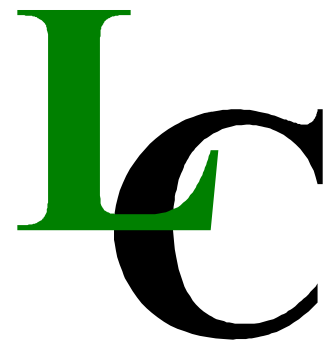

Castline Systems

Lightcalc



For Windows

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References

The calculations of glare indices Technical Memorandum No. 10 (London Chartered Institution of Building Services Engineers 1985)

CIBSE standard style format for the electronic transfer of luminaire photometric data Technical Memorandum No. 14 (London Chartered Institution of Building Services Engineers 1988)

The calculation and use of utilisation factors Technical Memorandum No. 5 (London Chartered Institution of Building Services Engineers 1980)

CIBSE Code for interior lighting (London Chartered Institution of Building Services Engineers 1994)

Castline Systems reserve the right to change specifications without notice.

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Overview

Specifications of Lightcalc

Lightcalc for Windows is a computer software package, its purpose is to produce lighting calculations and layouts in line with The Chartered Institution of Building Services Engineers (CIBSE) Code for Interior Lighting 1994

The logo for LightCalc For Windows is centered within a white rectangular border. The word "Light" is written in a bold, green, sans-serif font, while "Calc" is in a bold, black, sans-serif font. Below "Calc", the words "For Windows" are written in a smaller, black, italicized sans-serif font.

LightCalc
For Windows

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Calculations Generated by Lightcalc for Windows

Average illuminance (lumen method) calculations.

Used typically for interior lighting schemes. Calculations using this method are usually prescribed in terms of the average illuminance on a horizontal working plane considered to be at a height of the work above the floor (usually 0.85m) and covering the entire work area.

The basic formulae for the Average illuminance is:

$$\text{Average Illuminance} = \text{Lamp flux} \times \text{Utilisation Factor} \times \text{Maintenance Factor} / \text{Area}$$

Point source Calculations

Used typically for exterior lighting, car parks, sports fields etc. Calculations using this method are based on the inverse square and cosine rules. They are extremely intensive sometimes containing thousands of individual calculations combining calculations from each luminaire to each position on an imaginary grid.

The basic formulae for a Point Source Calculation is:

$$E = \frac{I \cos^3 \theta}{H^2}$$

Where:

E	=	<i>Illuminance at the point</i>
I	=	<i>Luminous intensity of the source</i>
H	=	<i>Mounting height</i>

Lightcalc for Windows will automatically select which method of calculation to use, based upon the type of photometric data for the luminaire that has been selected.

An integer indicating the type of photometry for the luminaire is displayed:

1. Type 1 refers to angular co-ordinate system typically used for roadway, area and indoor luminaires where the polar axis is vertical and the vertical angles start with 0°.
2. Type 2 refers to angular co-ordinate system used in floodlight photometry, where the polar axis is horizontal.

Glare Calculations

Glare calculations are in accordance with CIBSE TM10 The Calculation of Glare Indices 1985: Part 1
Calculation of glare index direct from the basic formula:

$$g = \frac{0.9 L_s^{1.6} \omega^{0.8}}{L_b P^{1.6}}$$

Where

- L_s = *Luminance of each individual luminaire in the direction of the observers eye*
- ω = *Solid angle subtended by each luminaire at the observers eye.*
- L_b = *Background luminance.*
- P = *Position index for each individual luminaire which relates its displacement from the line of sight.*

$$\text{Glare Index} = 10 \log_{10} [0.5 (g_1 + g_2 + \dots g_n)]$$

Manufacturers Data

Photometric data used for the calculations must be to the following specifications:-

CIBSE STANDARD FILE FORMAT FOR THE ELECTRONIC TRANSFER OF LUMINAIRE PHOTOMETRIC DATA TM14 1988.

There are two types in the format, they are to CIBSE/1 and CIBSE/2. Lightcalc for Windows **will** accept CIBSE/1 files. The CIBSE/2 files include predefined glare and utilisation factor data and are not fully compatible with Lightcalc for Windows but will provide limited results.

Photometric data may be added to the Lightcalc for Windows database from within the programme by using the Install Data File option. To use this facility the files must not be in compressed format. The Thorn Lighting and Philips databases supplied with Lightcalc for Windows are in compressed format and therefore can not be installed through the programme, they must be installed via the operating system (follow the installation instructions provided with the disks).

If the manufacturers photometric data files are only available in compressed format then they will have to be installed to the hard disk following the instructions supplied with them. They will not install via the Install Data File option in Lightcalc for Windows.

Getting Started

Installing Lightcalc for Windows

Windows 95

It is recommended that before Lightcalc for Windows is installed, your computer is shut down and then re-started. This will ensure that there are no other applications running. If Windows is configured for certain applications to run in the background then they must be disabled before proceeding any further.

After starting your computer system, install the software following the instructions printed on the label of Disk 1. This will start the Lightcalc for Windows set-up programme.

1. Start Windows 95.
2. Insert Disk 1 - 'Setup' in drive A.
3. Click the 'Start' button (located on the task bar at the bottom left hand corner of the screen).
4. Select 'Run' from the pop-up menu.
5. Type 'A:setup' and then press enter.

The 'Initializing Setup' box will appear briefly while the setup file is loading from the disk. You will then be presented with the main Lightcalc for Windows setup screen. Follow the on-screen prompts and insert the appropriate disks as requested. During the course of installation you will be asked for the drive and directory in which you wish to install to, we recommend that you accept the default drive and directory.

When installation is complete an icon window will appear.



To run the programme, either double click on the icon or click the 'start' button, select 'programs' and then select 'LCWIN'.

It is recommended that the screen resolution is set to a minimum of 800 x 600. However the programme will work in 640 x 480 but some of the features relating to grid ceilings may not be accessible on the screen.

The resolution may be changed by accessing Start - Settings - Control Panel - Display - Settings.

Windows 3.1 etc.

It is recommended that before Lightcalc for Windows is installed, your computer is shut down and then re-started. This will ensure that there are no other applications running. If Windows is configured for certain applications to run in the background then they must be disabled before proceeding any further.

After starting your computer system, install the software following the instructions printed on the label of Disk 1. This will start the Lightcalc for Windows set-up programme.

1. Start Windows. (This should display 'Program Manager' at the top of the screen).
2. Insert Disk 1 - 'Setup' in drive A.
3. From the 'Program Manager' select the 'File' menu (top left of screen).
4. Select 'Run' from the drop-down menu.
5. Type 'A:setup' and then press enter.

The 'Initializing Setup' box will appear briefly while the setup file is loading from the disk, followed by the main Lightcalc for Windows set-up screen. Follow the on-screen prompts and insert the appropriate disks as requested. During the course of the installation a drive and directory will be requested. We recommend that the default drive and directory (LCWIN) is used.

When installation is complete an icon window will appear.



To run the programme, double click on the icon.

It is recommended that the screen resolution is set to a minimum of 800 x 600. However the programme will work in 640 x 480 but some of the features relating to grid ceilings may not be accessible on the screen.

The resolution may be changed by accessing Windows set-up from Windows Main.

Running Lightcalc for Windows

Windows 95

To run the programme from Windows 95:

To run the programme from the 'Start' Button

- Click the 'Start' button
- Select 'programs'
- Select 'LCWIN'.

To run the programme from the LCWIN Program Group

- Double click on the Lightcalc for Windows icon in the LCWIN Program Group

Windows 3.1 etc.

To run the programme from Windows:

- From the windows Program Manager select the LCWIN Program Group
- To run the programme, double click on the Lightcalc for Windows icon.

Installation problems

This section deals with installation problems that can occur when loading Lightcalc onto your computer system.

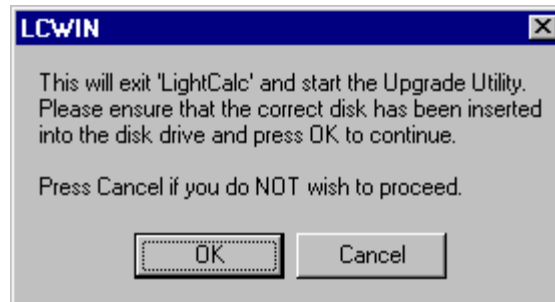
Note that the most common problem encountered is when the Setup programme is run from File Manager in Windows instead of Program Manager. Please ensure that you are running Setup as detailed on the disks.

Other installation problems encountered are as follows:-

- The installation programme stops part way through.
- This problem will sometimes include a box appearing on the screen displaying the message 'Lightcalc has not been properly installed'. The main causes of this problems are data errors on the disk and/or the disk being write-protected. Check the disk to see if it has been write-protected (the slider in the open position) and rectify if it has. If the problem persists try running the install programme on another machine.
- Lightcalc shows 'Licensed to:- Unregistered' on the title bar (see also 'Printing Problems' below).
- This problem is normally caused by incorrectly filling out the user registration details during installation. Try re-running the install programme. Note:- should this problem persist then your disk(s) may require re-setting - contact Castline Systems for details.
- A message box showing 'File <xxxxxxxx> in use' (<xxxxxxxx> can represent anything) appears.
- This problem normally occurs when either a programme such as a Virus Checker is running (some users have the Windows Clock programme running continuously, and this can cause a similar problem) or the computer is running on a network. Cancel the installation, close down the other programme(s) (if running on a Windows for Workgroups network, try exiting Windows and restarting it by typing 'WIN/N' instead of 'WIN'), the try re-running the install programme.

Upgrading

All Castline Systems Software incorporates a facility to upgrade to new versions from within the programme.



Before running the upgrade utility check the version number of the current programme.

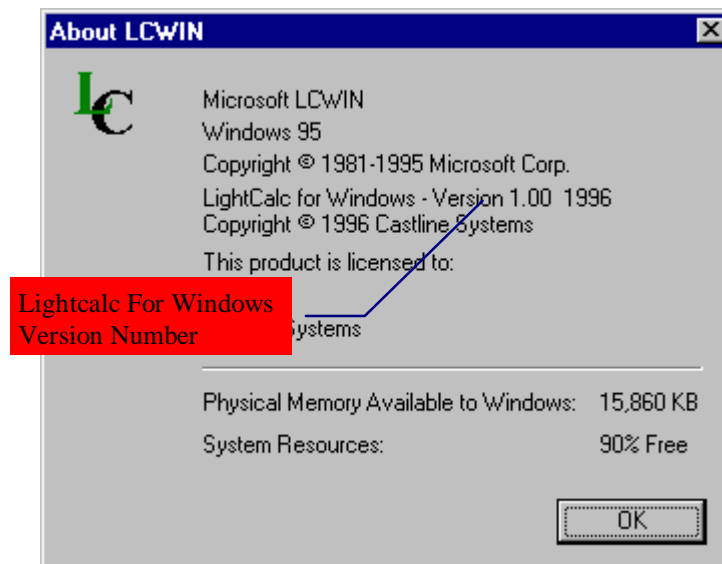
See Version

To upgrade Lightcalc for Windows first ensure that the upgrade disk containing the software upgrade is in the disk drive, then simply click on the Upgrade menu option and follow the instructions. The upgrade disk will be checked to see if any of the files that it contains are more recent than the files on the hard disk and then replace them as required.

The programme will be shut itself down to enable it to do this, and it will have to be restarted when the upgrade has been completed. As the upgrade utility scans the disk it will indicate that it is copying files and at the end of the process it will display the number of files that have been updated. Check the version number to confirm that it has updated the programme.

Version

To find the version number of the programme on your computer select 'About' from the 'Help' drop down menu.



See Upgrading

The design environment

The calculation screen is separated into 6 tabbed sections. Each tabbed section contains a logical part of the calculation process, The tabs are labeled as follows:-

- 1) **Luminaire:** Selection of the luminaire for use in the calculation.
- 2) **Dimensions:** The room or area dimensions and reflections.
- 3) **Maintenance:** Calculation of the maintenance factor.
- 4) **Layout:** A fully dimensioned layout of the final lighting scheme.
- 5) **Polar Curve:** Displays the luminous intensity distribution of the luminaire.
- 6) **Photometric:** Calculates and displays the Utilisation factor (UF) for the luminaire.

The calculations must be performed in the correct order, commencing with tab 1 to select the luminaire, then tab 2 to input the dimensions, tab 3 to determine the maintenance factor, and tab 4 for the final layout. Tabs 5 and 6 are available as soon as the luminaire has been selected.

Each of the above tabbed sections are described in detail in the relevant sections of this manual.

Tab 1 - Luminaire

General

After the Lightcalc introduction screen has disappeared the following screen will be displayed

If Manufacturers Photometric Data has not yet been added then do so before proceeding any further.

See Adding Photometric Data Files

Labels pointing to the interface elements:

- Drive List Box
- Directory List Box
- File List Box
- View TM14 Data Button
- Print TM14 Data Button
- Install Data File Button
- Sort Catalogue Number Button
- Sort Lamp Description Button
- Sort Luminaire Description Button

Catalogue No.	Lamp description	Description
FRAV 136 + FRD 312	36W T8	300mm wide module with opal sided opal base diffuser
FRAV 136 + FRE 312	36W T8	300mm wide module with opal sided prismatic controller
FRAV 136 + FRP 312	36W T8	300mm wide module with shallow framed opal panel
FRAV 136 + FRQ 312	36W T8	300mm wide module with shallow framed prismatic panel
FRAV 136 + FRX 1312	36W T8	300MM WIDE MODULE WITH LOW BRIGHTNESS REFLECTOR
FRAV 136 + FRY 1312	36W T8	300mm wide module with general purpose reflector
FRAV 158 + FRD 315	58W T8	300mm wide module with opal sided opal base diffuser
FRAV 158 + FRE 315	58W T8	300mm wide module with opal sided prismatic controller
FRAV 158 + FRP 315	58W T8	300mm wide module with shallow framed opal panel
FRAV 158 + FRQ 315	58W T8	300mm wide module with shallow framed prismatic panel
FRAV 158 + FRX 1315	58W T8	300MM WIDE MODULE WITH LOW BRIGHTNESS REFLECTOR

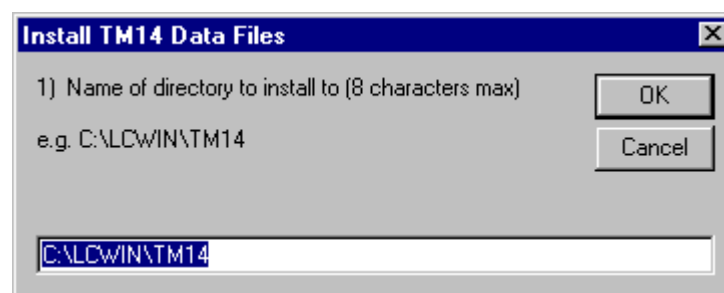
Adding Photometric Data Files

Before any calculations can be performed, photometric data must be accessible to the Lightcalc for Windows programme. Data may be accessed from the computers hard disk, from floppy disk or from CD-ROM.

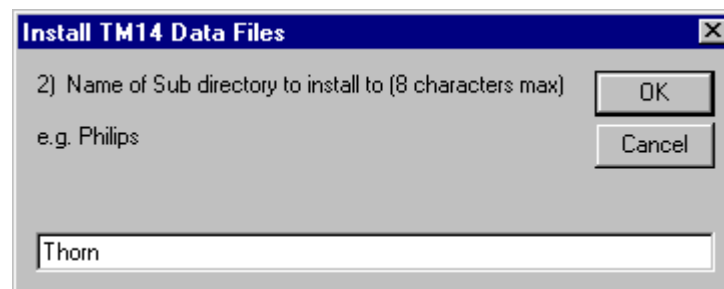
Installing photometric data to hard disk

To install manufacturers data to hard disk from within the Lightcalc for Windows programme:

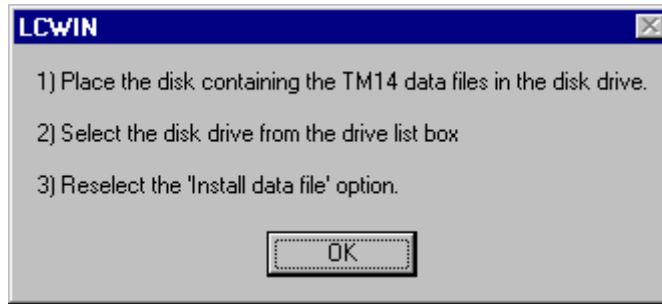
- Place the disk containing the TM14 data into the appropriate disk drive.
- Select the disk drive from the drive list box.
- Click on the Install Data File button.
- Lightcalc for Windows will display the following input box



- Click OK to select the default directory (C:\LCWIN\TM14), or enter an alternative (DOS conventions 8 characters maximum), this will set up a new directory if it does not already exist.
- Lightcalc for Windows will display the following input box



- Enter the name of the sub directory where the data files will reside, (DOS conventions eight characters maximum) and then click on the OK button. This will set up a new directory if it does not already exist. If possible use the manufacturers name e.g. Thorn - Philips etc., or if the manufacturers name is more than eight characters then shorten it to eight characters or less, e.g. Fitzgerald - Fitzgld or Fitz.
- The data files should now load to the hard disk.
- If more files are to be added then repeat this sequence of operations until complete
- If the Install Data Button is clicked before selecting the source then the following message will appear:



Reading photometric data from floppy disk

This method is very slow and is not recommended.

- Place the disk containing the TM14 data into the appropriate disk drive.
- Select the disk drive from the drive list box.
- Double click on the required sub directory in the Directory list box, this will load the files into memory.
- Click on the required luminaire in the luminaire list box.

Selecting the Luminaire

To select a luminaire for design scroll down the luminaire list and click on the desired luminaire.

You can sort the list in three categories by clicking on the appropriate sort buttons for:

1. **Catalogue number** This will rearrange the list in order of catalogue number.
2. **Lamp description** This will rearrange the list in order of lamp description.
3. **Luminaire description.** This will rearrange the list in order of luminaire description.

Ensure that the luminaire that you intend to use is highlighted before proceeding any further with the calculation.

Viewing TM14 Data

To view the TM14 data for the selected luminaire, click on the button labeled 'TM14 data'. This will display the entire file for the selected luminaire.

- Select the luminaire from the Luminaire List.
- The Luminaire List will be replaced by TM14 Data Screen.
- Click on the same button to return to the main screen.

Printing TM14 Data

It is very unlikely that during the normal use of Lightcalc for Windows that this facility will ever be required, however if at any time there is a need then proceed as follows:

- Select the luminaire from the Luminaire List.
- Click on the button labeled 'Print TM14 data'.
- This will print the TM14 data for the selected luminaire.

Tab 2 - Dimensions

Dimensions for Interior Lighting Calculations

If the selected luminaire falls under the category of CIBSE type 1 then the following screen will appear.

Length of Room Width of Room Height of Room

LighCalc for Windows - Licensed to :
File Print Options Upgrade Help

Room Details

Dimensions

Length Width Height

Mounting height

Luminaire mounting height Room Index =

Working plane

Height of object to be illuminated (Working Plane)
 floor desk

Lux Level

Illumination level required (LUX)

Reflectance

Ceiling	Wall	Floor
<input checked="" type="radio"/> 0.70	<input checked="" type="radio"/> 0.50	<input type="radio"/> 0.30
<input type="radio"/> 0.50	<input type="radio"/> 0.30	<input checked="" type="radio"/> 0.20
<input type="radio"/> 0.30	<input type="radio"/> 0.10	<input type="radio"/> 0.10
<input type="radio"/> 0.00	<input type="radio"/> 0.00	<input type="radio"/> 0.00

Height of Luminaire Room Reflection Values

Height of Working Plane Lux level required

Navigation: Luminaire | **Dimensions** | Maintenance | Layout | Polar Curve | Photometric
Buttons: Exit | Print Layout | Print Results | Preview Results | Click for sort order

TAB 2 - DIMENSIONS (Indoor)				
Item	Description	Type of input	Unit	Example
Dimensions				
Length	The length of the room	Numeric	Metre	15
Width	The Width of the room	Numeric	Metre	12.5
Height	The Height of the room	Numeric	Metre	3.25
Mounting Height				
Height	The Height of the luminaire	Numeric	Metre	3.25
Working Plane				
Height	Height of object to be illuminated	Numeric	Metre	0.85
Floor	Sets Working Plane to zero	Option	-	-
Desk	Sets Working Plane to Desk height	Option	-	-
Lux Level				
Illumination level required	Height of object to be illuminated	Numeric	Lux	500
Reflectance				
Ceiling	Reflectance of surface selection	Option	%	70
Wall	Reflectance of surface selection	Option	%	50
Floor	Reflectance of surface selection	Option	%	30

Room Index

From the data input into Tab 2, a room index is calculated using the formulae:

$$RI = \frac{Length \times Width}{height(Length + Width)}$$

The room index is a measure of the proportions of the room and is used to determine the utilisation factor (UF) of the luminaire in the final calculation.

Lux Level

Lux is the unit of illuminance used to input the average illumination level.

The following levels of illuminance are as recommended in the publication Code for Interior Lighting 1994.

Lux levels			
Description		Illuminance	Glare
General Building Areas			
Entrances	Entrances	200	19
Circulation areas	Lifts	100	-
	Corridors - passageways - stairs	100	22
Staff rooms	Changing - cleaners - cloakrooms	100	-
	General	50 - 200	22
	Rest rooms	150	19
Kitchen and food preparation	Staff canteens	200	22
	Serveries - Vegetable preparation	300	22
	Cooking	500	22
Communications	Food stores - cellars	150	22
	Switchboard rooms	300	19
	Telephone apparatus room	150	25
	Telex - post room	500	19
Building services	Reprographics	300	19
	Boiler house	100 - 150	25
	Control rooms	300	19
	Plant rooms	150	25
	Switch rooms	200	-
	Store rooms	100	-
	Entrances and exits	100	-
Car parks (indoor)	Control booths	200	-
	General	50 - 200	-
Loading bays	Ramps and corners	75 - 200	-
	general	150	-
Work stores	Unpacking - sorting	200	25
	storage	100	25
	rack storage	300	25
Warehouses	storage	100 - 150	-
	High bay rack stores - gangway	20	-
	control station	200	-
	packing and dispatch	300	25
General exterior areas			
Car parks (exterior)	Low risk - high risk	20 - 50	-
Pedestrian precincts	Low risk - high risk	20 - 100	-
	covered pavement and steps	75	-
Sales areas	service areas	50	-

	sales areas	50 - 200	-
Floodlighting buildings	general	30 - 100	-
Storage areas	general	20	-
Walking areas	general	50 - 100	-
Roadways	road footway or footpath	5 - 10	-
Security	area lighting	5 - 20	-
	perimeter	1	-
	checkpoints	150	-
	gatehouses	200	-
Offices and shops			
Offices	general	500	19
	computer work stations	300 - 500	19
	conference rooms	500	19
	data preparation rooms	500	19
	filing	300	19
Drawing offices	general	500	16
	drawing boards	750	16
	C.A.D.	300 - 500	-
	print rooms	300	19
Banks and building societies	counter - office area	500	19
	public area	300	19
Retailing			
Fashion and household stores	departmental stores	500	19
	chain stores	750	19
	specialist retailer	500	19
Food stores	Hypermarket / superstore	1000	22
	supermarket	750	22
	grocery / vegetable store	500	19
	specialist store	500	19
Retail catering outlets	food court	300	19
	fast food outlet	500	19
	family restaurant	200	19
Small retail outlets	newsagent	500	19
	stationer / bookshop	500	19
	chemist	500	19
	jeweller	500	19
Petrol filling stations	general	30	-
	pump area	300 - 500	-
Do-it-yourself	superstore	1000	22
	car accessory store	1000	22
	electrical / furniture store	750	19
	hardware store	500	19
	indoor garden centre	500	22
	outdoor garden centre	50 - 200	-

Showrooms	general	500 - 750	-
shopping precincts (exterior)	general	50 - 200	22
Covered arcades and malls	general	50 - 300	22

Reflectance's

A value must be selected for each of the room reflectance's.

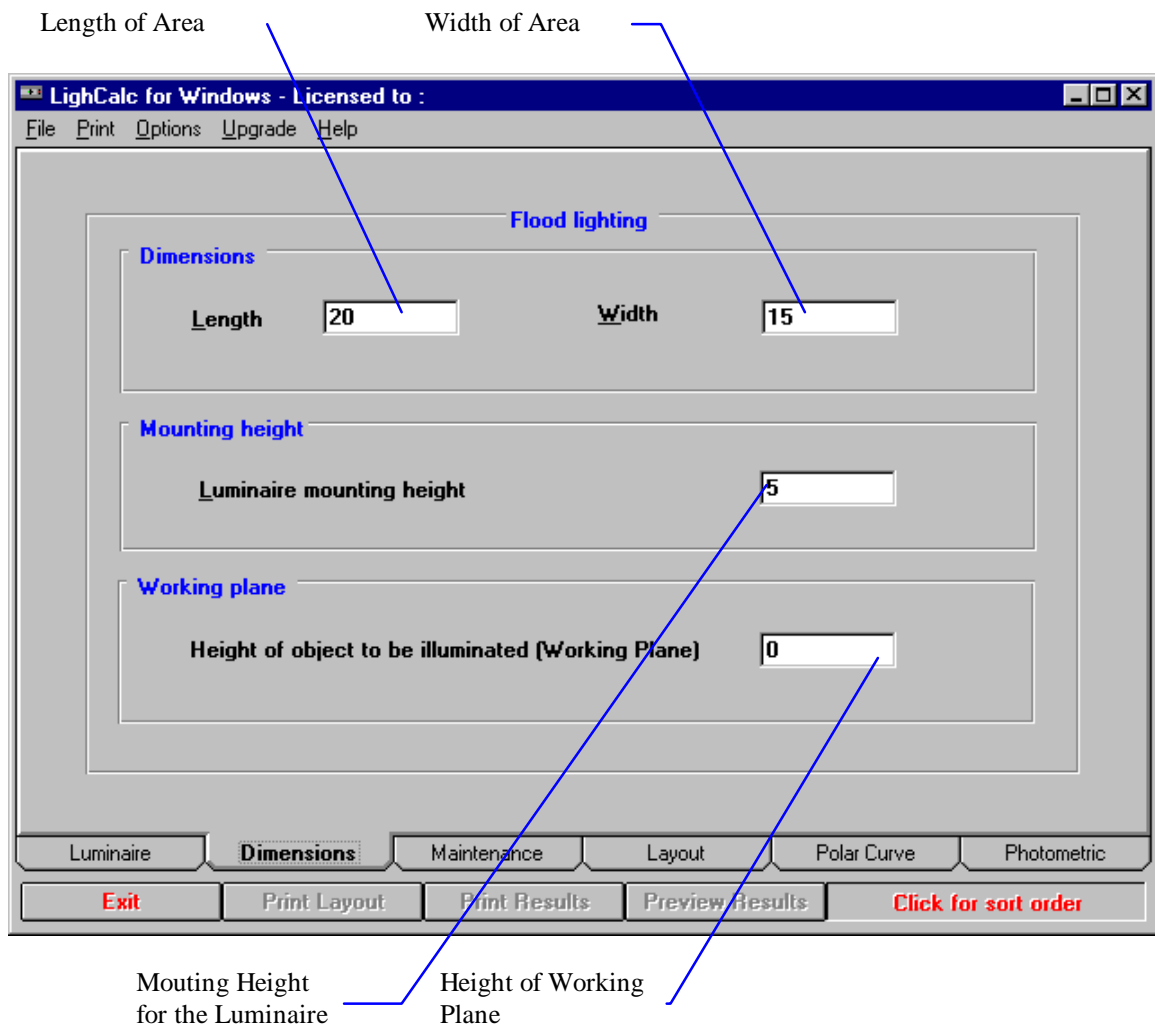
- Ceiling 70 50 30 0
- Wall 50 30 20 0
- Floor 50 30 20 0

The reflectance value is a percentage and is used to determine the utilisation factor (UF) of the luminaire in the final calculation.

If the reflectances are not known then use Ceiling = 70, Walls = 50, Floor = 20. High values represent a light bright reflective surface while low values represent a dull decor.

Dimensions for Exterior Lighting Calculations

If the selected luminaire falls under the category of CIBSE type 2 then the following screen will appear.

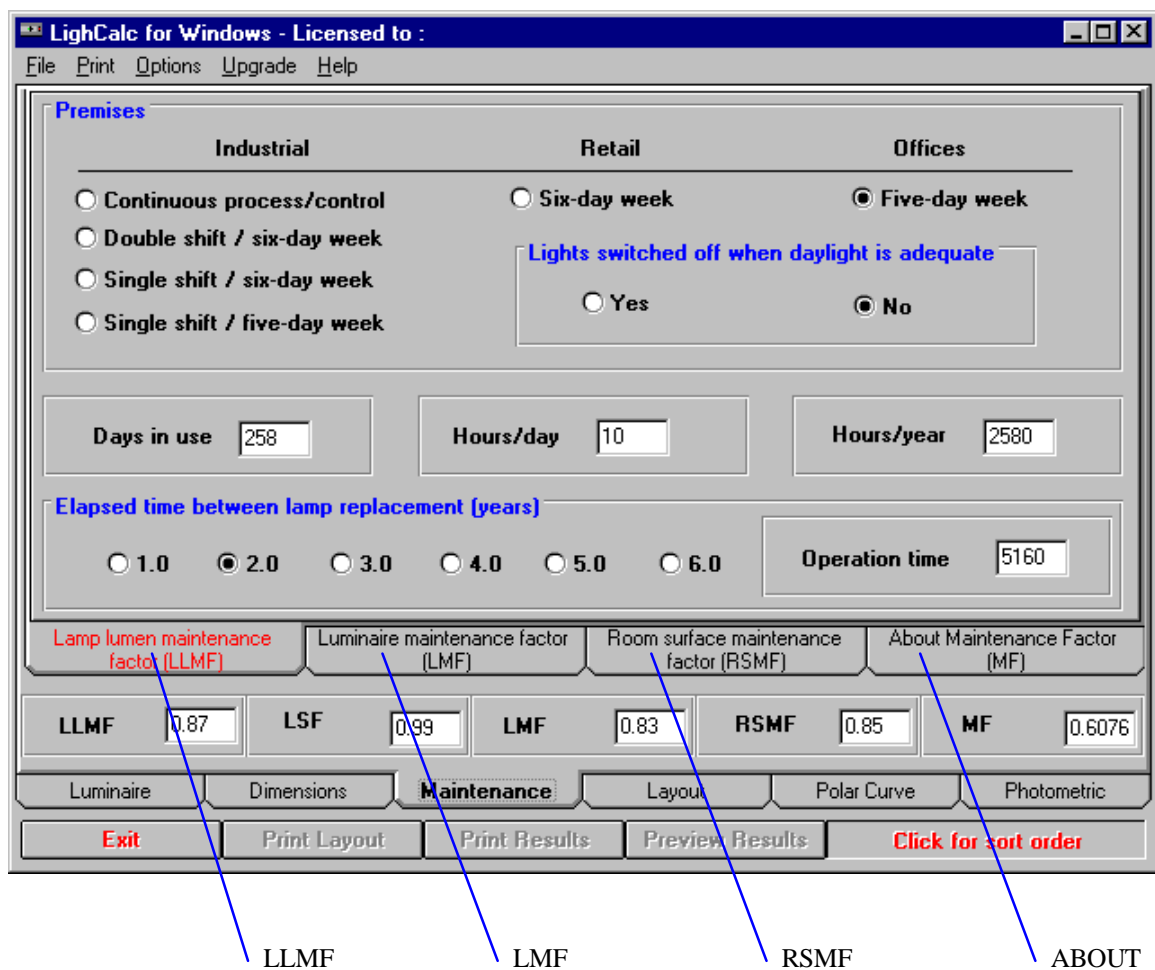


TAB 2 - DIMENSIONS				
Item	Description	Type of input	Unit	Example
Dimensions				
Length	The length of the Area	Numeric	Metre	20
Width	The Width of the Area	Numeric	Metre	15
Mounting Height				
Luminaire Mounting Height	The Mounting Height of the luminaire	Numeric	Metre	5
Working Plane				
Height	Height of object to be illuminated	Numeric	Metre	0.85

Tab 3 - Maintenance

Maintenance Factor

The Maintenance Factor Calculator



The Maintenance Factor is used in the final calculation and takes account of the following:

- Losses due to dirt collecting on the lamps and luminaires.
- Lamp lumen depreciation
- Lamp failure losses
- Room surface depreciation

The formulae used to determine the maintenance factor (MF) is:

$$MF = LLMF \times LSF \times LMF \times RSMF$$

where:

- LLMF = Lamp lumen maintenance factor
- LSF = Lamp survival factor
- LMF = Luminaire maintenance factor
- RSMF = Room surface maintenance factor

The method of calculating maintenance factor is the method described in CIBSE Code for Interior Lighting 1994.

For exterior lighting calculations the Maintenance factor screen is not accessible and a factor of 0.8 is assumed.

LLMF

Lamp Luminous flux (lumen) Maintenance Factor

Premises

Industrial **Retail** **Offices**

Continuous process/control Six-day week Five-day week

Double shift / six-day week

Single shift / six-day week

Single shift / five-day week

Lights switched off when daylight is adequate

Yes No

Days in use: 258 Hours/day: 10 Hours/year: 2580

Elapsed time between lamp replacement (years)

1.0 2.0 3.0 4.0 5.0 6.0 Operation time: 2580

Lamp lumen maintenance factor (LLMF) Luminaire maintenance factor (LSF) Room surface maintenance factor (RSMF) About Maintenance Factor (MF)

LLMF: 0.91 LSF: 1 LMF: 0.86 RSMF: 0.92 MF: 0.7199

Luminaire Dimensions **Maintenance** Layout Polar Curve Photometric

Exit Print Layout Print Results Preview Results Click for sort order

Select the Type of Premises

Time between lamp replacement

Light switched on / off

LLMF INPUTS				
Item	Description	Type of input	Unit	Example
Premises				
Continuous Process / Control	Industrial	Option	-	-
Double Shift / 6 day week	Industrial	Option	-	-
Single Shift / 6 day week	Industrial	Option	-	-
Single Shift / 5 day week	Industrial	Option	-	-
Six day week	Retail			
Five day week	Offices			
Lights Switched Off When Daylight Is Adequate				
Yes	Lights are switched off	Option	-	-
No	Light are not switched off	Option	-	-
Elapsed Time Between Lamp Replacement				
1.0	1 year between lamp replacement	Option	year	-
2.0	2 years between lamp replacement	Option	year	-
3.0	3 years between lamp replacement	Option	year	-
4.0	4 years between lamp replacement	Option	year	-
5.0	5 years between lamp replacement	Option	year	-
6.0	6 years between lamp replacement	Option	year	-

The LLMF is the proportion of the initial light output that is produced after a specified time.

LMF

Luminaire Maintenance Factor

The screenshot shows the 'Maintenance' tab of the LighCalc software. The 'Luminaire type' section has radio buttons for options A through F, with 'B' selected. The 'Environment' section has radio buttons for 'Clean', 'Normal' (selected), and 'Dirty'. The 'Elapsed time between cleaning (years)' section has radio buttons for 0.5, 1.0 (selected), 1.5, 2.0, 2.5, and 3.0. Below these are five input fields: LLMF (0.91), LSF (1), LMF (0.86), RSMF (0.92), and MF (0.7199). The 'Maintenance Factor' label is highlighted in yellow.

Type of Luminaire

Type of Environment

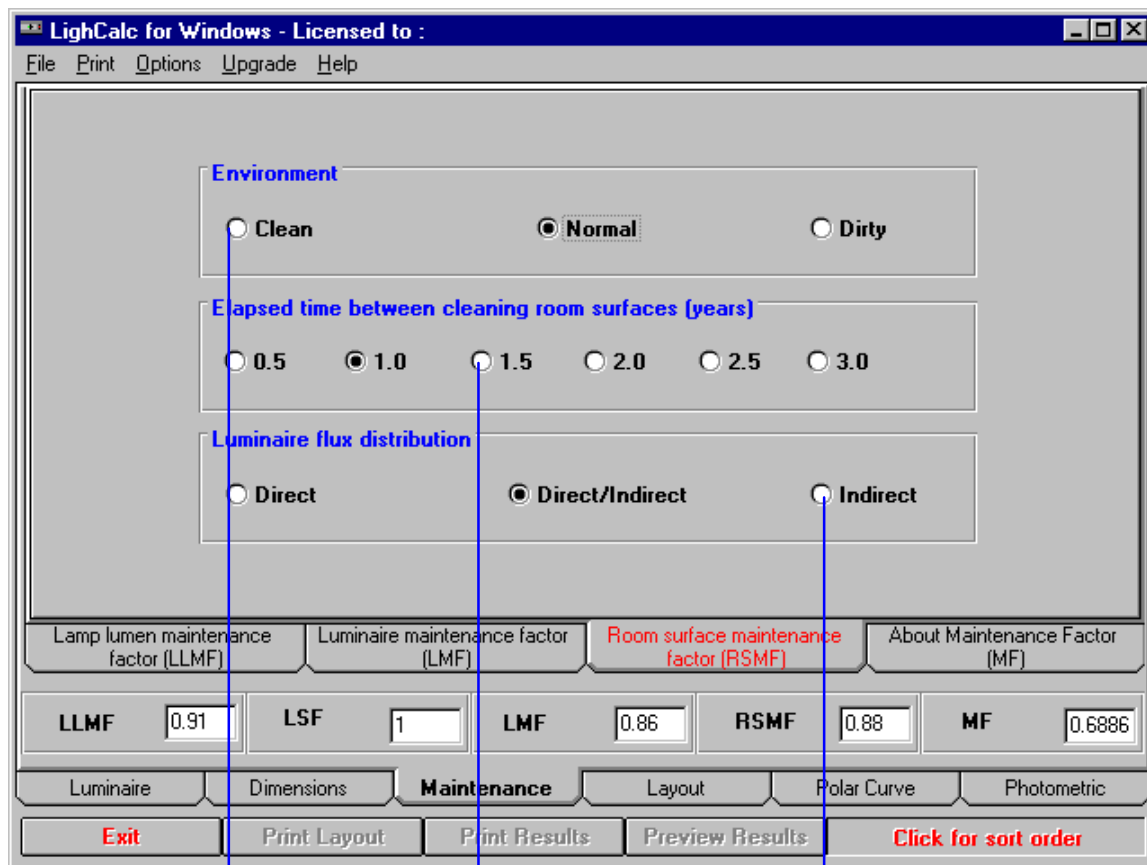
Time between Cleaning
the Luminaires

LMF INPUTS				
Item	Description	Type of input	Unit	Example
Luminaire Type				
A	Bare Batten	Option	-	-
B	Batten with VDT reflector	Option	-	-
C	Batten with industrial reflector	Option	-	-
D	Batten with diffuser: Recessed modular	Option	-	-
E	Proof Batten: Surface modular	Option	-	-
F	Uplighter	Option	-	-
Environment				
Clean	Clean environment	Option	-	-
Normal	Normal environment	Option	-	-
Dirty	Dirty environment	Option	-	-
Elapsed Time Between Cleaning (years)				
0.5	0.5 years between cleaning	Option	year	-
1.0	1.0 years between cleaning	Option	year	-
1.5	1.5 years between cleaning	Option	year	-
2.0	2.0 years between cleaning	Option	year	-
2.5	2.5 years between cleaning	Option	year	-
3.0	3.0 years between cleaning	Option	year	-

The LMF is the value for the light output from the luminaire caused by dirt deposition, and will vary according to the construction of the luminaire, the environment and the time between cleaning the luminaires.

RSMF

Room Surface Maintenance Factor



Type of Environment
 Time span for Cleaning the Room Surfaces
 Flux Distribution of the Luminaire

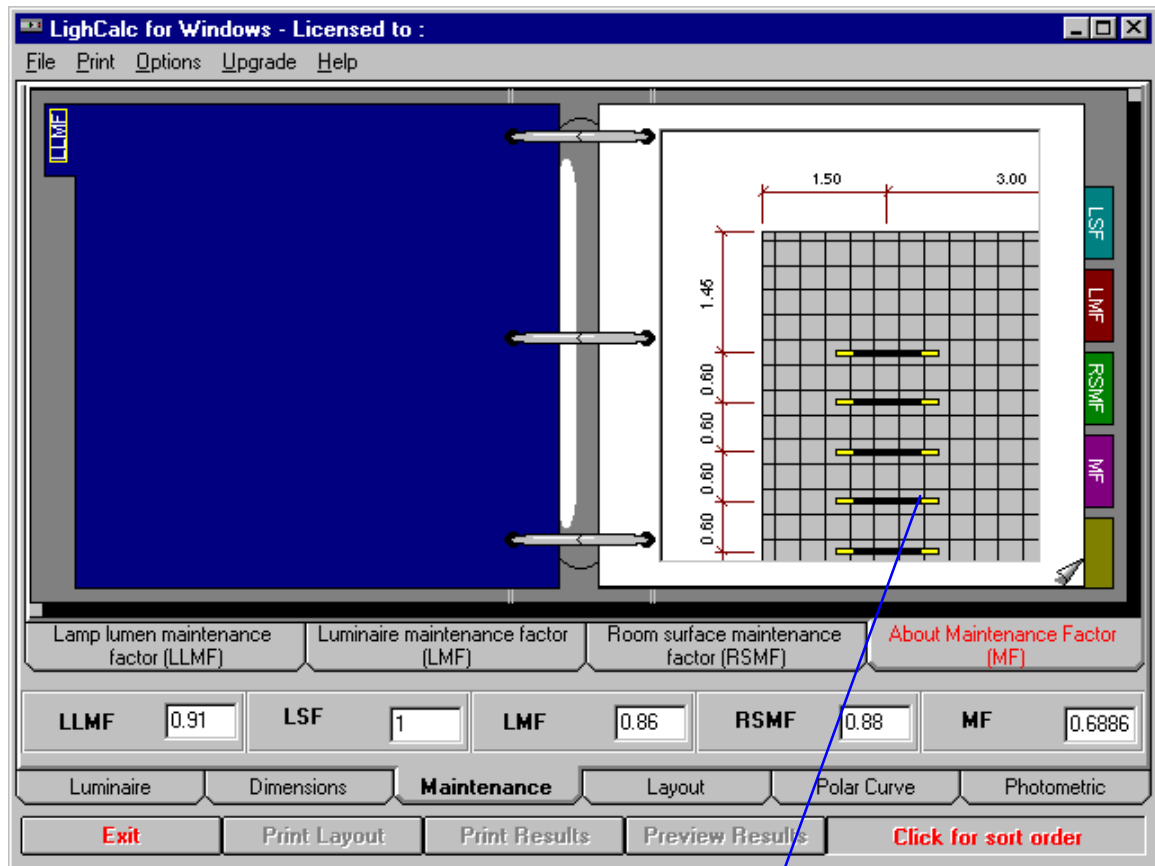
RSMF INPUTS				
Item	Description	Type of input	Unit	Example
Environment				
Clean	Clean environment	Option	-	-
Normal	Normal environment	Option	-	-
Dirty	Dirty environment	Option	-	-
Elapsed Time Between Cleaning Room Surface (years)				
0.5	0.5 years between cleaning	Option	year	-
1.0	1.0 years between cleaning	Option	year	-
1.5	1.5 years between cleaning	Option	year	-
2.0	2.0 years between cleaning	Option	year	-
2.5	2.5 years between cleaning	Option	year	-

3.0	3.0 years between cleaning	Option	year	-
Luminaire flux distribution				
Direct	Downward distribution	Option	-	-
Direct / Indirect	Direct / indirect distribution	Option	-	-
Indirect	Indirect distribution	Option	-	-

The RSMF is the value for the light reflection from the room surfaces caused by dirt deposition, and will vary according to the environment and the time between cleaning the room surfaces.

MF

Notes on Maintenance Factor



Luminaire Maintenance Category Information

Tab 4 - Layout

Interior Lighting Layouts

Typical screen

The screenshot shows the 'LighCalc for Windows' software interface. The main window displays a grid layout of 4 rows and 4 columns of luminaires (represented by yellow rectangles with an 'X'). The grid dimensions are 12 x 10. The interface includes several control panels and a bottom navigation bar.

Control Panels:

- Rows/Columns:** Rows: 4, Cols: 4, total: 16. Includes 'Rotate 90°' button.
- Area:** 12 x 10
- Lux level:** 648.481
- Lux (required):** 500
- SHR (max):** 1.779171
- Ceiling:**
 - Plain ceiling
 - Tiled ceiling
 - Length: 300, Width: 300, Tile Size: 300
 - Centre tile - Centre room
 - Corner tile - Centre room
 - Horizontal alignment
 - Centre, Edge

Glare Index Calculations:

- Glare Index veiwed endwise = 23.8
- Glare Index veiwed crosswise = 22.9

Bottom Navigation Bar: Exit, Print Layout, Print Results, Review Results, Click for sort order.

Annotations:

- Blue arrows point from text labels to specific UI elements:
 - 'Add or Subtract the number of Rows' points to the Row control panel.
 - 'Add or Subtract the number of Columns' points to the Column control panel.
 - 'Rotate Luminaires by 90°' points to the 'Rotate 90°' button.
 - 'Refresh the Screen Layout' points to the 'Refresh' button.
 - 'Ceiling Tile Start Location Options' points to the ceiling options section.
 - 'Luminaire to Tile Alignment' points to the 'Horizontal alignment' options.
 - 'Plain or Tiled Ceiling Options' points to the 'Ceiling' radio button options.

INTERIOR LIGHTING LAYOUTS - CONTROLS				
Item	Description	Type of input	Unit	Example
Rows and Columns				
Rows	Add or subtract rows of luminaires	Spin up / down	row	-
Columns	Add or subtract columns of luminaires	Spin up / down	column	-
Rotate 90°	Turn luminaire orientation through 90°	Button	degree	-
Ceiling				
Refresh	Redraw the display to add changes	Button	-	-
Plain ceiling	Displays a plain ceiling layout	Option	-	-
Tiled ceiling	Displays a tiled ceiling layout	Option	-	-
Length	Length of the ceiling tile	Numeric	millimetre	600
Width	Width of the ceiling tile	Numeric	millimetre	300
Tile Start Position				
Centre Tile	Centre of tile starts in the centre of room	Option	-	-
Corner Tile	Corner of tile starts in the centre of room	Option	-	-
Horizontal Luminaire Alignment To Ceiling Tiles				
Horizontal alignment	Luminaire horizontal alignment with tiles	Yes / No	-	-
Centre	Aligns the luminaire to the centre of tile	Option	-	-
Edge	Aligns the luminaire to the edge of tile	Option	-	-
Vertical Luminaire Alignment To Ceiling Tiles				
Vertical alignment	Luminaire vertical alignment with tiles	Yes / No	-	-
Centre	Aligns the luminaire to the centre of tile	Option	-	-
Edge	Aligns the luminaire to the edge of tile	Option	-	-

Interior Lighting Layouts - General

Interior lighting calculations are produced using the lumen method of calculation where the number of luminaires are calculated according to a predetermined Lux level. Unlike the point source calculation method where the level of illuminance is calculated from a given number of luminaires.

Once the basic layout is displayed it can be customised to suit individual requirements by adding or subtracting rows and columns of luminaires or adding a grid ceiling etc.

Rows and Columns

Rows and columns of luminaires may increased or decreased by clicking on the spin buttons as required.

The total number of luminaires is displayed in the adjacent text box.

Plain Ceilings

Plain ceiling layouts will display the luminaires on a 1-2-2-1 spacing evenly over the task area.

Tiled Ceilings

Tiled ceilings may be added by selecting the Tiled Ceiling option button and then inputting the tile width and the tile length in the appropriate input boxes.

Note that the tile dimensions are required in millimeters.

Tiles may be set on the reflected ceiling plan with either of the following start positions:

- Centre of the tile in the centre of the room
- Corner of the tile at the centre of the room

Click the Refresh button to apply the changes.

Alignment

Luminaires may either retain the default 1-2-2-1 spacing or may be aligned to the tile layout. Alignment options include the following:

1. Horizontal alignment

- Centre - Aligns the luminaires central to the tiles
- Edge - Aligns the luminaires to the edge of the tiles

2. Vertical alignment

- Centre - Aligns the luminaires central to the tiles
- Edge - Aligns the luminaires to the edge of the tiles

Click the Refresh button to apply the changes.

Intensity

The intensity button will allow point source calculations to be made across the working plane, the intensity of the calculations is variable between 1 and 50 with 1 producing a calculation for every 1 screen pixel within the task area, and 50 producing 1 calculation for every 50 x 50 pixels within the task area. The results will vary according to the resolution at which your screen is set, but a resolution of 10 should provide good results over a reasonable time.

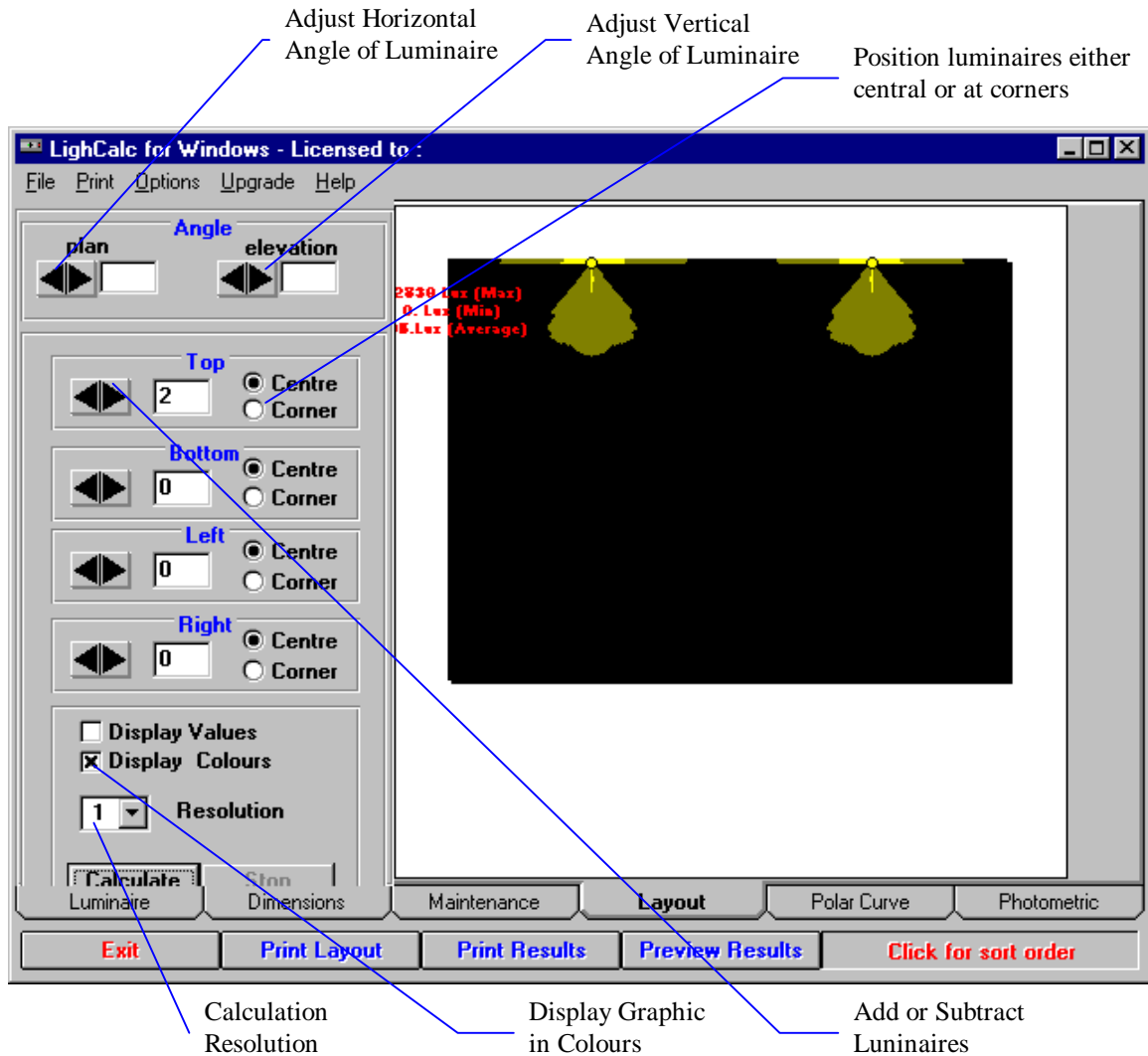
Setting the intensity resolution to a low number will provide very smooth graphics but will take a long time, alternatively setting the intensity resolution to a high number will give very 'blocky' layouts but the calculations will be very quick. An optimum intensity resolution for your computer / printer / setup must be found by trial and error.

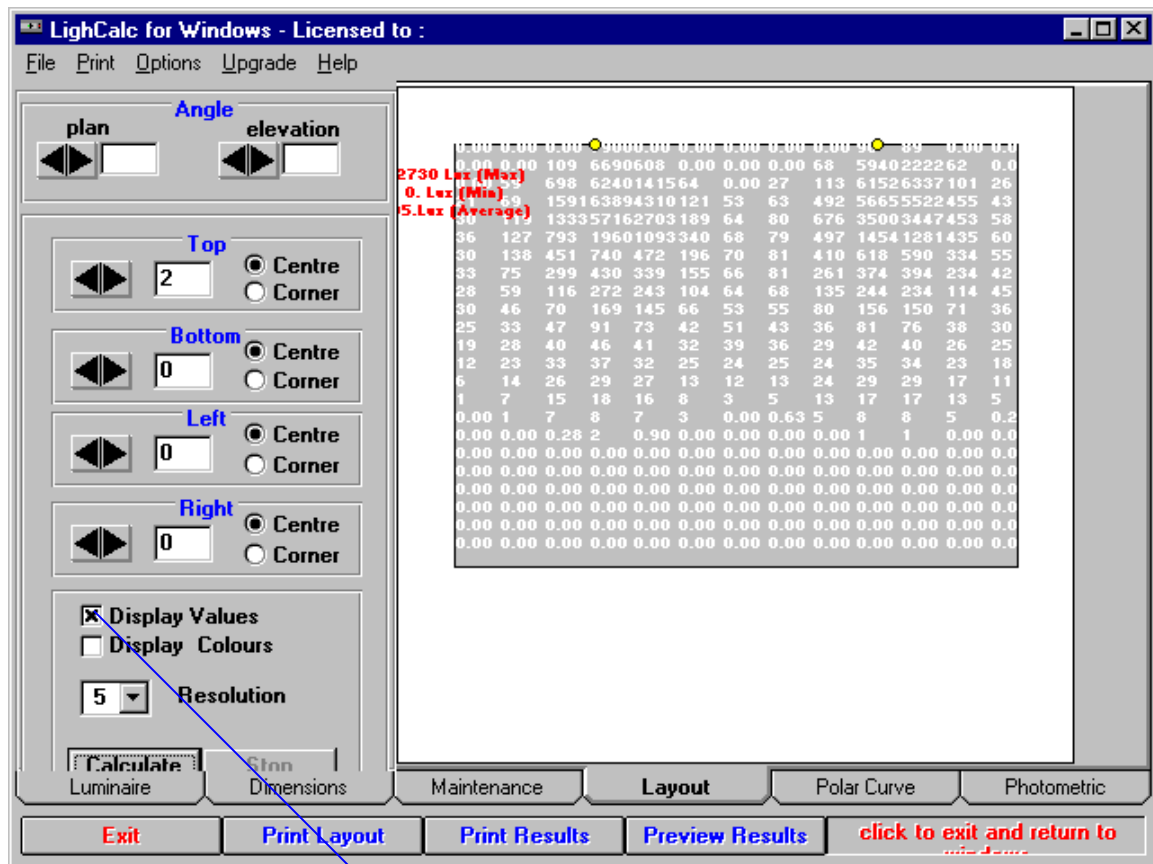
The intensity calculations are stored in memory until either the layout or the screen is changed allowing you to select the Intensity facility again without it re-calculating.

The Intensity data may be displayed either as an isolux diagram (contour lines), an intensity diagram, (colours) or just as lux levels on a 10 x 10 grid over the working plane. Any combination of these may be displayed at the same time.

Exterior Lighting Layouts

Typical screen





Display Lux Level as numbers instead of colours

Exterior Lighting - General

Exterior lighting calculations are produced using the point source calculation method. Unlike the lumen method of calculation (where the number of luminaires are calculated from a predetermined Lux level), the level of illuminance is calculated from a given number of luminaires.

The number of point source calculations performed over the task area can run into millions, and this can tie up a computer for some considerable time. It is for this reason that the display calculation resolution is variable between 1 and 50, with 1 being one calculation for each pixel (dot on the screen) and 50 being one calculation for every five pixels. Setting the resolution to 50 will be fast with the display being fairly jagged, while setting the resolution to 1 will be much slower but the display will be much finer.

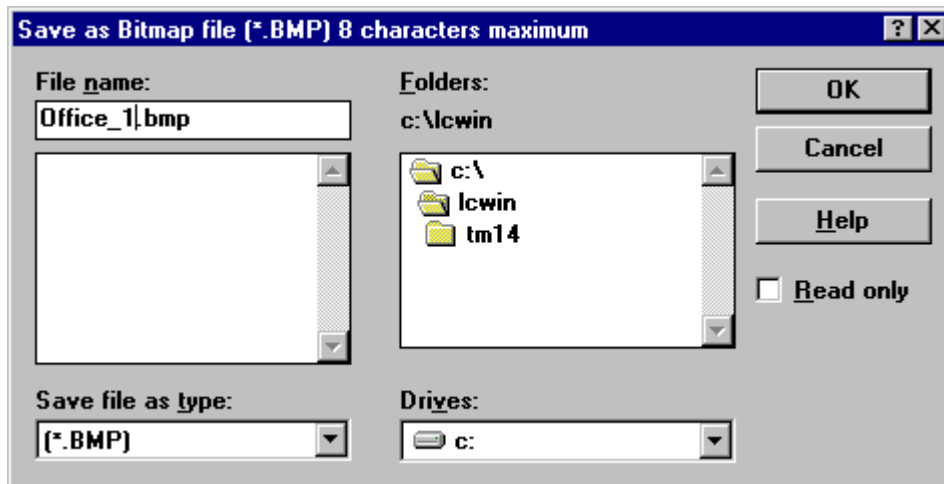
EXTERIOR LIGHTING LAYOUTS - CONTROLS				
Item	Description	Type of input	Unit	Example
Luminaire Angle				
Plan	Adjust the aiming angle in plan view	Spin up / down	degree	5
Elevation	Adjust the aiming angle in elevation view	Spin up / down	degree	3
Luminaire Location - Top				
Top	Add or remove a luminaire to top of area	Spin up / down	luminaire	-
Centre	Spaces the luminaires 1-2-1 from end	Option	-	-
Corner	Spaces the luminaires evenly	Option	-	-
Luminaire Location - Bottom				
Bottom	Add or remove a luminaire bottom of area	Yes / No	-	-
Centre	Spaces the luminaires 1-2-1 from end	Option	-	-
Edge	Spaces the luminaires evenly	Option	-	-
Luminaire Location - Left				
Bottom	Add or remove a luminaire bottom of area	Yes / No	-	-
Centre	Spaces the luminaires 1-2-1 from end	Option	-	-
Edge	Spaces the luminaires evenly	Option	-	-
Luminaire Location - Right				
Right	Add or remove a luminaire right of area	Yes / No	-	-
Centre	Spaces the luminaires 1-2-1 from end	Option	-	-
Edge	Spaces the luminaires evenly	Option	-	-
Display				
Display Values	Displays lux values on the layout	Yes / No	-	-
Display Colours	Displays the intensity levels as colours	Yes / No	-	-
Resolution	Sets the calculation resolution from 1 to 5	Drop down	pixel	3
Calculate	Starts the calculation	Button	-	-

Save Graphic

To select the area to be saved use the mouse to 'cut' a rectangle by clicking with the left mouse button and while holding down the left mouse button drag downwards to create a rectangle and then release the left button.

To save the lighting layout as a bitmap (BMP) graphics file:

- Invoke 'Save as BMP' from the 'Print' drop down menu.



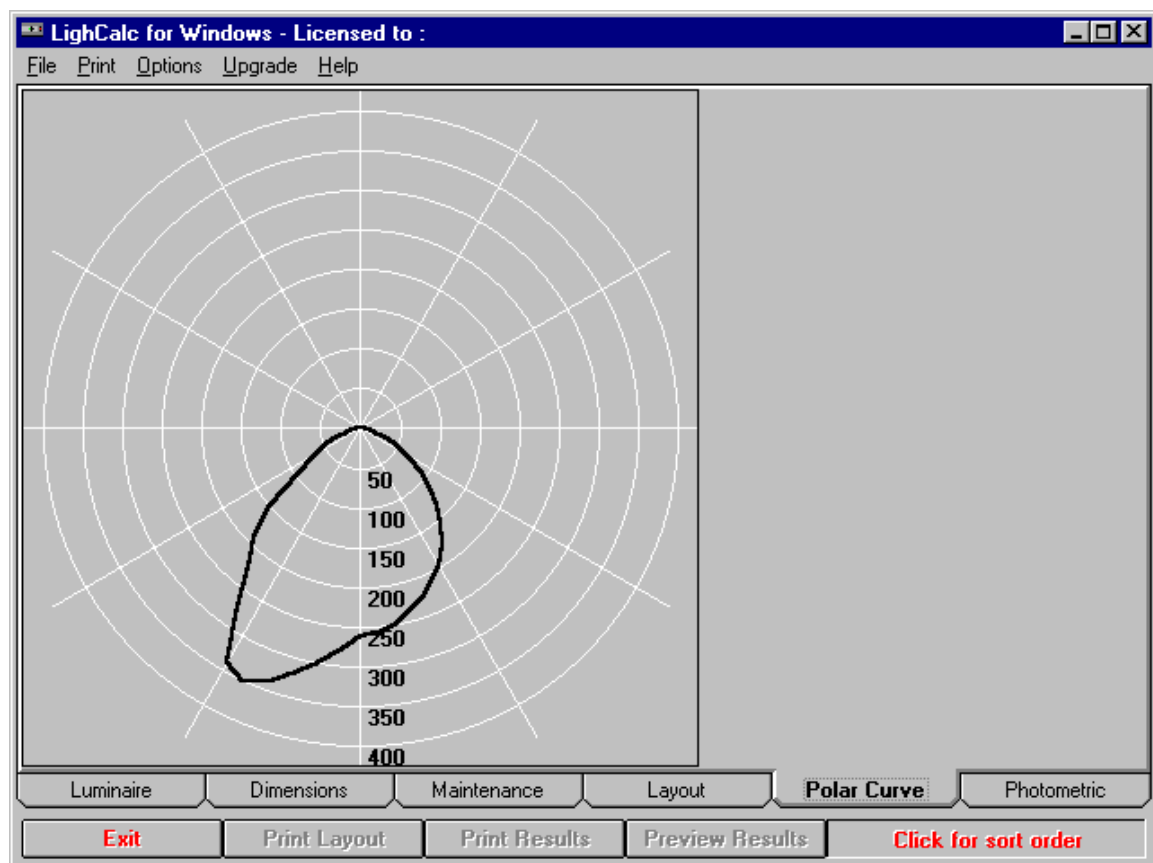
- Select the Drive and Directory where the file is to be saved.
- Input the name of the file using no more than 8 characters e.g. Office_1 (Lightcalc for Windows will automatically add the '.bmp' file extension).
- Click OK to complete the operation.

To save a section of the image use the 'cut' method described in the print graphics section.

Tab 5 - Polar Graph

Polar Diagram

A polar diagram may be displayed by selecting the Polar Curve Tab.



The polar curve shape is a schematic illustration of the luminous intensity distribution of the luminaire. This characterises the way in which the luminaire controls the light from the lamp.

For linear luminaires two curves are displayed, one representing the transverse (T), on the left side of the graph, and one representing the Axial (A) on the right.

For symmetrical luminaires the transverse and the axial curves will appear the same.

There are no user inputs in this section as it is for information only.

Tab 6 - Photometric Data

Utilisation Factor Table

The Utilisation Factor is calculated from the manufacturers TM14 data file and is displayed as shown below.

FRBV 436 + FRX 4612 600mm wide module with low brightness reflector											
Utilisation factor table - Standard presentation											SHR NOM = 1.75
Room Reflection			Room Index								
C	W	F	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00
0.70	0.50	0.20	n/a	0.50	0.52	0.54	0.56	0.58	0.59	0.60	0.61
	0.30		n/a	0.47	0.50	0.52	0.54	0.56	0.57	0.59	0.60
	0.10		n/a	0.45	0.48	0.50	0.52	0.54	0.56	0.58	0.59
0.50	0.50	0.20	n/a	0.49	0.51	0.52	0.55	0.56	0.57	0.58	0.59
	0.30		n/a	0.47	0.49	0.51	0.53	0.54	0.55	0.57	0.58
	0.10		n/a	0.45	0.47	0.49	0.51	0.53	0.54	0.56	0.57
0.30	0.50	0.20	n/a	0.48	0.50	0.51	0.53	0.54	0.55	0.56	0.57
	0.30		n/a	0.46	0.48	0.50	0.52	0.53	0.54	0.55	0.56
	0.10		n/a	0.44	0.47	0.48	0.51	0.52	0.53	0.54	0.55
0.00	0.00	0.00	n/a	0.43	0.45	0.47	0.49	0.50	0.51	0.52	0.53
DLOR = 0.56			ULOR = 0.00			SHR NOM = 1.75		SHR MAX = 1.78		SHR MAX TR = 1.92	
CIBSE/1				Test report 50/6361				Thorn Lighting Photometry			
Cat No FRBV 436 + FRX 4612				Lamp(s) = 4 x 36W T8							
Description 600mm wide module with low brightness reflector											
1200mm Linear Fluorescent											
QUATTRO											
Design attitude = 0°											
Length (m) = 1.242				Width (m) = 0.597				Height (m) = 0.104			
Ballast Lumen Factor (BLF) = 0.98				Input power (W) = 190				Input VA = 210			
Luminous area of:-				base (m²) = 0.566				side (m²) = 0 end (m²) = 0			
Glare shape = Rectangular box											

Navigation buttons: Luminaire, Dimensions, Maintenance, Layout, Polar Curve, **Photometric**

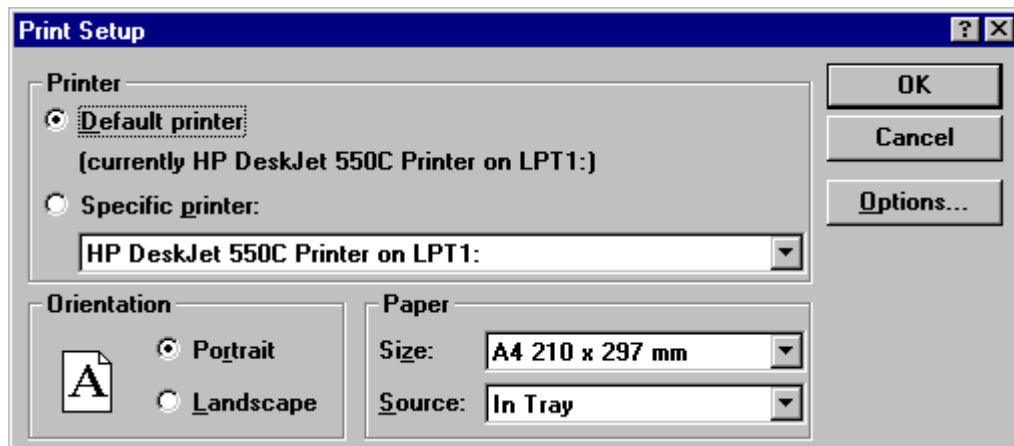
Action buttons: Exit, Print Layout, Print Results, Preview Results, Click for sort order

- There are no user inputs in this section as it is for information only.
- The utilisation factor is calculated in accordance with the methods described in CIBSE TM5: 1980.

Printing

Printer setup

The printer may be setup either from the Windows operating system environment or from the Printer Setup option in the Print drop down menu.



For best results set the paper size to A4 (210 x 297 mm).

Print preview

The print preview may be accessed either from the Preview Results Command Button at the bottom of the screen, or from the File / Print Preview menu option.

The screenshot shows a 'Print preview' dialog box with several sections and controls. Annotations with blue lines point to specific elements:

- Input Job Reference etc.:** Points to the 'Job reference.' field containing 'ACME Head Office'.
- Select which items appear in the header:** Points to the check boxes on the right of the header fields.
- Select Calculation Data to be Printed:** Points to the check boxes for 'Display Luminaire Details', 'Display Calculation Details', and 'Display Room / Area Details'.
- Set the top margin:** Points to the 'Top margin (mm.)' dropdown menu showing '0'.
- Select the Printer Font:** Points to the 'Printer Font' dropdown menu showing 'Arial'.
- Add the Date to the Print:** Points to the 'Print Date' check box.
- Add the Time to the Print:** Points to the 'Print Time' check box.

The dialog box contains the following fields and options:

- Job reference.:** ACME Head Office
- Calculation Ref.:** ABC/123
- Description:** Office 1 lighting scheme
- Engineer.:** Fred Bloggs
- Header Caption:** Lighting Design for ACME Ltd
- Display Luminaire Details
- Display Maintenance Details
- Display Calculation Details
- Display Cost Analysis
- Display Room / Area Details
- Top margin (mm.):** 0
- Print Date:**
- Print Time:**
- Printer Font:** Arial
- Buttons:** Cancel, Set Default, O.K.

Printing Options

Numerous options are available for the calculation print out and may be selected from the print set up window.

Text inputs (Headers and Footers)

These may be individually switched on or off by clicking in the associated check box to the right of each item.

Text inputs (Headers and Footers)
Job reference
Calculation Ref.
Description
Engineer
Header Caption

Calculation Details Printed

These may be individually switched on or off by clicking in associated the check box to the left of each item.

Calculation Details Printed
Display Luminaire details
Display Calculation details
Display Room / Area details
Display Maintenance details
Display Cost Analysis

Additional options include:

Other Print Options
Add the Date
Add the Time
Set the top margin
Printer Font

(Warning: Some fonts may produce a print out which will not fit on the paper)

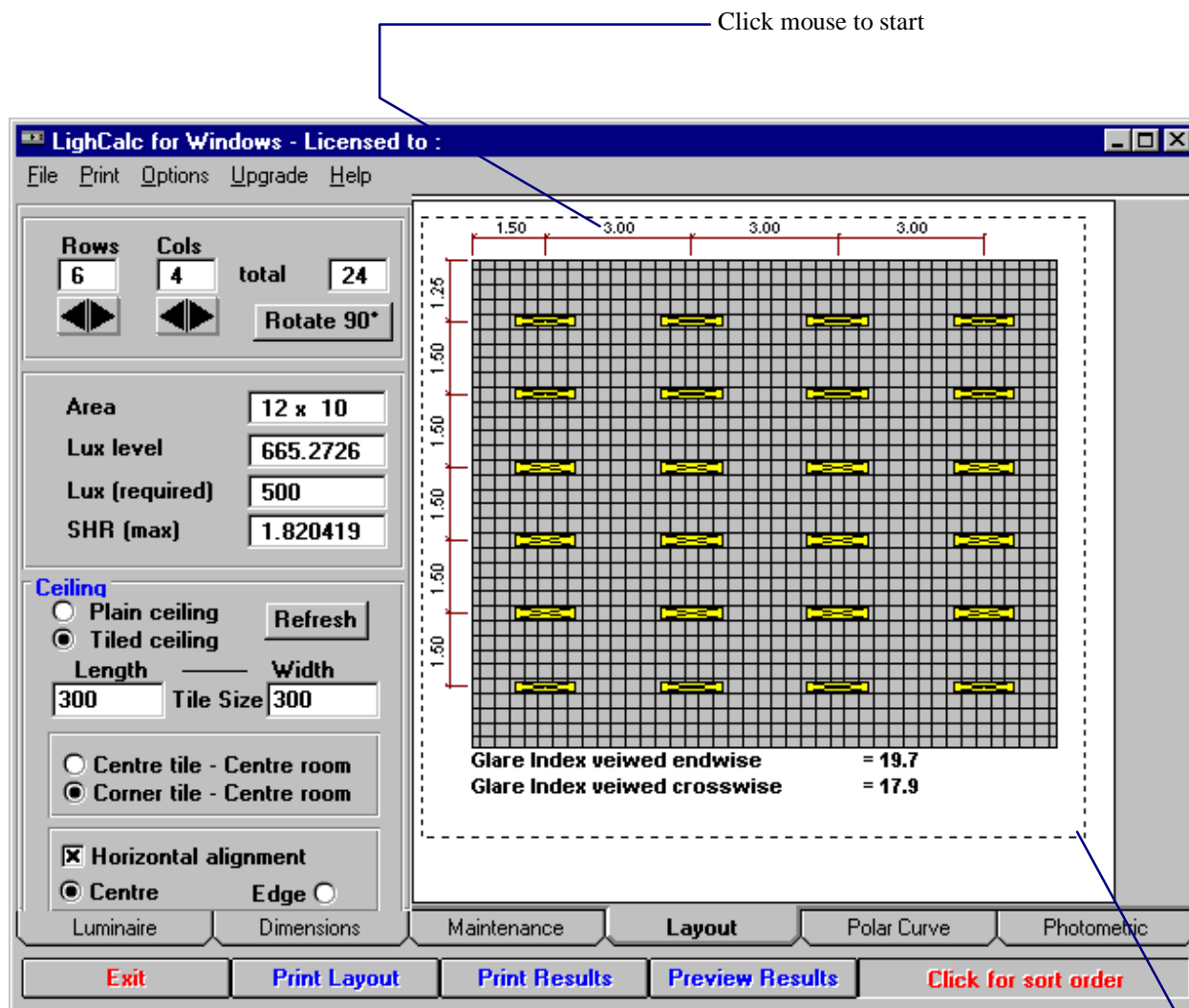
The print preview may be accessed either from the Preview Results Command Button at the bottom of the screen, or from the File / Print Preview menu option.

Print graphics

The lighting layout may be printed either by cutting the required area of the layout and then pasting it on to the paper, or by clicking the print layout button to print the full image.

Cut

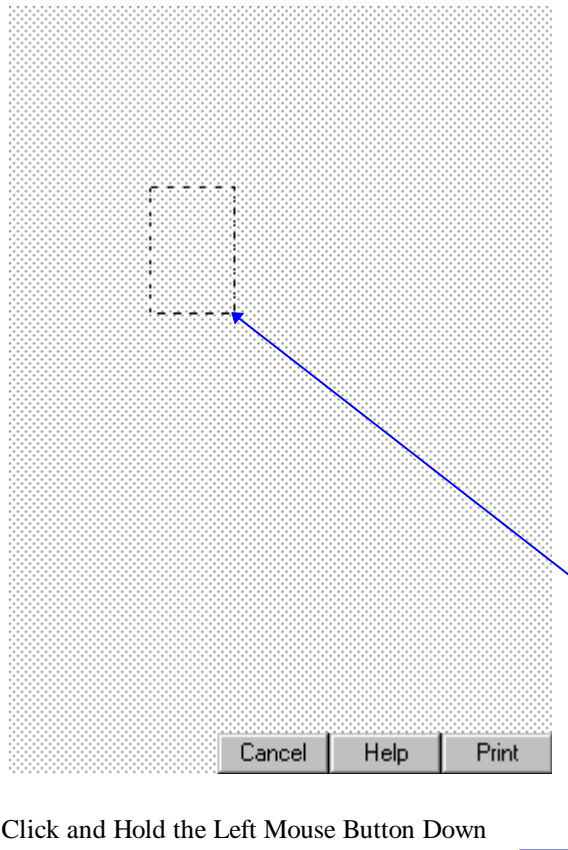
To select the area to be printed use the mouse to 'cut' a rectangle by clicking with the left mouse button and while holding down the left mouse button drag downwards to create a rectangle and then release the left button.



Click and hold down the left mouse button to draw the area to print.

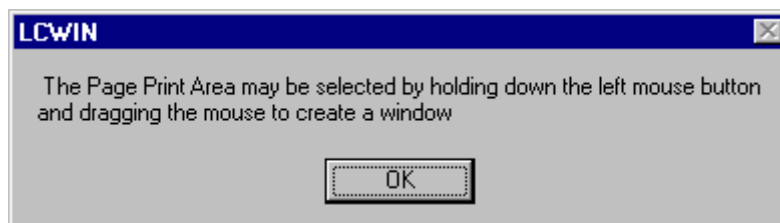
Releasing the left mouse button will display a flashing rectangle, this is the boundary of the area to be printed. If you want to cancel this last operation then click on the display with the right mouse button.

Paste



Click and Hold the Left Mouse Button Down to Create a Rectangle to Draw the Image

The Help Text



Print

- When the left mouse button is released the selected piece of the layout will appear.
- Click Print to continue

To Cancel

- Click on the display with the right mouse button , or click the Cancel button.

Reference

Setting the User Defaults

Setting the user defaults from the Options drop down menu.

Display Hints

The Display Hints or Tooltips are the text hints that appear when the mouse cursor passes over a control. While being especially helpful in the initial stages of using the programme, for the more experienced user they can become annoying and may be switched off if desired. To switch the hints on or off from the Options menu select User defaults then Display Hints and click Yes or No as required.

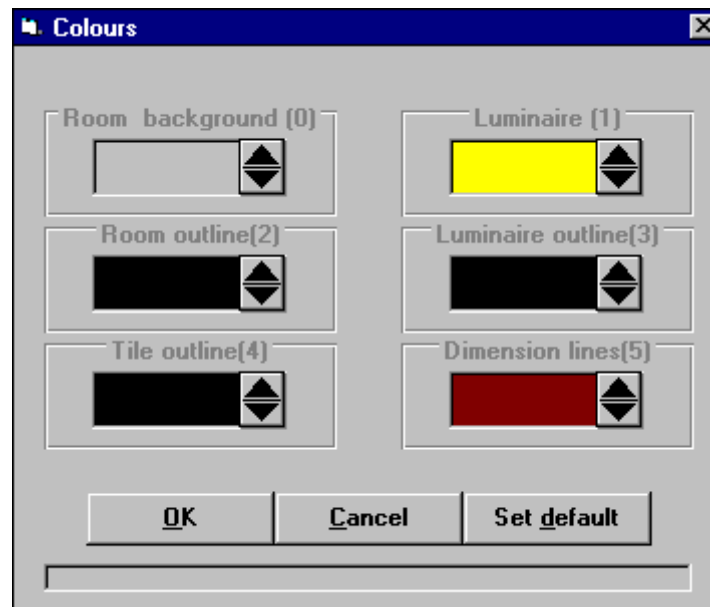
Running Costs

Running costs for the lighting layout are automatically calculated based on the unit cost for 1kW of electricity. To set the cost per unit from the Options menu select Running costs and then select Unit cost.

To set the currency unit for the running cost calculation select currency.

Colours

To set the colours for the Interior Lighting Layout Select Colours from the Options drop down menu.



16 colours are available for each of the following items.

Room Background

Room Outline

Luminaire

Luminaire Outline

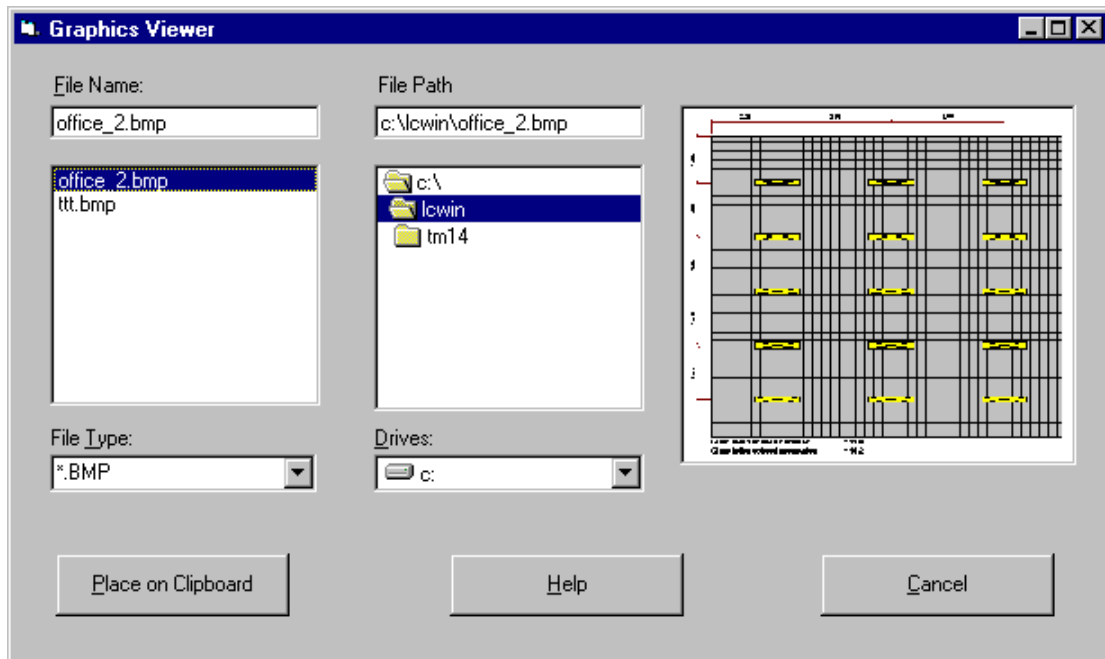
Tile Outline

Dimension Lines

To revert to the default settings click the 'Default' button.

Viewing Data Saved As Graphics

To view data saved as graphics files invoke the Graphics Viewer from the Print drop down menu



Select the Graphics file name from the file list and it will be automatically displayed in the view window

Trouble Shooting

Operation problems

Operating problems and remedies

Error codes

5	Illegal function call	55	File already open
6	Overflow	57	Device I/O error
7	Out of memory	58	File already exists
9	Subscript out of range	61	Disk full
11	Division by zero	67	Too many files
13	Type mismatch	68	Device unavailable
28	Out of stack space	70	Permission denied
48	Error in loading DLL	71	Disk not ready
51	Internal error	74	Can't rename with different drive
52	Bad file name or number	75	Path / File access error
53	File not found	76	Path not found
54	Bad file mode		

Most of the above errors are self evident but care must be taken to input the correct data, omitting data may cause the programme to error.

Error numbers 5 to 51 are mathematical / data errors

Error numbers 52 to 76 are disk / file / path errors

Printer Errors should be trapped by the operating system

Glossary of Terms

CIBSE

The Chartered Institution of Building Services Engineers

glare

Discomfort experienced when parts of the visual field are excessively bright in relation to the general surroundings.

Lamp flux

The light emitted by a lamp measured in lumens.

LLMF

Lamp Luminous Flux Maintenance Factor - The proportion of the initial light output of a lamp after a period of time.

LMF

Luminaire Maintenance Factor - The proportion of the initial light output from a luminaire after a period of time.

LSF

Lamp life survival factor - The percentage of functioning lamps in an installation after a stated period of operation.

LUMINAIRE

Lighting fitting

Maintenance Factor

The ratio of illuminance provided by an installation at a stated time and is the result of the LLMF, LSF, LMF and the RSMF.

Photometric data

Data relating to the characteristics of a luminaire required to perform lighting calculations.

Polar Curve

A polar graph displaying the luminous intensity distribution of a luminaire.

RSMF

Room Surface Maintenance Factor - The proportion of the illuminance provided by a lighting installation in a room after a period of time.

TM10

Technical Memorandum Number 10 - CIBSE The calculation of glare indices. 1985

TM14

Technical Memorandum Number 14 - CIBSE standard file format for the electronic transfer of luminaire photometric data.

TM5

CIBSE Technical Memorandum Number 5 - The calculation and use of utilisation factors.

Utilisation factor

(UF) The proportion of luminous flux from the luminaire which reaches the working plane.

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