit the three plastic spacers provided with the processor. Fit the processor by inserting PL7 on the LD90 processor into the connector SKT1 on the MUX card.

If the MUX card is the last card on the mux line then the MUX line must be terminated. To terminate the MUX fit link 1 between pins 2 and 3. All other mux cards must have this link fitted between pins 1 and 2.

Check that the LED is visible through the "MUX B OK" LED hole on the front panel.

Re-assemble the cover and fit the processor back in the rack.

A 5 way connector for MUX input B is provided in the second MUX card pack.

WARNING. Never connect power to the LD90 processor whilst the protective cover is removed. Voltages up to 340V DC can be found on the components below this cover.

Section 6. System Wide Control installation.

System Wide Control provides two types of control. The hand held programmer and the 8 or 16 way preset panels.

The hand held programmer allows the operator to playback and record backup presets in the LD90 racks. It also allows direct control of dimmers by selecting the dimmer using its circuit identifier and setting a level. Only one programmer can be used at any time.

The 8 or 16 way preset panel allows the operator to playback or record backup lighting states into the LD90 racks.

It is important to remember that backup lighting states always operate on highest takes precedence with all other inputs (Except when a dimmer is under direct control from the LEVEL button or from the hand held programmer)

6.1 Installation of a SWC programmer only.

If a hand held programmer is required but preset panels are not required then the power for the programmer can be provided directly from the LD90 processor. The processor provides +10v however the same power can also be used by the analogue inputs and the analogue outputs. The +10v output can only provide a maximum of 100mA therefore a SWC power supply may be required if there is not enough current available. See section 6.2 for details of the SWC power supply.
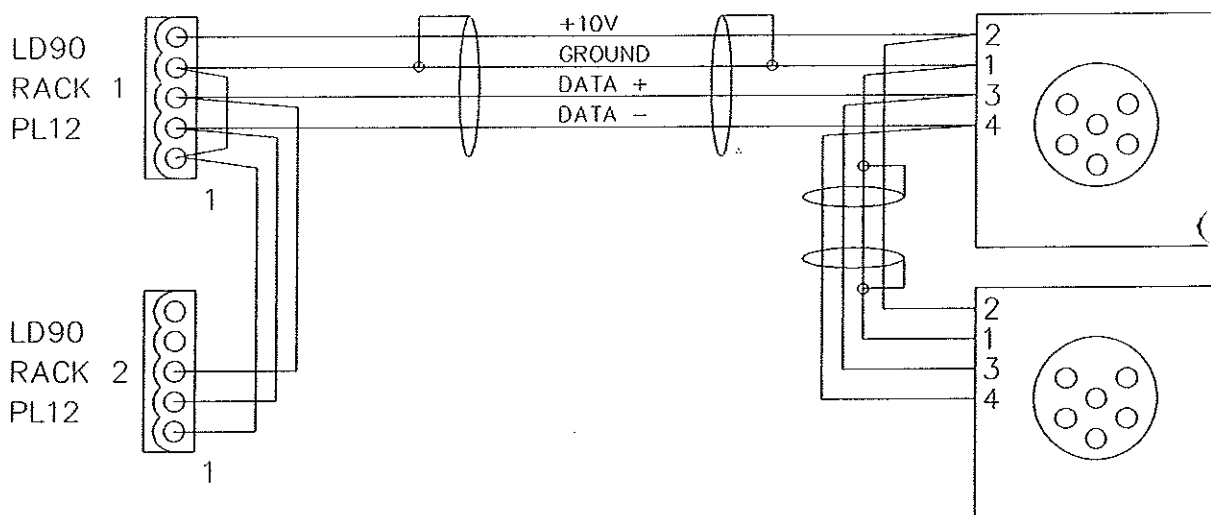
LD90	Description.	Cable core	SWC Programmer remote socket box
PL12 pin 5	= 10v @ 100mA	= Pair 1 RED	= XLR pin 2.
PL12 pin 4	= Ground	= Pair 1 BLACK.	= XLR pin 1
PL12 pin 3	= SMX DATA +	= Pair 3 GREEN.	= XLR pin 3
PL12 pin 2	= SMX DATA -	= Pair 3 BLACK.	= XLR pin 4
PL12 pin 1	= SCREEN	= Drain wire.	

The SWC programmer remote socket box contains a terminal block which is wired 1-1 with the pins of the 6 way XLR. It does not use the two part Klippon connector which is used by the preset panels.

IMPORTANT.

The SWC programmer remote socket box is fitted with a 6 pin XLR socket. Pins 5 and 6 are NOT spare pins. They are used by the factory for RS232 communication. Attaching power to pin 5 or 6 may result in serious damage to the SWC programmer. The RS232 communication is not available to customers.

The +10v power must only be supplied by one, usually the first, LD90 processor. The ground / screen connection should only be made to the Screen connector, pin 1, of every other LD90 processor. This will ensure that there is only one connection between mains earth and ground and there is no danger of creating earth loops.

The SWC cable must not be daisy chained to more than 31 LD90 dimmer racks. To connect to more racks a RS485 splitter / buffer must be fitted at the start of the SWC data line. Two cables can now be daisy chained with a maximum of 31 racks each.

Belden cable 9773 is recommended. Maximum cable run 300m.
(For cable runs under 150m Belden 8777 may be used).

6.2   Installation of Preset panels and a SWC programmer.

The preset panels require a power supply of +12v and -12v therefore an additional power supply must be fitted to the LD90 rack.

If the maximum number of preset panels and hand held programmers does not exceed 8 then a SWC power supply must be fitted to the first dimmer rack. If the maximum number of panels / programmers is between 8 and 25 then an Outlook power supply must be used. A new Outlook power supplied must be used for each additional 25 panels / programmers. See section 7. for details of Outlook power supply wiring.

The SWC power supply must be configured to provide two 12V output voltages. By linking the 12V output of the left supply with the 0V of the right supply the power supply can be used for -12V / 0V / +12V. Link outputs B and C together to achieve the correct output.

The 0V connection of the power supply and the SCREEN connection of PL12 on the LD90 processor must be joined together. Do not use the GROUND pin on the LD90 processor as this may cause earth loops if another earth is attached.
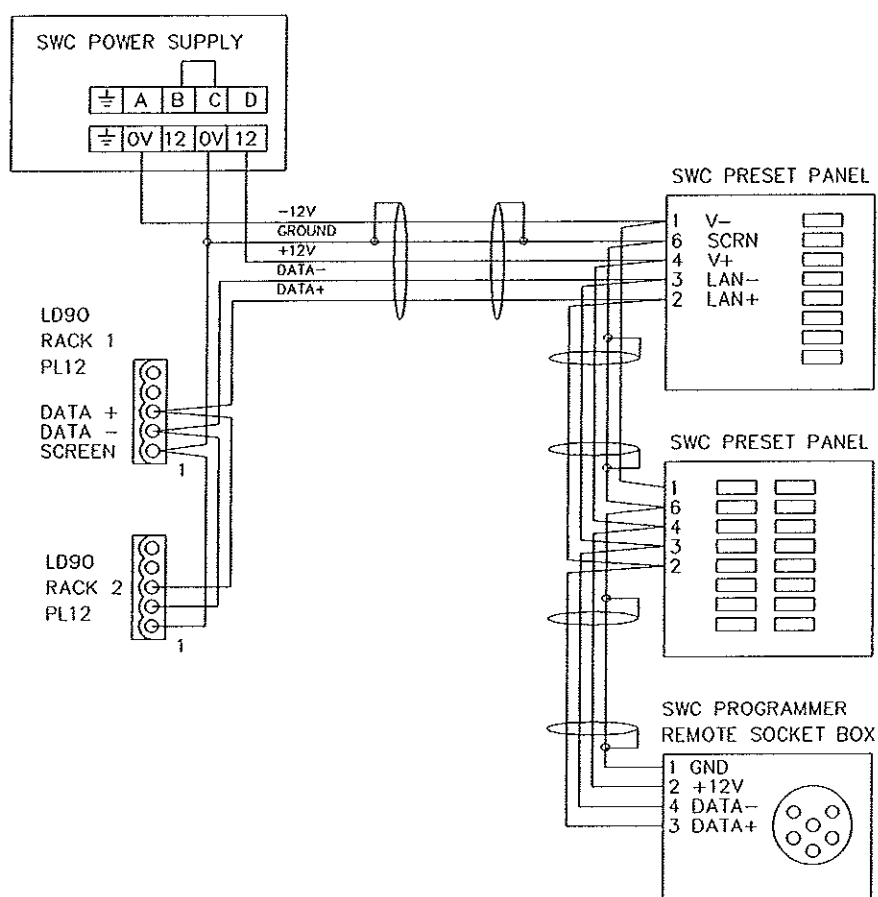
The SWC programmer remote socket box is a 6 pin XLR female.

LD90 / PSU	Description.	Cable core	Preset panel	SWC Prog socket box
PL12 pin 5	DO NOT USE.	-----------	-------	-------
PL12 pin 4	DO NOT USE.	-----------	-------	-------
PL12 pin 3	= SMX DATA +	= Pair 3 GREEN.	= Pin 2	= Pin 3
PL12 pin 2	= SMX DATA -	= Pair 3 BLACK.	= Pin 3	= Pin 4
PL12 pin 1 & PSU 0V right	= SCREEN & GROUND	= Pair 1 BLACK & Pair 2 BLACK & Drain wire.	= Pin 6	= Pin 1
PSU 12V right	= +12V	= Pair 1 RED	= Pin 4	= Pin 2
PSU 0V left	= -12V	= Pair 2 WHITE	= Pin 1.	= Not used
PSU 12V left	Not used	-----------	--------	-------

Belden cable 9773 is recommended. Maximum cable run 300m.
(For cable runs under 150m Belden 8777 may be used).

NOTES FOR ENGINEERS.

The ground wire is only used by the SWC programmer. The ground connection, pin 6, on the preset panels is not used by the preset panel. It is only fitted in order to give the installation engineer a place to attach the screen.

If a hand held programmer is not going to be installed then all ground wires can be ignored. Pin 6 will be used for the screen only.

If the hand held programmer is fitted then at least 1 ground wire must be used. The screen must not be used to provide the ground for the SWC programmer because this ground will carry current.

When a daisy chain is being used it is difficult to fit two screen cables and two ground cables into the panel connector. A one way terminal block can be used for the ground and screen connection, inside the panel back box, instead of connector pin 6.

Section 7.   Outlook installation.

IMPORTANT.   There are 2 different wiring methods for OUTLOOK. Both use the same Belden cable but each method uses different cores for each function. MAKE SURE YOU USE THE CORRECT OPTION. If in doubt use the option for OUTLOOK and SWC.

7.1   Outlook panels only.

The following wiring details are supplied with each Outlook panel. These details are published by Strand Lighting USA and are identical to the wiring details of the Premiere system. This wiring is not suitable for use with a SWC programmer.
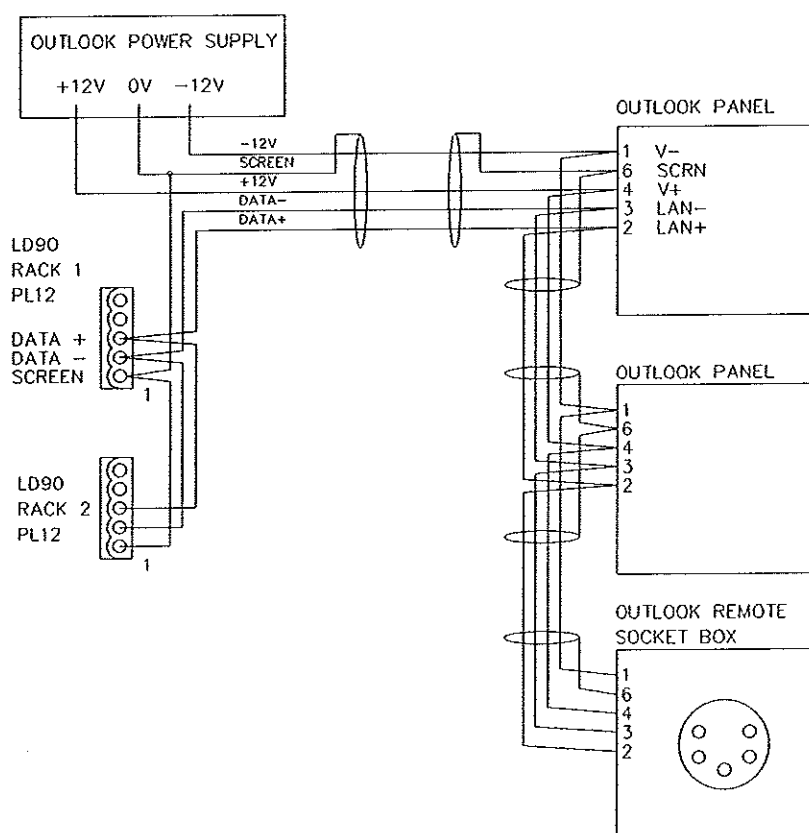
Outlook remote socket box has a standard 6 pin input connector with the same pin configuration as all other outlook panels. The output socket is a 5 pin XLR.

The pin out of the 5 pin XLR fitted to the Outlook remote socket box.

        Pin 1   =   -12V
        Pin 2   =   DATA +
        Pin 3   =   DATA -
        Pin 4   =   +12V
        Pin 5   =   NOT USED

The Outlook power supply has a 6 pin XLR socket fitted and inputs for data + and data -. This socket and these inputs are for SWC use only and should not be used in this application.

LD90 / PSU	Description	Cable core	Outlook panel & Remote socket box.
PL12 pin 5	DO NOT USE	------	-------
PL12 pin 4	DO NOT USE	------	-------
PL12 pin 3	DATA +	Pair 2 BLACK	Pin 2
PL12 pin 2	DATA -	Pair 2 RED	Pin 3
PL12 pin 1 & PSU 0V	SCREEN	SCREEN	Pin 6
PSU +12V	+12V	Pair 1 BLACK	Pin 4
PSU -12V	-12V	Pair 1 WHITE	Pin 1

7.2   Outlook and SWC installation.

The following wiring diagram will allow the use of SWC and OUTLOOK. The wiring is the same type as the SWC wiring shown in section 6.2.
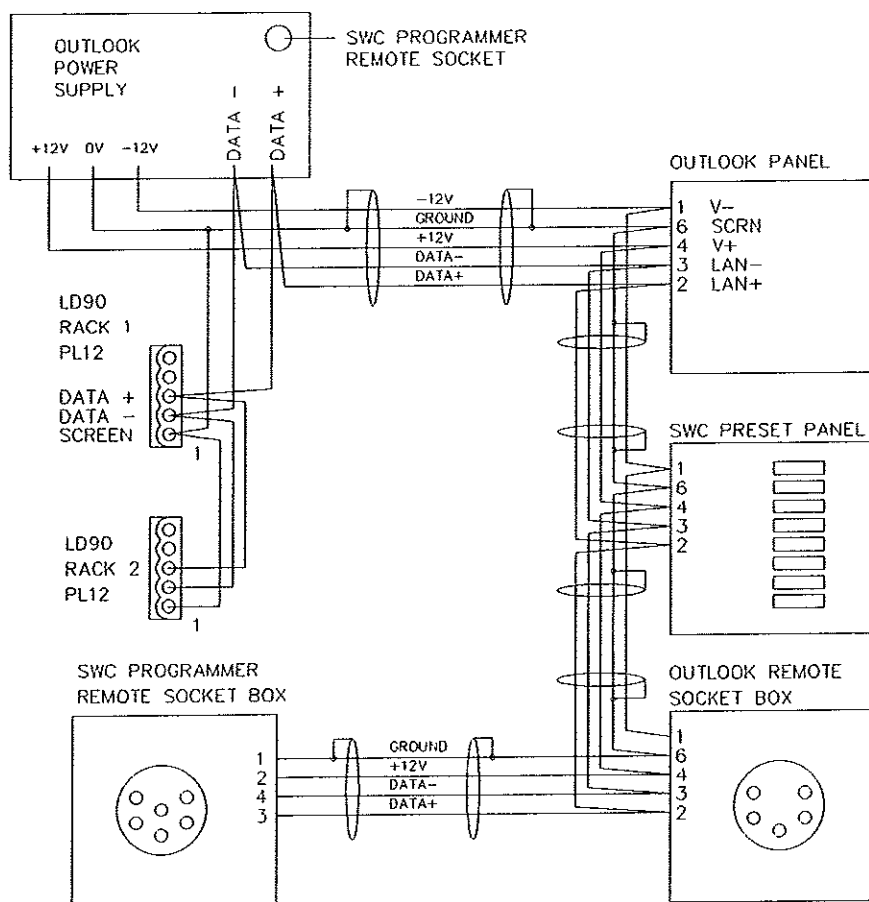
LD90 / PSU	Description	Cable core	All Outlook panels & SWC Preset panels	SWC Prog Socket box
PL12 pin 5	DO NOT USE	------	-------	--------
PL12 pin 4	DO NOT USE	------	-------	--------
PL12 pin 3	DATA +	Pair 3 GREEN	Pin 2	Pin 3
PL12 pin 2	DATA -	Pair 3 BLACK	Pin 3	Pin 4
PL12 pin 1 & PSU 0V	SCREEN & GROUND	Pair 1 BLACK & Pair 2 BLACK & Drain wire	Pin 6	Pin 1
PSU +12V	+12V	Pair 1 RED	Pin 4	Pin 2
PSU -12V	-12V	Pair 2 WHITE	Pin 1	Not Used

The recommended cable is Belden 9773 for runs up to 300m.
For cable runs less than 150m or where a maximum of 4 panels is used Belden 8777 can be used.

Pin out of the Outlook remote socket box.

    Pin 1   =   -12V
    Pin 2   =   DATA +
    Pin 3   =   DATA -
    Pin 4   =   +12V
    Pin 5   =   NOT USED

Remember to set the rotary switch on the remote socket for the correct room number. This setting will be used instead of the switch setting on the panel that has been connected to the socket.

Pin out of the SWC programmer remote socket box.

    Pin 1   =   GROUND
    Pin 2   =   +12V
    Pin 3   =   DATA +
    Pin 4   =   DATA -
    Pin 5   =   NOT USED
    Pin 6   =   NOT USED

The 6 pin XLR on the Outlook power supply can be used to connect a SWC hand held programmer.

Section 8.   Installation of SV90.

To install SV90 the installation engineer must connect, DATA +, DATA - and GROUND between the LD90 and the computer which is running SV90.

The SV90 protocol converter supplied with LD90 requires +9V therefore the power to the protocol converter must not be taken from any LD90, SWC or OUTLOOK power supplies.

8.1   Installation of the SV90 Remote option.

The following diagram shows the connection of the REMOTE SV90 option which is supplied by Strand Lighting.
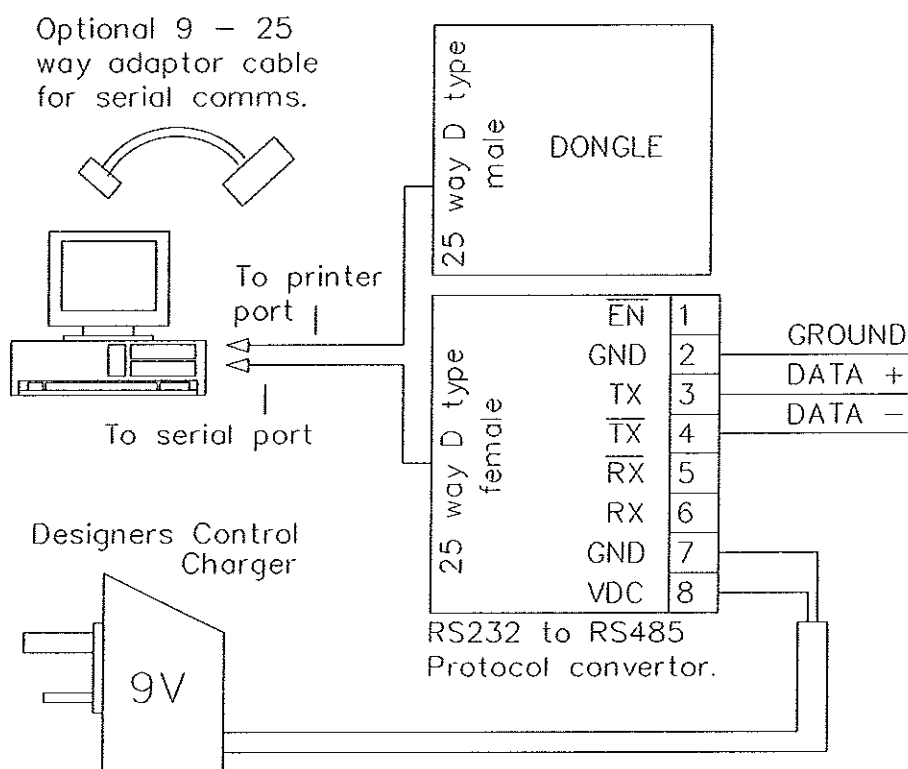
The REMOTE option is also supplied with SV90 software, an SV90 manual and the instructions for the protocol converter. The links for the protocol converter, as described in the instructions, are set in the factory and the converter should not be opened.

If the customer has a computer with a built in RS485 serial output the protocol converter is not required. The Dongle must still be fitted to the computer to use the remote SV90 software.

The customers computer must have the following capacity.
IBM PC or 100% compatible computers.
540K of RAM
MS DOS 3.0 or later.

SV90 serial communication uses 9 data bits however not all computers can output this protocol. So far Strand Lighting has identified the following suitable computers.

AST Premium 386
DELL System 220
Everex System 1700
Toshiba T1000SE
Toshiba T2000
Tandon 286

The customer will also require an ASCII text editor program for the SV90 configuration file. The program EDIT which is supplied with DOS version 5.0 or later is suitable. The program EDLIN which is supplied with DOS version 4.0 is also suitable but it is not as user friendly.

8.2   Connection to the LD90.

The SV90 communication requires Data +, Data - and Ground.

The following diagram shows the installation of SV90 only. The socket box, if used, has the same pin output as the SWC programmer remote socket.
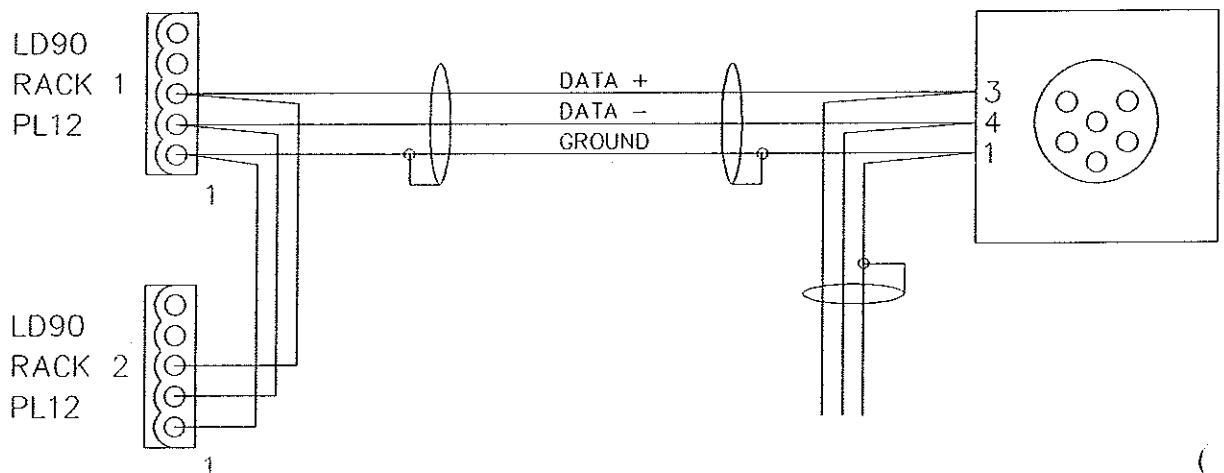
To prevent "Earth Loops" it is very important to ensure that the GND cable is connected to PL12 pin 1 SCREEN and not connected to PL12 pin 4 GND.

The protocol converter shown in section 8.1 has two ground pins. These are tied together inside the converter and they are attached to the Chassis earth of the computer. This will earth the ground line to the LD90. In order to prevent earth loops the cable must not be connected to ground at the LD90 end of the cable.

SV90 can also be fitted to any LD90 installation which has been designed with SWC programmer remote sockets.

When using SV90 the SMX data input must NOT be terminated. This includes the last LD90 processor on the SMX / SV90 data line. For no termination link 4 should be linked between pins 1 and 2.

SV90 tries to communicate with the LD90 rack all of the time. The SWC and Outlook panels only communicate when a button is pushed.

When using SV90, any input from a SWC programmer, SWC backup panel or Outlook panel will cause a communication fault in the SV90 software. The software may stop running or it may report communication failure. To reset the SV90 software the operator must exit the SV90 program then run it again. This will happen every time a button is pressed on a SWC or Outlook panel.

Use SV90 software version A3 or later. Earlier versions of SV90 software will work but the communication timing is more critical and there is a risk of communication failure if the LD90 processor does not respond instantly to a request for information.

It is important to remember that the SV90 program was written for the EC90 dimmer. None of the Outlook functions can be programmed using SV90. SV90 software will only access 32 of the 99 backup lighting states. Many of the functions of EC90 which are shown on the SV90 software are not available on the LD90.

Section 9.   LD90 Maintenance.

9.1   Error 06032.

The LD90 performs a number of self tests on power up.

The most common error is "Error 06032 >". This error appears after the module test and indicates that one or more of the modules has been changed for a different type. This could indicate that the processor has been moved to another rack, A power block has been changed or a ribbon cable to a power block has come loose.

By pressing the ">" key the display changes to show the message "Module Changed".

Press "-" to view earlier entries in the LD90 error log. The log will scroll until it reaches the start of the log.
Press "+" to view later entries in the LD90 error log.

Press "Enter" to accept the message and continue normal operation. The LD90 will not   ( )
record this error into the error log.

Pressing "Enter" will also record the new module type into the memory so that the error does not appear the next time the rack is switched on. If the processor does not find any modules and displays 000 on power up, this message can be accepted but the processor will always give an error each time it powers up.

9.2   Processor and fuse replacement.

9.2.1   Removing the processor.

1.   Switch power off.
2.   Remove the front cover of the rack.
3.   Remove the two fixing screws shown arrowed in the following diagram.
4.   Remove the earth strap from the earth bus-bar to the Processor Unit.   ( )
5.   Slide the unit out approx. 75mm, giving enough space to disconnect all control signal cables, the 3-phase power cable, and the Power Block cables as shown below. Note the positions of all connectors as several of them are similar.
6.   Slide the unit forward and out of the rack.
7.   Replacement is the reverse of the above procedure. Make sure that the connections to the Power Modules are made to the correct plugs on the PCB. They are clearly marked "DIMMERS - PHASE L1", "DIMMERS-PHASE L2", and "DIMMERS-PHASE L3".
8.   Ensure that the rack cover is replaced before applying power again.

Cut away view of the LD90 rack.
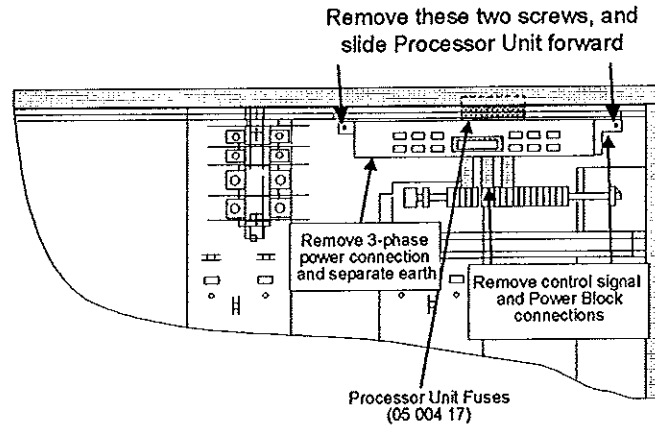
9.2.2   Setup transfer.

The setup information includes the rack setup, each dimmer setup, SWC backup states, Outlook room assignments and Outlook room presets. All of this information is recorded into an EEPROM. A battery is not required to keep the information in this device therefore the EEPROM can be removed and replaced in another LD90 processor with all of the information intact.

1.   Remove the Processor Unit from the rack
2.   Remove the Processor Module cover (two screws)
3.   Ensure anti-static precautions have been taken.
4.   Gently lever out EEPROM, IC12
5.   Repeat above two steps with exchange unit.
6.   Swap devices over. Make sure that the device is oriented correctly, see left.
7.   Replace the covers on both units.

Front of Processor Unit
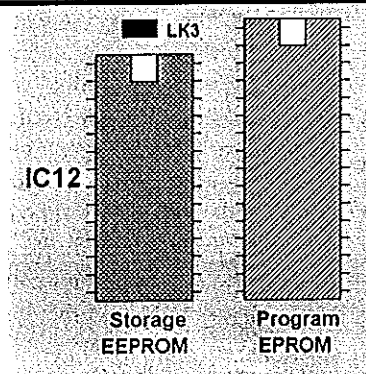

9.2.3   Fuse replacement.

The fuses are mounted above the LD90 processor. The processor must be removed before the engineer can remove the fuses.

Fuses are rated at 2A and are mounted in a fuse cap.

## 9.3   Power block maintenance.

The power device in the 13A dimmer module can be replaced easily.

1. Identify which physical dimmer is at fault, by reference to the fascia panel labelling.
2. Isolate the rack and remove the front cover.
3. Remove all the fascia covers from the Power Block is question, by gently pressing the "legs" inwards to release them from the extrusion.
4. Unscrew and remove the Power Device.
5. Replace the device with one of the pair supplied in the spare part kit 05 004 18.
6. Ensure that the screws are done up tightly to avoid a "hotspot" on the device in service.
7. Replace the mounting screw with the one supplied in the spare part kit above. This is essential to guarantee adequate thermal contact with the heatsink.
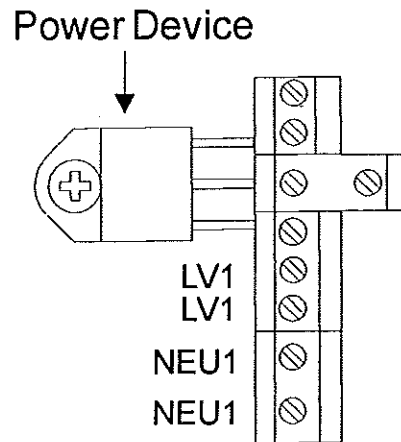
Power Device

The power device in the 25A must only be replaced by a service engineer.

1. Isolate the rack and remove the front cover.
2. Remove the power block which contains the faulty power device. Label each supply wire and each load wire before disconnecting.
3. Loosen the screws on the two lower mounting brackets then remove the top mounting brackets. The Power block can be tilted forwards and lifted out of the LD90 rack.
4. Remove all of the screws which hold the power device onto the power block. These can be accessed through holes cut in the circuit board. There are two screws in each power device.
5. Slide the circuit board right until it clears the lip holding the circuit board down. Lift the circuit board to reveal the power devices.
6. Remove the 4 screws holding the faulty power device and fit a new power device.
7. Refit the circuit board then fit the power block back into the LD90.
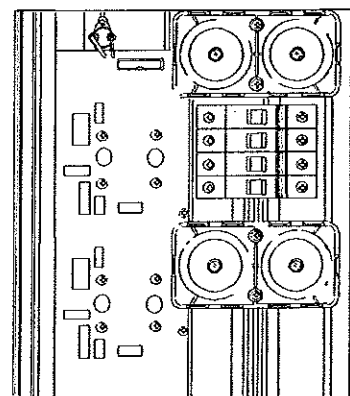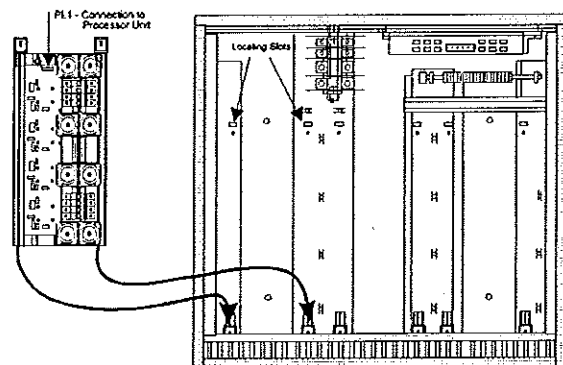
Note.   It is possible in some cases to remove the circuit board whilst the power block is still installed in the LD90 rack. This is not recommended because there is a risk of dropping the screws and shake proof washers, which hold the power device to the power block, behind the circuit board.

Appendix A.   LD90 hardware changes and modifications.

This list of modifications is correct on 25.1.94

A.1   Power supply modification.

This modification applies to Ref 1974 PCB issue 1 and 2.   *PcB issue 3 now in manufacture.*

Fault :

An LD90 processor is switched on and then off. Some processors then fail to switch on again. On some occasions the processor needs to be off for hours before it can be switched on again.

Cure :

The modification is to remove R73 and change C30 to $0.1\mu F$.

All LD90 processors were recalled to Strand Lighting or selected ASC's. There should not be any processor without this modification.

A.2   Service Bulletin I-8Z0049.

This modification should only be carried out as field service routine. The LD90 processor will not be recalled.

P R O D U C T	LD90 Racks 05 001 01 / 05 001 02 / 05 001 04 / 05 001 05 / 05 001 03 / 05 001 06 LD90 Processor Unit 05 003 14 ANDI DX Dimmer Racks CHANGE NOTE: E12532
P R O B L E M	Relates to LD90 Processor Unit REF1974 built on PCB 1048/2. (1048/3 and later are OK). Clearance in ground plane layer around component holes for D15, R44, R45 and C20 is inadequate to prevent voltage flash-over on boards with slightly eccentric layer registration. Problem shows as total failure of the PSU, visible damage to internal layers around one of the above through-holes and burn-out of R344, R345 and R346

ACTION: Boards in the field should be reworked as a routine upgrade if a visit to site is required for any reason. Stock and exchange units should be reworked as should any units returned for repair. Repair after the above failure mechanism is possible provided that the PCB has not suffered excessive burning damage.

EQUIPMENT REQUIRED: Soldering iron, Solder, Solder-sucker or braid, Small hand-tools,
18 SWG TCW.

REWORK BEFORE FLASH-OVER: The procedure isolates the offending four via holes (which are all joined by a short 'L' shaped track on the copper side of the PCB) by withdrawing the component leads and connecting them together in free air on the component side of the PCB. It should be noted that this circuit node operates at over 300V dc and care is required to ensure the safety and structural integrity of the reconstructed node.

Isolate the rack, remove the cover and unplug all connectors from the Processor unit.
Remove the two fixing screws, withdraw the processor unit and remove it to a suitable rework bench.
Adopt anti-static working practices, remove the mesh cover and lift the PCB off the nylon pillars.
Identify the four offending components (D15, R44, R45 and C20) and their common track node on the copper side of the PSU section of the PCB. Carefully unsolder these four joints and lift one end of each of the four components from the PCB holes.
Use the Tinned Copper Wire to form a bridging link to re-connect the four component leads together in free air above the surface of the pcb. (It may be necessary to replace C20 if the lead is too short).
Raise Mod Level shown on PCB to 2 and fit a small label to the front metalwork identifying mod level.
Reassemble the Processor module and refit to the rack before applying power and testing.

REWORK AFTER FLASH-OVER: This procedure is identical to that above except that a repair will be required also.
Visually examine the PCB to confirm the nature of the fault and that damage is not excessive.
Remove and replace R344, R345 and R346 and also C1, C4 and C10 if these have been burnt by the adjacent resistors. Clean scorch marks from the PCB and chassis before replacing the components.
Rework D15, R44, R45 and C20 as above.

COMPONENT DETAILS:
Resistors - R344, R345 and R346 - 4.7 Ohm PR37 1.6 watt,   R44, R45 - 150K Ohm CFR 100 1 watt
Diode - D15 - BTY11 - 800   **Capacitors -** C1, C4, C10 - 0.1uF Class X,   C20 - 10nF 1KV Disc

Sidebar label: D E T A I L

Appendix B.   Software upgrades.

The current software version at the time of publication is C1.

B.1   Software history.

<u>Version A1   -   18.2.93</u>

This software does not support MUX B, System Wide Control and 60Hz operation.

<u>Version A2   -   1.3.93</u>

This software allows 60Hz operation. MUX B and SWC are still not supported.

Fault - When the dimmer patch is modified only the last change is recorded into the EEPROM when the operator exits from the Patch menu.

<u>Version A3   -   26.4.93</u>

No additional features added. The patch fault in version A2 has been fixed.

<u>Version B1.   -   3.8.93</u>

SWC is now supported. Extra menus allow backup fade times to be entered.

Setting a dimmer to Non-Dim & Max Volts=250V will tell the LD90 that a relay is fitted instead of a power device. (See section 1.4.3)

The name LAW is changed to CURVE in software and on hardware.

MUX B is not available.

Fault - If D54 protocol is selected the LD90 will not allow the user to program a patch with a range of channels greater than 26.

<u>Version C1   -   26.11.93</u>

GAL IC25 must also be changed when fitting C1.

MUX B is now fully supported.
Outlook has been added to the LD90 program.
The keypad lock can be enabled / disabled at power up.

The fault D54 patch fault with version B1 has been fixed.

B.2   Software installation.

To install new software first remove the LD90 processor from the rack. Follow the instructions in section 9.2.1.

Remove the cover and replace the EPROM IC16 with the latest version of software. If software is being upgraded from version B1 or earlier to version C1 or later the GAL IC25 must also be changed.

Version B1 or earlier - GAL program CB009002
Version C1 or later - GAL program CB009003

When version B1 or earlier is upgraded to C1 or later the LD90 will re configure the EEPROM data base to add the Outlook options. The display will show "Arch Init" when it powers up for the first time.

No data will be lost when software is upgraded unless :-
a.   Software is upgraded from version A1.   ( )
b.   The GAL IC25 is not correct for the version of software installed.

Version C1 installed with the wrong GAL will not run.

Refit the processor and replace the rack cover before switching on.

( )

Appendix C.   SV90 configuration file.


```
# **************** SV90 configuration file ******************
#
#  Copyright (c) Strand Lighting Ltd. 1991. All rights reserved.
#
#  SV90.CFG Version A1  3rd JULY 1992
#
# ************************************************************
#
# NOTES:
# 1)   user options detailed in this file can also be used on the
#      command line when invoking the SV90 executable.
#      eg:
#           SV90 -aON -qON -mREMOTE -x1,1,1
#
# 2)   user options have defaults which can be changed by config.file
#      or command line options. the order of precidence being;-
#
#      Highest      command line
#                   configuration file
#      Lowest       defaults
#
# 3)   user config.file name defaults to SV90.CFG, if user wants to
#      use an alternative the SV90 environment variable should be
#      setup prior to invoking the SV90 executable file.
#      eg:
#           set sv90=new_filename.ext
#
#
# 4)   user options, eg: -a -b -x etc. MUST be defined according to the
#      following syntax rules.
#           a)     - minus character MUST be first char. on line
#           b)     only ONE user option per line
#
# 5)   SV90 command line is limited to 80 chars. max.
#
# **************** SV90 configuration file ******************

# THIS INFORMATION MUST BE SET UP FOR YOUR SITE BEFORE
RUNNING SV90
#
#
# rack type -r EC90 or CD90
-rEC90
```

```
# smx system configuration discriptor option -x
# syntax definition = -x <rack_ID>, <link>, <address>
# rack_ID:    rack_number
# link:       single digit number,    1=coms link 1
#                              2=coms link 2
#                              any other number invalid
#            N.B. only link 1 supported as of A1 release
#
# address:    smx address for rack,   in decimal
#
# NOTE:-      rack_ID & address MUST be in range 1 -> 20 ONLY...
#
-x 1, 1, 1
#-x 2, 1, 2

# supplies configuration discriptor option -s
# syntax definition =
# -s"<supply_ID>,<supply_type>,<over_current_limit>,<rack_number_list>"
#
# supply_ID:   text string upto 12 characters max, typically name of supply
# supply_type: single digit, 1=single phase
#                              3=three pahse supply
#                              any other digit not allowed
# over_current_limit:   current alarm limit for the supply in Amps
# rack_no_list: list of rack numbers connected to the supply

-s"SUPPLY_1,3,100,1"
#-s"SUPPLY_2,3,100,2"

# audible over current alarm option -a ON or OFF, default=ON
-aON

# colour option -c ON or OFF, default=OFF
-cON

# time format option -t HRS_24, HRS_12, default=HRS_12
-tHRS_24

# date format option -d DAY_MONTH, MONTH_DAY, default=DAY_MONTH
-dDAY_MONTH

# timeout period on main screen until event log screen started
# -i (ie: no user input on main screen) 1->99 mins, default=1mins
-e1
```

```
# printer form length option -f 1->99, default=66(european A4 standard)
#                                72(usa letter size)
-f66


# initial mode when specifying dimmer selections, default = CIRCUIT
#      - also sets which status screen is the default - Circuit Status
#        or Dimmer Status
#        -e CIRCUIT, DIMMER
-iDIMMER


# terminal mode option -m REMOTE=remote(RS485 supervisory link)
#                        LOCAL=local(RS232 rack processor link)
#                        OFF=off-line version
#                        DEMO=demo version (off-line without save)
-mOFF


# coms link 1 to physical hardware mapping option -p1 1->4, default=1
-p11


# coms link 2 to physical hardware mapping option -p2 1->4, default=2
-p22


# silent (quiet) mode option -q ON or OFF, default=OFF
# NOTE: this can be toggled during run time by the ALT-S key
-qOFF


# main screen user banner string option -u, max 40 characters
# the first character inside the double quote "" characters
# MUST be a number in range 1->4 inclusive, this identifies
# where the string will appear on the main screen.
# notes:
#      -u"1      will be placed on line 7 (ie: first user line)
#      -u"2      will be placed on line 9 (ie: second user line)
#      -u"3      will be placed on line 11 (ie: third user line)
#      -u"4      will be placed on line 13 (ie: forth user line)
#
# "0123456789012345678901234567890123456789"
# "      |       |       |       "
-u"1                          "
-u"2                          "
-u"3   Digital Dimmer Management System   "
-u"4                        "


#
# smx UART type -v0=Auto-detect -v1=Type 1 -v2=Type 2 (default Auto)
#
-v0


# end of file
```