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Chapter 1

INTRODUCTION

This manual describes how to use the Exterior Lighting Software supplied on the accompanying disks. This program or actually group of programs is written for the IBM range of Personal Computers and close compatibles (including the new PS/2 systems).

The main function of this program is to calculate illuminance (horizontal, vertical or back to camera) and luminance levels on surfaces, relative to the ground plane, for a layout of poles with luminaires fitted. The term 'pole' is used throughout the program to denote the mounting location of luminaires. While this is directly applicable to exterior applications it can also be interpreted as a position on the ceiling (or below the ceiling etc.) for under canopy or interior lighting applications.

The calculations are performed using the point by point method with linear or quadratic interpolation of the photomtric data at the selected grid points from the I-Table for the luminaire/s in use.

Resulting levels displayed initially on the VDU screen in tabular/matrix form can be re-produced as hard copy on the printer attached to the computer. The results can be further viewed on the VDU screen as contours or as a 3-D wire frame diagram, a hard copy can also be obtained on a printer or if available more accurately on a plotter . The most recent version of the program also allows output in 'DXF' file format for input to 'AutoCad'.

From these results the Lighting Engineer/Technician can determine if the layout of poles and luminaires has given adequate or required lighting levels over the area of concern. If not, the layout can be easily altered and calculations re-done and further output produced.

To enable these calculations to be performed photometric I-table data for the luminaires to be used must be available. This photometric data, supplied by luminaire manufacturers, is input into a library file and is accessed via a unique reference number called the Luminaire Code Number.

The layout of poles and lights prior to a calculation is stored on a disk file which is used for future calculations or

layout alterations. Once an appropriate design has been arrived at the results can be archived on disk. These archived jobs can be retrieved at a later date for further action, if so desired.

The program has been designed to be as user friendly as possible and this is achieved by using menus to select tasks to be performed or choose alternatives required by the program. Also the program remembers the most recent data input for each question, and therefore a minimum of keystrokes are required for repetitive or for modification tasks. The input of the majority of data is done on fixed screens rather than the screen scrolling up as you would be generally use to. This allows the simple modification to input data before it is transmitted back to the computer if noticed to be incorrect.

Chapter 2

GENERAL INFORMATION ABOUT THE PROGRAM

2.1 Computer System Requirements

The program requires one of the range IBM Personal Computers (including new PS/2 systems) or close compatibles running the MS-DOS 2.11 (or higher) operating system. Either two floppy disks or one floppy and one hard disk is required with at least 512Kb of RAM, one of the various graphics display adapter boards, appropriate monitor, printer and optionally a maths co-processor chip and XY plotter.

A special version (3.xx) of the program is available upon request, at no extra charge, for machines not fitted or intended to be fitted with a maths co-processor. Whilst the standard version (4.xx) runs quite satisfactorily on machines not equipped with a co-processor the special non co-processor version speeds up calculation time over the inbuilt emulator of the co-processor version, see the following table. The calculation time referred to is the actual number crunching in working out the illuminance/luminance levels, other processing in the program eg. user input, file input/output etc. is not greatly affected either way.

NOTE: Version 3.xx does not support Hercules, VGA or MCGA graphics adapter boards.

Program Version No.	Relative Calculation Time Factor
3.xx Non co-processor	8
4.xx with Co-processor fitted	1 (quickest)
4.xx without Co-processor fitted (ie. Emulator used)	35

It is also assumed that the user has some basic knowledge of the operations of the computer and the MS-DOS operating environment.

2.2 Conventions Used - Design Layout

The program calculation area is based on the cartesian co-ordinate system with the positive Y direction pointing vertically up the VDU screen and the positive X direction pointing horizontally to the right, refer Appendix A, Fig. A-1. The assumed dimensions are metres which will give the illuminance levels in Lux (ie. Lumens/sq.m.) and luminance levels in Candelas/sq. m., if any other units are used the resulting levels will not be as above.

Within this co-ordinate system the pole/s (mounted with luminaire/s) are positioned relative to the origin (0,0), negative co-ordinates are allowed. The luminaire/s on each pole are aimed by either giving a horizontal and vertical angle to the aim point or the X and Y co-ordinate of the aim point on the ground plane. The horizontal angles are measured about the pole position in a clockwise direction with 0 degrees being in line with the positive direction of the Y axis, refer Appendix A, Fig. A-2.

The vertical angle to the aim point is measured upwards from the base of the pole about the luminaire mounting position, refer Appendix A, Fig. A-3. This angle must be less than 90 degrees and 0 degrees implies that the luminaire is aimed directly downwards.

The rectangular area (calculation field) over which the levels are to be calculated is defined by either a co-ordinate for its lower left hand corner (field reference point) relative to the origin and a number of equal sized intervals in the X and

a number of equal sized intervals in the Y direction or simply as a range of distances in the X and Y direction. The size of the intervals either being user defined or calculated by the program upon entry of a desired output scale.

Up to another three rectangular areas (windows) in this calculation field can also be defined, within these windows the minimum, maximum and average illuminance/luminance levels as well as uniformity ratios will be determined. Further, a masked area of irregular shape can be defined over which these values are also determined.

2.3 Conventions Used - Photometric Data

Originally due to a lack of standard presentation for photmetric I-table data within the Australian Lighting industry it was necessary for this program to set some concise formats. To this end it was decided to have six format types as described below and shown in Appendix B, Fig. B-0 to Fig. B-5. Since this program was originally developed the European C.I.E. and North American I.E.S. have produced standard formats, refer Appendix B, Fig. B-6 and Fig. B-7. Co-incidentally the orientation of format types 0 to 5 match those referred to by the IES. Many manufacturers these days supply their I-table data in these latter formats and as well on floppy disks which can be directly loaded into the library files.

Format No.	Description	Range of Angles	
0.	B-Beta symmetrical	H=0 to 90	V=0 to 90
1.	B-Beta symmetrical	H=0 to 90	V=-175 to 175
2.	B-Beta assymmetrical	H=-90 to 90	V=-90 to 90
3.	C-Gamma symmetrical	E=0 to 180	C=0 to 180
4.	C-Gamma assymmetrical	E=0 to 180	C=0 to 360
5.	C-Gamma axially symmetrical	E=0 to 180	Not applicable
6.	CIE format	G=0 to 180	C=0 to 360
7.	IES North America format	Various angles	

Unfortunately if the I-tables supplied by manufacturers do not co-incide directly with one of these formats then it will have to be manually re-arranged before inputing into the program.

NOTE: Care should be taken when re-arranging photometric data that a test run should be made with the new luminaire to ensure the illuminance levels calculated by the program match those of the manufacturer for the luminaire in the

same mounting arrangement. In the event that a table has been inserted incorrectly in the library files then the use of one of the choices under the 'Utility routines' in Chapter 4 may easily correct the problem.

Chapter 3

GETTING STARTED

3.1 Backup Disks

It is suggested that before installing this program on your computer for the very first time you make a copy of the original disks supplied with this manual. Use these copies as your working disks and store the original disks away in a safe place.

Following the addition of photometric data into the library files and on a regular basis it is also suggested you make backup copies of these and other data files in case of accidental erasure of files or disk drive failure. This backup can be achieved by using the MS-DOS 'copy' command, refer DOS manual for correct proceedure.

3.2 Dual Floppy Disk System Users

The original version of this program, developed some years ago, was designed for a dual (360K) floppy disk system. However, subsequent versions have increased in size and complexity and will now only operate easily on a hard disk system.

A dual disk version can be supplied, if necessary, but will require some swapping of disks if certain options are required to be run.

3.3 Hard Disk System Users

This version is supplied on three disks in a compressed format and therefore it requires a special program and proceedure to unpack and make it ready for use.

Installation proceedure:

Step 1 - Load Disk No. 1 into Drive A: and in response to your DOS prompt type "A:INSTALL" (without the quotes) then press the <Enter> key.

Step 2 - Respond to the questions asked and change disks in drive A: successively when requested.

Step 3 - After the INSTALL program has finished remove the last disk and put them all away in a safe place.

Once installed the floppy disks will no longer be required and the Lighting program can be started either from the C: drive root directory (as it now contains the batch file PLE.BAT) or in this newly created sub-directory by entering

PLE

followed by pressing the <Enter> key.

Upon starting the VDU screen will clear and display the lighting program logo, to clear this press any key. Initially as the 'Customisation file' does not exist on the supplied disks the program automatically executes the 'PROGRAM CUSTOMISATION' option, refer Chapter 13 for more details, to set default values for the program to function correctly.

NOTE: Whenever <ESC> or <F10> appears flashing in the bottom right hand corner of the screen the program is temporarily halted until the 'Escape' or 'Function 10' key is respectively pressed.

Once the default values have been accepted the password question, refer Fig. 3.1 will appear (not appropriate for Demonstration version). This password is used to protect the program against unauthorised use by others with access to your computer. The current password should be entered to gain access (characters entered are echoed as blocks on the screen), do not press the <Enter> key after last character of the password. The program is initially supplied with a password which can be subsequently

altered, as decribed in Chapter 12. Should an incorrect character be entered in the password press the <Home> key and the password can be re-entered.

The Main Application menu will then be displayed, refer Fig. 3.2. After selecting the desired option from this menu processing will continue accordingly. These options will be described in detail in Chapters 4 to 17.

When re-starting the program at a later date the password question will appear directly after the logo screen as the 'Customisation file' has now been created.

3.4 Making Selections From Menus

Selecting an option from a menu can be done in one of two ways. Either use the up and down cursor keys to move the highlight bar over the desired option and then press the <Enter> key or just simply press the key of the first letter of the desired option (no need to press the <Enter> key in this case).

By pressing the <Esc> key no action will be taken with the current menu and control of the program will return either to the previous menu or the Main Application menu for re-selection.

Whenever a menu is displayed the current date and time will also be shown at the top of the screen for convenience.

3.5 Input Of Data - Fixed Screens

The input of a majority of data into the program is done via what we shall call as 'fixed screen' or 'spread sheet' input. The program will display on the screen one or more questions followed by underscored input field/s that indicate the width of data that can be entered. Entering of data and moving about the fields is done by pressing the keys as described below. Some fields may already contain data (default values or values input last time the option was run) which can be used as is or altered.

When data is displayed in all appropriate fields the <Enter> key is pressed which passes these values back to the program for processing. Should a field contain invalid data than an error message will be displayed on the bottom line of the screen followed by a flashing <F10>. To clear this error press the

'Function 10' key and the cursor will be positioned at the start of the field in error. Change the data in this field as necessary and press the <Enter> key again. Providing no errors remain the program will continue with the next screen etc..

Responses to the questions can be either a string of one or more characters or number/s (the decimal point is only necessary when the number has a decimal fraction).

KEY PRESSED	ACTION
Alphanumeric	In 'Insert' Mode - Shifts contents of field from cursor position to the end of the field one position to the right and drops off the last character. The key pressed is inserted at the cursor position. In 'Overtype' Mode - Replaces the character at the cursor position with the key just pressed. **NOTE: Numeric fields will only accept keys 0-9, '+', '-', '.' and ',' any other key will have no effect other than to sound the warning buzzer.**
Tab Forward	Shifts cursor to start of the next logical field
Tab Back	Shifts cursor to start of the preceeding logical field
F1	Erases from current cursor postion to end of the field all characters then shifts cursor to start of next logical field
F2	Positions the cursor at the end of the data in the current field
, (comma)	Same as 'F1' but only valid for numeric fields after at least one number has been input
Backspace	Erases the character before the cursor and shifts remainder of the field one character to the left
Enter	Transmits contents of screen back to program for processing
Return	Same as <Enter> key
Escape	Aborts input to the current screen and returns to Main Aplication menu or a previous menu/screen to make a futher selection
Home	Shifts cursor to start of the first logical field on the screen

End	Shifts cursor to end of the last logical field on the screen
Cursor Up	Shifts cursor up and left to the next available field
Cursor Down	Shifts cursor down and right to the next available field
Cursor Left	Shifts cursor one position to left or to end of preceeding field if already at the start of the field
Cursor Right	Shifts cursor one position to right or to start of next field if already at the end of the field
Insert	Toggles between 'Insert' and 'Overtype' modes, this is indicated by a change in the size of the cursor
Delete	Deletes the character at the cursor position and shift the remainder of the field one position to the left adding a space on the end
Space Bar	In 'Insert' Mode - inserts a blank at the cursor position and shifts everything to the right one character. In 'Overtype' Mode - places a blank character at the cursor position and moves the cursor one position to the right

Chapter 4

LUMINAIRE LIBRARY

In brief this option performs the following functions

- Inputs photometric data of luminaires into the library files
- Changes luminaire code numbers in the library
- Deletes luminaires from the library
- Lists photometric I-table data as stored in the library
- Produces summary listing of all luminaires in the library

This option begins with the sub-menu shown in Fig 4.1, via this menu a choice of five further functions can be carried out as described in the following sections.

To exit from this sub-menu just press the <Esc> key and the program will return to the Main Application menu.

4.1 Add photometric data

This option inputs photmetric I-table data into the library files "FLINDEX1.IEE" and "FLLIBRY1.IEE" either manually or via disk input files.

NOTE: Considerable care should be taken with this option to ensure supplied photometric table is in a format suitable for the program. If not, then the table will need to be re-arranged before running this option. Inputing the table

incorrectly will result in incorrect illuminance levels being calculated.

The program continues with the menu in Fig 4.2, requesting the manufacturer's name of the fitting being added, these names are assigned by the user, refer Chapter 13.

Once this is selected the format type of the data being added is choosen from the menu in Fig 4.3. Format type 6 and 7 load I-tables directly from disk files whereas the others require the manual typing in of the table. The selected manufacturer's name will be displayed on the bottom of the screen for confirmation.

4.1.1 Manual entry of I-Table

The manual input of photometric data (Format types 0 to 5) is carried on two fixed screens, Fig 4.4 and Fig 4.5. The first screen assigns a reference number to the luminaire, horizontal or elevation angles etc. and the second screen inputs the actual intensity values.

A description of each field follows:

Luminaire code number: ##___

A valid response is a number between 1 and 999. This number combined with the manufacturer code (##) is used as a reference number to use this luminaire in all other options.

Lamp Lumens: _____ [1000 or Actual lumens of test lamp]

If the intensity values in the table are actual candelas then the response is the actual lamp lumens of the test lamp. If the intensities are candelas per 1000 lamp lumens then the response is 1000.

Luminaire Description: _____

This description would be as denoted in the manufacturers catalogue (up to a maximum of 50 characters) can be used. Include any special features of the luminaire such glare shields that may distinguish it from other similar types. This description will be used on output generated in the 'Summary listing' section.

Horizontal angles: ____ or **Azimuth angles: ____**

is the angles across the top of the standard format tables ,refer Appendix A. Depending on whether B-Beta or C-Gamma

data is being input as to which of the above questions appear. Response to this is not appropriate for Format type 5.

Vertical angles: ____ or **Elevation angles: ___**

is the angles down the side of the standard format table and depending on whether B-Beta or C-Gamma data is being input as to which of the above appear.

Intensity Multiplier: _____

Where the table supplied has an inbuilt intensity multiplier, it can be specified here so data can be input directly from the table without having to multiply each intensity manually. If a multiplier is not used then just enter "1".

Once data has been entered into all the appropriate fields press the <Enter> key and providing no errors are encountered (ie. valid data entered) the program will continue by displaying the screen shown in Fig 4.5. This screen will be repeated for each of the 'Vertical' or 'Elevation' angles entered on the previous screen. In to these screens will be entered the intensity values corresponding to each 'Horizontal' or 'Azimuth' angle. Each screen is entered by pressing the <Enter> key and data must be included in each field.

When all screens/fields have been completed the message

Writing I-table to disk.....

appears on the bottom of the screen indicating the Library files are being updated. This is followed by

Printing complete photometric data table.....

as a hard copy of the data entered is being sent to the printer/ system print file. When printing of table is complete program will return to the sub-menu, Fig 4.1 for further selection.

4.1.2 Disk entry of I-table Data - CIE/SAA

With this choice the input of photometric data in the standard CIE/SAA format for street lights can be done quite simply from a disk file. It begins with the screen shown in Fig 4.6 requesting the name of this file. If the file is found the header of it is read and displayed on the next line of the screen. The screen changes to that shown in Fig 4.7 into which

the luminaire code number and the description to be assigned to this luminaire in the library is input. If this luminaire is not to be added then respond with a '0' in the luminaire code number field.

The remainder of the data from the file is then read and saved in the Library files as indicated by the following.

Writing I-table to disk.....

Data saved in library file

If a '0' was used for the code number these messages will not appear instead the message

LUMINAIRE '##############' NOT ADDED TO FILES

will indicating the data has been skipped. The program then tries to continue reading from the input file looking for data from another luminaire, if found then the screen in Fig 4.6 and Fig 4.7 will be re-displayed for this next luminaire, otherwise the program returns to the menu in Fig 4.1. For ease of use the input file can contain the photometric data for as many luminaires as necessary, it is not essential that data be contained in a seperate file for each luminaire. However the data must be contiguous within the file.

4.1.3 Disk entry of I-table Data - IES

With this choice the input of photometric data in the standard North American IES format can be done quite simply from a disk file. It begins with the screen shown in Fig 4.8 requesting the name of this file. If the file is found the label lines are read and displayed on the lower part of the screen. The screen changes to that shown in Fig 4.9 into which the luminaire code number and the description to be assigned to this luminaire in the library is input. If this luminaire is not to be added then respond with a '0' in the luminaire code number field.

The remainder of the data from the file is then read and saved in the Library files as indicated by the following.

Writing I-table to disk.....

Data saved in library file

If a '0' was used for the code number these messages will not appear instead the message

LUMINAIRE '##############' NOT ADDED TO FILES

will indicating the data has been skipped. The program then tries to continue reading from the input file looking for data from another luminaire, if found then the screen in Fig 4.8 and Fig 4.9 will be re-displayed for this next luminaire, otherwise the program returns to the menu in Fig 4.1. For ease of use the input file can contain the photometric data for as many luminaires as necessary, it is not essential that data be contained in a seperate file for each luminaire. However the data must be contiguous within the file.

4.2 Change/Delete luminaire code numbers

This option allows the renumbering of luminaire code numbers and/or deleting luminaires from the library index file "FLINDEX1.IEE". It begins by making a copy of the current Index file indicated by the message

Copying Library file.....

and then displays the menu shown in Fig 4.10.

An explanation of the choices that can be made from this menu follow:

4.2.1 Delete luminaire/s

If this option is selected then the screen as in Fig 4.11 will be displayed. Into this screen upto 18 luminaire code numbers can be entered. After pressing the <Enter> key the program will attempt to delete the specified luminaires. If successful the message

- DELETED or **- RE-INSTATED**

will be printed against the numbers else the message

- NOT FOUND

will be displayed indicating the code number could not be found in the library and therefore no action was taken.

NOTE: When luminaires are deleted from the library they are not physically removed instead their code number is made

negative. Consequently, if a negative code number is input in the above then it will be re-instated into the library.

When completed the menu in Fig 4.1 will be displayed for further selection.

4.2.2 Change luminaire code number/s

If this option is selected then the screen as in Fig 4.12 will be displayed. Into this screen upto 18 pairs of luminaire code numbers can be entered. The first number on each line is the current code number within the library and the second is the new number to be assigned to this luminaire. After pressing the <Enter> key the program will attempt to change the specified luminaires. If successful the message

- ALTERED

will be printed against the numbers else the message

- NOT FOUND or **- INVALID** or **- NO CHANGE**

will be displayed indicating the current code number could not be found , the new number was inappropriate or the new number already exists respectively, and therefore no action was taken.

When completed the menu in Fig 4.1 will be displayed for further selection.

4.2.3 Exit without saving any changes made

If this choice is made then the program will exit from this section ignoring any code number changes or deletions that may have already been made ie. the Library files remain as they were.

4.2.4 Save changes and Exit

If this choice is made then the program will exit from this section altering the library index file accordingly for any code number changes or deletions made. This will be indicated by the message

Writing changes to Library file.....

When completed the menu in Fig 4.1 will be displayed for further selection.

4.3 List photometric data

This option produces a listing on the printer or System print file of the photometric I-table data of any luminaire stored in the Luminaire Library files. The choice of where the output is to be directed is given via the menu in Fig 4.13.

The screen shown in Fig 4.14 will then be displayed, into which upto 18 luminaire code numbers can be entered. After pressing the <Enter> key the program will attempt to list the specified luminaires. If successful the messages

Printing.....

will appear otherwise the message

- NOT FOUND

will be displayed against the code number indicating it could not be found and therefore no action was taken.

When completed the menu in Fig 4.1 will be displayed for further selection.

4.4 Summary listing of luminaires

This option produces a summary listing of luminaires in the Library files in numerical order of the luminaire code number. The menu in Fig 4.15 selects where the output is to be directed. After a choice has been made the program continues by reading all code numbers from the file, sorts them into the desired order and then outputs them to the selected device as indicated by the following messages displayed on the bottom line of the screen.

Reading Library file....
Sorting....
Printing....

When output is to the screen it will be done one page (screen full) at a time, to continue onto the next page press the <F10> key. To terminate the listing at the end of any page press the <Esc> key instead. A sample of the screen output is shown in Fig 4.16.

When completed the menu in Fig 4.1 will be displayed for further selection.

4.5 Utility routines

This option allows easy modification or correction to photometric data previously entered into the Library files as well as the complete removal of any deleted luminaires by packing the files thus freeing up disk space. The sub-menu shown in Fig 4.17 will be displayed from which a further selection can be made as detailed below.

4.5.1 Change existing photometric data

Within this choice it is possible to change the intensity values stored in the library for a particular luminaire but not to change any of the angles. Changing the intensity values would usually only be required where the data may have originally been entered manually and a typing mistake was made that was not noticed till a printout of the table was scrutinised.

The screen in Fig 4.18 will be displayed requesting the code number of the luminaire to modify. The program will then continue with the screen in Fig 4.5 displaying the intensity data for the range of angles. Change the desired values and press the 'Enter' key on each screen till the end is reached, this corrected data will then be updated on the library files. The program will then return to the menu in Fig 4.17.

4.5.2 Pack library files

With the earlier option on page 4-5 deleting luminaires from the library only marked the entry in the Index file with a negative number thus the luminaire could be re-instated by using

a negative code number to the delete question. However, this new choice will physically remove the data from the disk and compact the files accordingly.

The screen on Fig 4.19 will be displayed to check if the Demonstration luminaires (those originally supplied with the software package) are also to be removed. Several lines will be displayed on the this screen indicating the programs progress. When complete press the 'F10' key to return to the menu in Fig 4.17.

4.5.3 Horizontally swap I-table data

This choice allows the simple reversal of the photometric data in the Library for a particular luminaire in the horizontal (or azimuth) angle direction, refer Fig 4.20. It would generally only be used where the data would have been originally entered manually in reverse order by mistake. This prevents having to re-enter the data from scratch.

The screen in Fig 4.21 will be displayed to request the code number to use and a new number to be assigned to the changed data.

When complete the program will return to the menu in Fig 4.17. NOTE: Remember to delete the old luminaire from the library as it will have the same description as the new one and may cause some confusion at a later date with two different code numbers for apparently the same luminaire. You may also then wish to re-number the new luminaire back to the original number.

4.5.4 Vertically swap I-table data

Same as the previous section except data is swapped in the vertical (or elevation) angle direction, refer Fig 4.20.

4.5.5 Multiply I-table data by a factor

If an incorrect multiplier had been entered on Fig 4.4 when manually entering the photometric data for a luminaire then it can be simply corrected in this option by specifying another factor to produce the correct original value.

The screen in Fig 4.22 will be displayed to request the code number to use, a new number to be assigned to the changed data and the multiplication factor. NOTE: This factor will not necessarily be the original value especially if you quoted some

value other than 1 to the screen in Fig 4.4.

When complete the program will return to the menu in Fig 4.17. NOTE: Remember to delete the old luminaire from the library as it will have the same description as the new one and may cause some confusion at a later date with two different code numbers for apparently the same luminaire. You may also then wish to re-number the new luminaire back to the original number.

Chapter 5

NEW JOB INPUT --> CALCULATE....

In brief this option performs the following functions

- Asks for file name on which pole/luminaire data is to be stored
- Asks for job title, pole positions, mounting heights etc. for all poles involved
- For each pole - enter luminaire code number, lamp lumens and aim points etc.
- Then proceeds with calculations as described in Chapter 7

5.1 Assign layout file etc.

It begins with the screen shown in Fig. 5.1, which requires the input of the following items

Filename to store layout data: _____

the characters input must be a valid MS-DOS filename (e.g. combination of upto eight letters A-Z and digits 0-9, file extension not permitted) that does not already exist. Unless a drive letter is specified as part of the filename the file will be created on the default drive, see Chapter 13. This file will hold the pole/luminaire layout data for future calculations and ammendments.

Job Title: _____

will be the title of this job and will be printed on all hard copy output for identification.

Aiming Mode: _ **[0=Angle 1=Co-ordinate]**

the default value as set in Chapter 13 will be shown in this field but can be altered for this session, if desired. A '0' value here will mean that the luminaires on all poles will be aimed by a horizontal and vertical angle to the aim point rather than the X and Y co-ordinate of that aim point.

5.2 Locating poles

After pressing the <Enter> key and if no errors are detected the program will continue with the screen shown in Fig. 5.2 to locate the position of the first pole. For street lighting applications this would be the position of the luminaire as at present an outreach length is not allowed. The following details items found on this screen.

X Co-ordinate: _____

is the X co-ordinate of the pole relative to the origin (0,0), the value can be negative if it is located to the left of the origin.

Y Co-ordinate: _____

is the Y co-ordinate of the pole relative to the origin (0,0), the value can be negative if it is located below the origin.

Luminaire Height: _____

is the mounting height of all luminaires on this pole. If luminaires are mounted at various heights then either use the average height or use other poles at this same position for the different heights.

5.3 Attach and aim luminaires

After again pressing the <Enter> key the screen will change to that shown in Fig. 5.3 or Fig. 5.4 depending on the current Aiming Mode.

Luminaire Code No.

_____

is the luminaire code number of the luminaire (acceptable range is 1 to 20999) to be used, refer Chapter 4 for proceedure in obtaining a list of luminaires in the library.

Lamp Kilolumens

_____

is the total lumens of all lamps in the luminaire in Kilolumens eg. a lamp with an output of 30,000 lumens would be input as 30 and 35,500 lumens input as 30.5.

Aim Angle
Horiz Vert

_____ _____

are the horizontal and vertical angles to the aim point of the light. The horizontal angle is measured between the positive direction of the X axis and an imaginary line joining the pole base and aim point position measured clockwise on the horizontal plane in degrees. The vertical angle is measured between the line of the pole and an imaginary line to the aim point measured about the luminaire in the vertical plane in degrees, refer Appendix A.

Aim Point
X Y

_____ _____

are the X and Y co-ordinates of the aim point of the light on the ground plane, negative values are acceptable.

Enter data into as many lines as required for the number of luminaires on this pole. To enter this screen press the <Enter> key. If the last line of the screen contained data then another

blank screen will be displayed for input of lights 12 to 22 and so on. When no more lights are required simply press the <Enter> key on the empty screen or a screen with the last line blank. Upto 99 lights can be attached to a single pole, if more are required then simply locate another pole at this same location and attach the additional lights to it. If blank lines are embedded in the data then the program will automatically compress the data after the last screen is entered.

The above screens (Fig. 5.2 and either Fig. 5.3 or Fig. 5.4) are then repeated until data for all the poles/luminaires have been input. When no further poles are required press the <Enter> key on a blank Fig 5.2 screen. Upto a maximum of 99 poles can be used each containing upto 99 different luminaires.

The program automatically continues as described in Chapter 7.

Chapter 6

MODIFY EXISTING JOB --> CALCULATE....

In brief this option performs the following functions

- Asks for the file name containing layout data to be changed
- Select from a menu the method of altering data
- Proceed through input file repositioning, deleting or adding poles and re-aiming, deleting or adding luminaires etc.
- Then proceeds for calculations as described in Chapter 7.

This option allows the changing of all pole/luminaire layout data saved previously rather than re-entering all data from scratch. This option is particularly useful for large jobs with many luminaires where the aiming angles of a few lights or pole positions requires changing to optimise a design.

The option begins with the screen shown in Fig. 6.1 and requires the name of the file to be used for input

Filename containing layout data to be changed: _____

the response must be a valid MS-DOS filename (".FLD" extension is implied) that already exists. If a drive letter is specified as part of the filename the file will be input from that drive else from the default drive, see Chapter 13.

The field will contain the name of the file last used to store layout data.

Continuing the screen shown in Fig. 6.2 will appear, with the following fields

Filename to store layout data: _____

the characters input must be a valid MS-DOS filename (e.g. combination of upto eight letters A-Z and digits 0-9, file extension not permitted) that does not already exist. Unless a drive letter is specified as part of the filename the file will be created on the default drive, see Chapter 13. This file will hold the pole/luminiare layout data for future calculations and ammendments.

This field will contain the name of the input file. This is done so that the file names of successive modifications can simply be a base name plus a sequential digit. By pressing the <F2> key the cursor will move to the last character of the field where the next digit (number) can be easily input. If this proceedure is not required just enter another file name instead of the <F2> key, then pressing <F1> key will erase any remaining characters in the field.

Job Title: _____

will be the title of the job from the input file which will generally not need changing.

Aiming Mode: _ [0=Angle 1=Co-ordinate]

the default value as set in Chapter 13 will be shown in this field but can be altered for this session, if desired. A '0' value here will mean that the luminaires on all poles will be aimed by a horizontal and vertical angle to the aim point rather than the X and Y co-ordinate of that aim point.

After changing any of the fields press the <Enter> key and if no errors are detected the program will continue with the menu shown in Fig. 6.3 to simplify the way the pole/luminaire data is to be altered.

6.1 Pole by Pole

If this selection is made then the program will continue as described in Chapter 5, except rather than blank fields being displayed, the fields will contain the data as stored in the specified input file. Fields as required can be changed or where a screen is not to be changed then just press the <Enter> key.

To delete a pole (and attached luminaires) just enter '99999' as the X co-ordinate for the screen shown in Fig 5.2. However, a confirmation question is asked before deletion is

actually done. The 'POLE NO.' to the left of the screen will then continue in sequence according to the input file data. The addition of poles is done when the end of the input file is reached ie. blank fields are displayed in Fig. 5.2.

6.2 Start at nominated Pole then Pole by Pole

On making this selection the screen as in Fig 6.4 will be displayed requesting the pole number from which to start modifying. After a suitable value has been entered the program will scan through the input file, displaying screens as it goes, until it reaches the nominated pole where the computer will beep. The program will continue as described in Chapter 5, with fields containing the data as stored in the input file specified. Fields as required can be changed or where a screen is not to be changed then just press the <Enter> key.

To delete a pole (and attached luminaires) just enter '99999' as the X co-ordinate for the screen shown in Fig 5.2. However, a confirmation question is asked before deletion is actually done. The 'POLE NO.' to the left of the screen will then continue in sequence according to the input file data. The addition of poles is done when the end of the input file is reached ie. blank fields are displayed in Fig. 5.2.

6.3 Change/Delete nominated Pole only

On making this selection the screen as in Fig 6.5 will be displayed requesting the pole number to modify. After a suitable value has been entered the program will scan through the input file, displaying screens as it goes, until it reaches the nominated pole where the computer will beep. The program will continue as described in Chapter 5, with fields containing the data as stored in the input file specified. Fields as required can be changed or where a screen is not to be changed then just press the <Enter> key. After changes have been made to this pole the input file will be scanned again until its end and screens diplayed as above.

To delete the pole (and attached luminaires) just enter '99999' as the X co-ordinate for the screen shown in Fig 5.2. However, a confirmation question is asked before deletion is

actually done. The 'POLE NO.' to the left of the screen will then continue in sequence according to the input file data. The addition of poles is done when the end of the input file is reached ie. blank fields are displayed in Fig. 5.2.

6.4 Add additional Pole/s only

On making this selection the program will scan through the input file, displaying screens as it goes, until it reaches the end of the input file where the computer will beep. The program will continue as described in Chapter 5.

6.5 Replace luminaire type with another

On making this selection the screen as in Fig 6.6 will be displayed requesting the current and new luminaire code numbers as well as the lamp kilolumens of this new luminaire. After suitable values have been entered the program will scan through the input file, displaying the pole and light numbers changed, until it reaches the end. The program will continue as described in Chapter 7 to calculate the illuminance levels.

Chapter 7

CALCULATE ILLUMINANCE/LUMINANCE --> QUICK DISPLAY....

In brief this option performs the following functions

- Asks for input file name if not already known from previous option
- Input whether horizontal and/or vertical illuminance levels required or luminance
- If vertical, choose whether from all four directions or specific point eg. view from a camera position
- If luminance then define observer position
- Enter field reference point co-ordinates and size of calculation field
- Enter number and size of windows for minima, maxima etc.
- Enter shape of masked area for minima, maxima etc.
- Program then continues as described in Chapter 8.

This option begin with the screen as shown in Fig. 7.1(a) or Fig. 7.1(b). Only part of this screen will be initially displayed, further lines will be added depending on responses given.

7.1 Assign layout file

If the option as described in Chapter 5 was not just run the following question will appear otherwise a statement as to the file that is being used will be shown

Filename containing layout data: _____

the response given must be a valid MS-DOS filename (an extension of ".FLD" is implied) that already exists. If a drive letter is not specified as part of the filename input will be from the default drive, see Chapter 13.

7.2 Calculation type

The program then continues by requesting the type of calculation (illumiance or luminance) it is to perform

Calculation type: _ [H=Eh V=Ev B=Both Eh & Ev L=Luminance]

a response of "H" will calculate horizontal levels (Eh) only, "V" vertical (Ev) only, "B" will do both horizontal and vertical and "L" will do luminance. If "V", "B" or "L" is selected further details for the type of vertical calculation or observer position is required

Calculation direction: _ [1=Parrallel to Axis
2=Back to Camera]

selecting "1" will give levels in directions parallel to X and Y axis. Selecting "2" will require a further response of where the camera (or viewing position) is located

Camera position - X Co-ord.: _____
- Y Co-ord.: _____
- Height : _____

is the X co-ordinate, Y co-ordinate and height above the

ground plane of the camera lens/viewing position.

R-Table No.: __ [1 - 20]

is the number assigned to the standard Road Surface Reflectance table which is temporarily displayed below this question on the screen. Refer CIE publication no. 30 for more information but the usual selection is surface 'R3'.

Observer position - X Co-ord.: _____
- Y Co-ord.: _____

is the X co-ordinate and Y co-ordinate of the observer used to calculate the luminance. The observer is usually placed 60 metres in front of the area over which the levels are being calculated.

7.3 Locating calculation field

Continuing with this option the bottom of the screen as shown in Fig. 7.2(a) or Fig. 7.2(b). will be displayed, only part of this screen will be initially displayed, further lines will be added depending on responses given. This is used to locate the calculation field over which the illuminance or luminance levels are to be calculated. This is specified differently depending on the value in the next question

Grid Specification format: _ [0=Increment 1=Scale]

a response of "0" positions the area by locating the field reference point (lower left corner of the calculation field) and defining the size of the field as a number of equal sized intervals in the X and Y direction. A response of "1" requires a scale to be input and the limiting X and Y co-ordinates of the field, the computer automatically determining interval distances. This grid specification format determines the method used which can be changed from the default value (see Chapter 13) for the current run.

In either case the height of the calculation field above the ground level is required, a negative value here implies the calculation field is below ground level.
A very large area with small increment distances has to be run as several seperate jobs (due to limitations of the program - see Appendix A) and by changing the co-ordinate of the field reference point or range of the calculation field for each run,

the areas can be made to overlap.

Field Reference point - X Co-ord.: _____
- Y Co-ord.: _____

is the X and Y co-ordinate of the bottom left hand corner of the calculation field.

Number of Increments in X: ___
in Y: ___

is the number of equal sized intervals in the X and Y direction, the values do not have to be the same.

Increment distance in X: _____
in Y: _____

is the distance of each of these intervals for X and Y, the values do not have to be the same.

Scale of Grid: 1: _____

is the scale of the resulting printer output. The computer automatically calculates the increment distances as the printer output is based on 10 characters per inch across the printer paper and 6 lines per inch down the printer paper. Typical values are given to the right of the screen for information purposes.

Start X Co-ord. : _____
Finish X Co-ord.: _____

is the start and finish co-ordinate of the calculation field in the X direction which will be rounded to suit the increment distances. This rounding will always increase the size of the field slightly so that the specified co-ordinates are included within it.

Start Y Co-ord. : _____
Finish Y Co-ord.: _____

same as above except in Y direction.

Height of field above ground plane: _____

is the height of the calculation field above the ground plane. A negative value can be used to locate the field below the ground plane.

7.4 Windows/Masked Area for minima, maxima etc.

Up to three windows and one masked area can then be defined within this calculation field over which the minimum, maximum and average illuminance /luminance are determined as well as the uniformity ratios. These are input on screens Fig. 7.3 or Fig. 7.4 depending on the setting of the Grid specification format.

Increment No. in X
Start Finish

is the start and finish increment number of the window in the X direction. The first position is increment number "0" and values input must be within the increment numbers previously input for the calculation field which are displayed on the bottom of the screen.

Increment No. in Y
Start Finish

same as above except in the Y direction.

X Co-ordinate
Start Finish

is the start and finish co-ordinate of the window, this co-ordinate range must be within the field of calculation which is displayed on the bottom of the screen. The actual co-ordinates will be rounded to suit the increment distances. This rounding will always increase the size of the window slightly so that the specified co-ordinates are included within it.

Y Co-ordinate
Start Finish

same as above except in the Y direction.

Masked Area _ [0=No 1=Yes]

If a masked area is required then specify "1" in this field.

The screen as shown in Fig 7.5 will be displayed where the boundary of this area can be defined. Refer to the next section for a more detailed explanation of this facility.

This is all the input data required to perform the illuminance or luminance calculations.

As the calculations proceed the following messages

Searching library for luminaire code no. #####..... Found
Calculating component from pole ### - light no. ###.... Finished

will be displayed on the screen for each pole/luminaire location encountered.

When the calculations are complete the message

Calculations complete

will briefly appear and the computer will also beep. At this point if any windows or masked area were specified then the minimum, maximum etc. will be displayed on the screen as shown in Fig. 7.6(a) or Fig. 7.6(b), press the <F10> key to continue as indicated.

After this the resulting horizontal and/or vertical (from camera only) or luminance levels are displayed on the VDU screen in an abbreviated matrix form, an example is shown in Fig. 8.1, Fig. 8.2 and Fig. 8.3, for more detail refer to Chapter 8. As the calculation field may be too large to fit on the screen at one time, a screen full or page will be displayed, then by pressing the <F10> key the next page will appear. The notation at the bottom of the screen will indicate whether horizontal, vertical illuminance or luminance levels are being displayed.

These calculated levels are also saved in a disk file named 'FLEVELS' on the default drive. This file is used for input to other options for the display of this information.

When all has been displayed the program Main Application menu will re-appear for further selection.

7.5 Masking an Area

Unless specified otherwise in the previous section the illuminance/luminance calculated and displayed will be over the entire calculation field. If it is desired that it be displayed

only over part of this area then a 'masked area' should be chosen (see Fig 7.3 or Fig 7.4).

When a masked area is chosen the screen in Fig 7.5 will be displayed showing the calculation field (left side of screen) as earlier input, if the field is too large it will be continued on the next screen.

The idea at this point is to move the cursor around this field (with keys as shown on right side of screen) and press the "+" key for grid points to be included in calculations/display. This will be echoed by the shape of the grid point changing to a "♦", to exclude a point use the "-" key. If it is required that all grid points within a certain radius be included/excluded then press the "C" key. Questions will then appear on the bottom line of the screen asking for the radius and whether to include or exclude points. The screen will then be refreshed with the appropriate points marked. Therefore, by using this circle facility twice with differing radii and "+" then "-" status a ring of points can be created or using a vary large radius all points can be made the same.

When all required points have been modified then press the <Enter> key to go to next part of field (large fields only) or return this information back to the program for further action.

If it is decided not to include an area then press the <Esc> key instead and the program will return to Fig 7.3 or Fig 7.4. If it is required to restore the masked area to what it was before entering this process then press the <Esc> key again.

Chapter 8

QUICK DISPLAY OF CALCULATED LEVELS

In brief this option performs the following functions

- Displays the last calculated illuminance/luminance levels on the screen.

This option allows the re-display of the calculated levels on the screen in an abbreviated matrix form.

8.1 Illuminance

The display appears as shown in Fig. 8.1 for horizontal levels and Fig. 8.2 for verticals (back to camera only). The bottom line of the screen indicates which levels are being displayed and the height of the calculation field. The levels displayed are in Lux (ie. Lumens per square metre) and are rounded to the nearest integer value. If a masked area has been choosen then points outside it will be shown with a "." instead of a numeric value. The point at which the minimum and maximum levels occur will have the illuminance value flashing.

8.2 Luminance

The display appears as shown in Fig. 8.3 and the bottom line of the screen indicates the location of the observer and height of calculation plane. The levels displayed are in Cd/m2 (ie. Candelas per square metre) and are rounded to the nearest two decimals places. If a masked area has been choosen then points outside it will be shown with a "." instead of a numeric value. The point at which the minimum and maximum levels occur will have the luminance value flashing.

8.3 Restore calculation field, filenames etc.

This option can also be used to re-store all the previous input, calculation field values and file names for the most recent job run after you have logged off. As the program only remembers these values while it is running.

Chapter 9

OUTPUT CALCULATED LEVELS

In brief this option performs the following functions

- Allows selection of the destination of the output
- Prints pole and luminaire layout schedule
- Prints minima, maxima for each pre-selected window or masked area
- Prints illuminance levels for either horizontal or vertical
- Prints luminance levels for the nominated observer

This option begins by reading the last calculated levels into computer memory.

9.1 Output device selection

Where the output is to be directed to can be selected from the Output Device menu, see Fig. 9.1 which will next appear.

The choices from this menu are:

Printer [LPT1:]

sends the output directly to the printer, ensure printer is turned on and on-line before responding otherwise a 'DEVICE TIME OUT' error may result and prematurely terminate the

program. This choice will not be available if a printer is not attached to the computer.

System print file [FL.LST]

appends the output to the System print file (FL.LST). This is used mainly where a printer is not connected to the computer in use. Later the file could be transferred to another computer/printer by floppy disk for printing.

9.2 Contents of output

A choice is then given via the Array Output menu, see Fig. 9.2 as to what can be printed.

The choices from this menu are explained below:

Horizontal levels

this choice will process the horizontal levels only and will not be displayed in the menu if vertical levels where only last calculated. A sample of the output produced is shown in Fig 9.3.

Vertical levels all four directions

this choice will process the vertical levels in all four directions only and will not be displayed in the menu if not included in last calculations. A sample of the output produced is shown in Fig 9.4.

Vertical levels back to camera

this choice will process the vertical levels back to camera only and will not be displayed in the menu if not included in last calculations. A sample of the output produced is shown in Fig 9.5.

The levels displayed are in Lux (ie. Lumens per square metre) and are rounded to the nearest integer value. If a masked area has been choosen then points outside it will be shown with a "." instead of a numeric value.

Luminance levels

this choice will process the luminance levels only and will

not be displayed in the menu if not included in last calculations. A sample of the output produced is shown in Fig 9.8.

The levels displayed are in Cd/m2 (ie. Candelas per square metre) and are rounded to the nearest two decimal places. If a masked area has been choosen then points outside it will be shown with a "." instead of a numeric value.

Pole/Luminaire schedule

this choice will print in tabular or schedule form the co-ordinates of each pole, the aiming angles, aim points etc.. A sample of the output produced is shown in Fig 9.6(a) and Fig 9.6(b).

Window/Masked Area statistics

this choice will print the minima, maxima and uniformity ratios (minimum/maximum & minimum/average) and co-ordinate range of the previously selected windows or masked area. A sample of the output produced is shown in Fig 9.7(a) and Fig. 9.7(b).

All the above

this choice will automatically execute all the available selections in sequence from this menu.

After printing is complete the Array Output menu will be re-displayed for a further selection, output will automatically be to the earlier selected device. To exit from this loop or to change the output device press the <Esc> key to return to the Output Device menu. Press the <Esc> key again to return to the Main Application menu.

Chapter 10

ISO DIAGRAM

In brief this option performs the following functions

- Enter scale of the diagram
- Enter value of each contour level
- Diagram can then be printed on the printer
- Diagram can also be drawn on the plotter or sent to AutoCad

---

This option begins by reading the last calculated levels into computer memory.

10.1 Scale and contours

The scale and number of contour lines to be drawn (up to 10) is then input via the screen shown in Fig. 10.1.

Scale: 1:____ [Minimum is 1: ####]

the minimum scale of the largest sized diagram that will fit all the calculation field on the screen is shown in the statement adjacent to this question. Input of the desired scale, whole number greater than or equal to minimum scale value is required.

Contour Level No. ##: _____

for each contour line required (upto ten) enter its value against a contour level no., the value input can be an integer number or real number with upto 2 decimal places.

Show Grid intersection points: _ [0=No or 1=Yes]

if '1' is selected then a dot will be placed on the screen where the grid lines intersect.

After pressing the <Enter> key the screen will then clear, the boundary of the calculation field area will be drawn with ticks at each grid increment point, contour lines will be drawn and an anotation displayed at the start of each line. While this is being done contour data co-ordinates are written out to a temporary file named "FLCONTRS.TMP" for use by the Plot option.

10.2 Display and output functions

When the diagram is complete the function key line

<F1>PRINT <F2>PLOT <F3>LEVELS <F4>AIM-PT <F5>WINDOW <F9>RE-DRAW

<Esc>MENU

will be displayed on the bottom of the screen, this indicates further options available through the use of the function keys 1 to 5 and 9 or the <Esc> key. The 'PRINT' function will not be displayed/available if a printer is not connected. The 'PLOT' function will not be displayed/available if a plotter is not connected. The 'WINDOW' function will only be displayed/available if at least one window was specified prior to calculation of illuminance/luminance.

On pressing the respective function key the program will proceed as indicated in the following sections. When complete another key may be pressed.

10.2.1 <F1> key

Pressing this key will print the diagram on the printer, but first changes the bottom line to show the job title and X and Y increments distances. This output will not work unless your printer can print complex screen graphics (ensure MS-DOS 'graphics' program is previously executed eg. include in

'autoexec.bat' file) or you have installed a graphics display program such as 'PIZZAZ'. Refer to Fig 10.2 and Fig 10.3 for a sample of this type of output.

10.2.2 <F2> key

Pressing this key produces the contour output to a file, plotter or in a format suitable for input to AutoCad depending on response to question

Plot to AutoCad, File or Plotter (A, F or P)

For the action when an "A" is selected see the section at the end of this chapter. However, if a "P" is selected then the next question will appear

Is plotter turned on, Paper in place, Pens ready (Y or N)

or if an "F" is selected a file name on which to store the data is asked.

Name of File

In either case a question to select a new scale is asked.

Current scale= #### Minimum scale= #### Enter new scale

Thus the diagram can be to a different scale, if desired to utilize the full drawing sheet of the plotter etc. Next is asked

Plot light positions and aiming points (Y or N)

responding with a "Y" the plot will show a small circle at each pole location and dashed lines radiating outwards representing the aiming direction of each light. This line will terminate at the actual aim point on the ground plane.

Following satisfactory answers to above questions the plotting process will start and be indicated so by several short messages on the bottom of the screen, an example of output produced on HP equipment is shown in Fig 10.4.

When complete the screen of Fig 10.1 will re-appear for any appropriate further action, press <Esc> key to return to the Main Application menu.

10.2.3 <F3> key

Pressing this key displays the grid point illuminance/luminance levels on the diagram if not displayed and erases them if they are already displayed. Unfortunately if the grid increments on the screen are close together than values will be overwritten and difficult to distinguish.

10.2.4 <F4> key

Pressing this key erases the pole symbol and aim point lines from the diagram if displayed else draws them in.

10.2.5 <F5> key

Pressing this key erases the boundary of each window area shown as a dashed line on the diagram if displayed else draws them in.

10.2.6 <F9> key

Pressing this key redraws the contour diagram but first re-displays the scale and contour level screen (Fig 10.1) so that the contour levels or scale can be altered.

10.2.7 <Esc> key

Pressing this key returns to the Main Application menu for further selection.

10.3 AutoCad interface

Selecting the "A" option in the plot phase will envoke the following process to create a "DXF" file containing the current status of the display as a series of AutoCad entities. This file can be input to AutoCad using the "DXFIN" command to overlay the contour diagram onto an existing base drawing.

Individual items of the diagram are stored on seperate layers as defined in Fig 10.5. Thus as required any of these layers can be 'turned off' or 'frozen' to produce a final drawing to your requirements. Colours and line types of these layers are not set in the DXF file but could be set by a prototype drawing in AutoCad.

Initially the co-ordinates for pole positions and possibly aiming angles/co-ordinates would be obtained from the AutoCad base drawing over which the contour information is required. N.B. These co-ordinates are required in metres not AutoCad 'drawing units'.

When creating the DXF file the first question that appears on the bottom of the screen is

Conversion Factor - No. of drawing units to equal one Metre ?

an appropriate response is required so the lighting program can convert the actual distances on the diagram into 'drawing units' so that it will correctly overlay and align with the AutoCad base drawing. As an example if your AutoCad drawing had each drawing unit equivalent to 1 millimetre than your response to the question would be 1000.

The response to the next questions determine whether certain items are included on the DXF file or not.

Plot light positions and aiming points (Y or N) ?

Plot windows (Y or N) ?

Following valid answers the program will begin to generate the DXF file and the message

Outputing to file: ########.DXF.... Processing Vector ####

will appear on the bottom of the screen to indicate the program is progressing. Note the file name is the same as that containing the pole/luminaire layout for the current job but with

a "DXF" extension. When complete the screen in Fig 10.1 will re-appear for further selection as required.

To view the results in AutoCad terminate the lighting program, start up Autocad, select 'Edit an EXISTING drawing' and load the base drawing. To overlay the contour diagram contained in the DXF file enter "DXFIN" in response to the command prompt and respond with the filename ######## as above (the sub-directory of the lighting programs will also need to be included). You will observe the contour diagram etc. being drawn over the base drawing. Turn layers off or freeze them or enhance the drawing as required and save it. The DXF file will then no longer be required as its contents are saved as part of the drawing and therefore it can be deleted.

Chapter 11

WIRE FRAME DIAGRAM

In brief this option performs the following functions

- Size is determined by computer and diagram displayed
- Height/shape of diagram can be changed and re-drawn
- Diagram can be printed on printer
- Diagram can be drawn on the plotter

This option begins by reading the last calculated levels into computer memory.

11.1 Conversion to 3D co-ordinates

The program then proceeds to convert this data into 3-Dimensional system co-ordinates and displays.

Converting X,Y,Z data co-ordinates to 3D X,Y screen co-ordinates....

The program will then draw the calculation field and grid surface lines parallel to X axis. If grid lines in the Y direction are required to be drawn respond with "Y" to this question on the bottom of the screen

Plot surface lines in both directions (Y or N)

11.2 Display and output functions

When finished the function key line will be displayed on the bottom of the screen

<F1>PRINT <F2>PLOT <F3>CHANGE <F4>RE-DSP <F9>CLEAR <Esc>MENU

This line displays the options available through the use of the function keys 1 to 4 and 9 or the <Esc> key. The 'PRINT' function will not be displayed/available if a printer is not connected. The 'PLOT' function will not be displayed/available if a plotter is not connected.

On pressing the respective function key the program will proceed as indicated in the following sections. When complete another key may be pressed.

11.2.1 <F1> key

Pressing this key prints the diagram on the printer, but first changes the bottom line to show the job title. This output will not work unless your printer can print complex screen graphics (ensure MS-DOS 'graphics' program is previously executed eg. include in 'autoexec.bat' file) or you have installed a graphics display program such as 'PIZZAZ'. Refer to Fig 11.1 for a sample of the output.

11.2.2 <F2> key

Pressing this key produces the wire frame output to a file, plotter or in a format suitable for input to AutoCad depending on response to question

Plot to File or Plotter (F or P)

If to "P" is selected then the next question will appear

Is plotter turned on, Paper in place, Pens ready (Y or N)

otherwise a file name on which to store the data is asked.

Name of File

In either case a question to select if surface lines in both X and Y directions are to be displayed

Plot surface lines in both directions (Y or N)

Following satisfactory answers to above questions the plotting process will start and be indicated so by several short messages on the bottom of the screen, an example of output produced on HP equipment is shown in Fig 11.2.

When the plot is finished the function key line will be re-displayed.

11.2.3 <F3> key

Pressing this key allows proportions of the diagram to be changed and the diagram re-displayed. The size of the diagram is altered by responding with a percentage value of the current diagram height to this question

Enter new height (% of current height)

A value less than '100' will decrease the size of the diagram. The 3-D co-ordinates of the diagram will be re-calculated and the diagram displayed again.

11.2.4 <F4> key

Pressing this key clears the screen and re-displays the current diagram.

11.2.5 <F9> key

Pressing this key clears the diagram from the screen, sometimes needed before pressing the <F4> key .

11.2.6 <Esc> key

Pressing this key returns to the Main Application menu for further selection.

Chapter 12

ALTER ACCESS PASSWORD

In brief this option performs the following function

- Changes the access password

This option allows the alteration of the password which gains access to the program and consists of the question

New Password: _____

The response is any string of characters (upper or lower case excluding special keys) followed by pressing the <Enter> key.

NOTE: Take note of this new password before pressing the <Enter> key.

Processing will then return to the Main Application menu for further selection.

If at anytime the password is forgotten it will be necessary to copy the "FLPASSWD.DAT" file from the original Disk No. 1 onto the current working disk and then access the program via the original password.

Chapter 13

PROGRAM CUSTOMISATION

This chapter describes how certain system parameters within the program can be assigned default values depending on the type of computer used, its associated peripherals and preferences of the user. This customising information is stored in the customisation file "PL.INI" in a specific format. This file must be on the disk drive from which the starting "PL" command is issued. If the file is not found then an error will be displayed and this option will be automatically executed to set up such a file.

The customisation file should only be altered with this option and never with a text editor or similar program as it will alter the proper sequence of the file which could have spurious results.

13.1 Screen, printer and file setup

The option begins with the screen as shown in Fig. 13.1 and the following describes the meaning of all the fields and their association within the programs.

Background Colour: __ [0-7]

this parameter sets the background colour of the display, mainly used where a colour display is in use but can be used on monochrome screen to give shades of green or amber. The available colours or shades are shown as colour bars to the right of the screen.

F/Gnd Colour-Statements: __ [0-15]

this parameter sets the foreground colour of the display for 'statements' that draw the users attention. Mainly used

where a colour display is in use but can be used on monochrome screen to give shades of green or amber. The available colours are shown as coloured numbers to the right of the screen.

F/Gnd Colour-Questions : __ [0-15]

this parameter sets the foreground colour of the display for 'questions' that require a response from the user. Mainly used where a colour display is in use but can be used on monochrome screen to give shades of green or amber. The available colours are shown as coloured numbers to the right of the screen.

F/Gnd Colour-User Input: __ [0-15]

this parameter sets the foreground colour of the display for 'user input' to questions. Mainly used where a colour display is in use but can be used on monochrome screen to give shades of green or amber. The available colours are shown as coloured numbers to the right of the screen.

F/Gnd Colour-Errors : __ [0-15]

this parameter sets the foreground colour of the display for 'error' messages. Mainly used where a colour display is in use but can be used on monochrome screen to give shades of green or amber. The available colours are shown as coloured numbers to the right of the screen.

Graphics Adapter Board: _ [0=MDPA 1=CGA 3=EGA 4=VGA 2=Herc. 5=MCGA]

this parameter enables the highest resolution of graphics output to the screen depending on the graphics board fitted within the computer, see also 'Monitor Type'. Types '*' are not supported in Version 3.xx of the program.

```
    0 = Monochrome Display and Printer Adapter (text only)
    1 = Colour Graphics Adapter - medium resolution
    2 = Enhanced Graphics Adapter - high resolution
*   3 = Hercules, Graphics Card Plus, InColor or
        Monographics
*   4 = Multi-Colour Graphics Array
*   5 = Video Graphics Array
```

If Board type 3 is used then you must load the 'Hercules' driver (QBHERC.COM - Disk No. 3) before running the lighting program. This is done by entering 'QBHERC' in response to the DOS prompt. It is suggested that it be included in your 'autoexec.bat' file so it will be automatically done when activating your computer as the driver stays resident in

memory.

Monitor Type: _ [0=Mono 1=Colour 2=Enh/Colour]

this parameter in conjunction with the Graphics board type above enables the best display of text and graphics on the screen.

0 = Monochrome (either green or amber)
1 = Colour (medium resolution)
2 = Enhanced Colour (high resolution)

Allowable combinations (ie. typical pairings) of the Adapter board and Monitor are indicated with an "Y" in the table below, other combinations ("-") will result in an error:

		0 Mono	1 Colour	2 Enh/Colour
0	MDPA	Y	-	-
1	CGA	Y	Y	-
2	Herc.	Y	-	-
3	EGA	Y	Y	Y
4	VGA	Y	-	Y
5	MCGA	-	-	Y

Screen Display-Width: ___ [Millimetres]

The value for this parameter is the width across the VDU screen in millimetres into which text and graphics can be mapped. A correct value here will ensure the contour diagrams will be to an accurate scale. The value can be determined in 'GWBASIC' or 'BASICA' by entering the following statement

```
SCREEN 0 : KEY OFF : COLOR 0,7,0 : CLS : SYSTEM
```

and measuring the horizontal distance on the screen of the white shaded area.

Screen Display-Height: ___ [Millimetres]

Same as above except it is the height of the shaded area.

I-Table interpolation method: _ [0=Linear 1=Quadratic]

Indicates to the program which interpolation proceedure for determining intensity values from the luminaire I-Table is to be used. '0' implying linear interpolation and '1' for quadratic. The values determined from either method will be

slightly different, however quadratic is more acurate but takes slightly longer to execute. The 'SAASTAN.EXE' program for road lighting uses quadratic interpolation.

Printer Connected: _ [0=No 1=Yes]

Indicates to the program whether a printer is connected to the computer. '0' implying a printer is not connected and therefore the program will automatically re-direct all printer output to the System Print File.

Print Width: ___ [No. of characters]

Sets the width in characters of the printer or System print file to enable full use of the paper for output, value must not be less than 80 or greater than 160.

Aiming Mode: _ [0=Angle 1=Co-ordinate]

the aiming of the luminaires can either be by specifying a horizontal and vertical angle or the co-ordinate of the aim point.

0 = Horizontal and vertical angles to aim point required
1 = X and Y co-ordinate of aim point required

This value lows output to run if required.

Grid Area Specification: _ [0=Increment 1=Scale]

defining the calculation field can either be by a number of fixed length increments in the X and Y directions or setting a scale value and range of X and Y, where the computer determines the number and size of the increments, the resulting output to the printer can be used as an overlay onto your base plan

0 = Number of Increments and distances required
1 = Scale and range of X and Y required

This value can be changed on screen during a run if required.

Data Files Default Disk: _: [A-E]

This parameter allows the program to run on whatever disk drive combination is available or preferred. If a hard disk is available then this parameter can be set to the hard disk drive letter unless you specifically require the floppy drive to hold the Library and Data files.

Company Name:

Sets the name of your company to appear on all output to the printer and plotter and in the Main Application menu.

Data Entry Mode: _ [0=Insert 1=Overtype]

the method by which data is entered into the fixed screens is initially set by this parameter. In 'Insert' mode any character entered from the keyboard will be inserted where the cursor is located and the original character and those to the right will be moved one position to the right, the last character being dropped off if it overflows the field. In 'Overtype' mode the character under the cursor is simply replaced with the key pressed on the keyboard and the cursor moves one position to the right

0 = Sets 'Insert' Mode
1 = Sets 'Overtype' mode

Toggling between these modes on the fixed screens is done by pressing the 'Insert' key, the size of the cursor will change to indicate it has been affected.

Delete System Print File: _ [0=No 1=Yes]

several options in the program al file extension go to the System print file (also defaulted to when a printer is not connected). Each time the program accesses this file the data is simply appended to the end of this file if it exists. When logging on the choice is given via this option to delete this file and start from the beginning or not.

0 = Do not delete file at logon ie. continue appending to the file if already in existance
1 = Delete file at logon thereby starting a new file each time

After all appropriate fields have been filled press the <Enter> key to pass the values back to the program.

13.2 Plotter setup

Providing no error occurs the program will continue with the screen as shown in Fig. 13.2.

Plotter Type: _ [0=None 1=GRAPHTEC 2=HEWLETT PACKARD 3=BMC]

A value between '0' and '3' can be used as follows to indicate the type of plotter used.

0 = non connected
1 = GRAPHTEC Model MP1000
2 = HEWLETT PACKARD HP7470 OR HP7475 and compatibles
3 = BMC Model B-1500

If '0' is input the remaining fields on the screen are ignored. Should output in AutoCad 'DXF' file format be required and a plotter is not connected then select '2' above and use dummy values for following fields.

Comm. Port No.: _ [1-4]

this lets the program know to which serial RS-232C communication port (1 to 4) the plotter is connected, ignored if a plotter is not connected.

Baud Rate: ____ [300, 1200, 2400, 4800, 9600]

specifies the transfer rate of data between the computer and plotter in bits per second.

Parity: _ [N=None O=Odd E=Even]

indicates what parity checking is done on the data.

Data bits: _ [7 or 8]

is the number of data bits either 7 or 8

Stop bits: _ [1 or 2]

is the number of stop bits either 1 or 2

The above information must match a suitable "MODE" statement executed in DOS before the lighting program is run (include statement in 'autoexec.bat' file so automatically done on system startup). This 'MODE' statement contains protocol parameters used to initialize the asynchronous communications controller in the computer. The setup switches on the plotter must also correspond.

Paper Size: _ [0=A3 or 1=A4]

this value sets the paper size used in the plotter so that correct sized plot will be produced

0 = A3 (approx. maximum plot size = 390mm X 270mm)
1 = A4 (approx. maximum plot size = 270mm X 190mm)

Border and Title block lines: __

is the plotter pen number (1 to 6) used to draw the border, title block and letter the company name on the plotting page for both the contour and wire frame diagram. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Grid and Base lines: __

is the plotter pen number (1 to 6) used to draw the grid area on the contour diagram and the base lines on the wire frame diagram. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Contour and Wire frame lines: __

is the plotter pen number (1 to 6) used to draw the actual contour lines and the surface lines on the wire frame diagram. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Text on diagrams and Grid points: __

is the plotter pen number (1 to 6) used to letter the text on both the contour and wire frame diagram, including title block. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Pole positions and aim directions: __

is the plotter pen number (1 to 6) used to draw the circular pole symbol and dashed line representing the aim direction on the contour diagram. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Other Text: __

is the plotter pen number (1 to 6) used to letter all other text on the plotting page for both the contour and wire frame diagram. The word at the end of this field is the layer name this data will be loaded into for 'AutoCad'.

Pen Velocity: __ [% of maximum]

this parameter sets the speed of the plotting pen depending on type of pen in use, for ink pens use a slower speed ie.

less than 100 say 50.

After all appropriate fields have been filled press the <Enter> key to pass the values back to the program.

13.3 Luminaire manufacturer names

Providing no error occurs the program will continue with the screen as shown in Fig. 13.3.

Manufacturer Name ##: _____

This parameter assigns a manufacturers name to the first two digits (##) of the luminaire code number. Upto 19 manufacturers can be used with the manufacturer/supplier's name for the luminaire photometric data used. **'LUMINAIRE MANUFACTURER NO. 20'** is always set to **'Miscellaneous'**.

Pressing the <Enter> key will pass these values back to the program. Providing no errors result the parameters will be written to the 'Customisation file' and the changes will be effected for the remainder of the current run and all further runs until altered again.

If the changed values are not to be used then press the <Esc> key instead of the <Enter> key and this option will be aborted. If on the third screen when <Esc> is pressed any changes made on the first two screens will be used for the remainder of the run. If this is not required then logout of the program and re-start which will read the original 'Customisation file'.

Chapter 14

DELETE/ARCHIVE/RETRIEVE LAYOUT FILES

In brief this option performs the following functions

- Lists on screen all design layout files found on the selected drive
- Lists on screen all results files found on the selected drive
- Allows saving (archiving) of result files for future reference
- Allows retrieval of archived files for further calculation or printouts

---

This option is used to list and erase luminaire layout job and results files as well as archiving and retrieving results files.

Layout job files are files (with an extension of 'FLD') that contain the pole positions, luminaire types, aiming details etc. which are independent of the calculation field. Results files (with an extension of 'FLA') contain all this information as well the calculation field data, calculated illuminance types and levels. This second type of file is created by archiving the 'FLEVELS' file when the final lighting design is attained.

Retrieving one of these files loads it back into the 'FLEVELS' file where display options can be used. It also re-creates a layout file to enable further calculations to be performed, if desired.

The option begins with the screen menu as shown in Fig. 14.1. The choices from this menu are described in the following sections.

14.1 Layout files currently on Disk

This section searches the directory of the assigned disk drive (initially set to the default data file drive, refer Chapter 13) and displays the occurence of all layout files found. The list as shown in Fig 14.2 has the files listed in alphabetical order of the filename. Further options are available, as listed on the bottom of the screen, to manipulate the screens and delete files.

These options are envoked by pressing the appropriate special key or the key indicated in brackets '( )' any other key will simply sound the computer buzzer as a warning. The options are described below:

PgDn	Displays the next page of files if not on last page, current page number is indicated on bottom right side of screen.
PgUp	Displays previous page of files if not at page 1.
Home	Moves the cursor (left hand side of screen) to first file listed on the screen.
End	Moves the cursor to last file listed on the screen.
Cursor Up	Moves the cursor one line up unless on the first line.
Cursor Down	Moves the cursor one line down unless on the last line.
(T)ag	Places the diamond shape adjacent to the file at the cursor position and moves the cursor down one line. If file already tagged no action taken.
(U)ntag	Removes the diamond shape adjacent to the file at the cursor position and movse the cursor down one line. If file is not tagged then no action is taken.
(D)elete Tagged	Deletes all the tagged files from each page but first confirms the deletions are to be carried out.

<Esc> Exits from this part of the program without affecting the status of any of the files (tagged or untagged), returns to the menu in Fig 14.1

14.2 Result files archived on disk

This section searches the directory of the assigned disk drive (initially set to the default data file drive, refer Chapter 13) and displays the occurence of all result files found. The list as shown in Fig 14.2 has the files listed in alphabetical order of the filename. Further options are available, as described in the previous section, to manipulate the screens and delete files.

14.3 Archive current result file: 'FLEVELS'

This section copies or archives the current result file ('FLEVELS') to a specified file. The name of this file is given in response to the next question.

Current result file to be saved in file:

The assumed drive unless another is indicated as part of the file name is the assigned drive and a file extension of 'FLA' is implied. Unless an error occurs the program will return to the menu in Fig 14.2 when complete.

14.4 Copy back archived result file

This option restores a file archived via the previous option

so that the data it contains can be used for display purposes or re-calculation. The name of the acrhived file is input to this question,

Name of file containing archived job:

which will be read from the assigned drive unless a drive letter is included as part of the filename. An file extension of 'FLA' is implied and any other is not accepted.

Unless an error occurs the program will display the message

Reading details into memory from file: "FLEVELS".....

indicating the file has been restored and the contents of the file is being loaded into computer memory as the current job, when complete to the menu in Fig 14.2 will be displayed.

14.5 Set assigned drive

This option changes the drive on which the result file 'FLEVELS' is archived to and restored from. The default sub-directory on that drive will always be used, possibly use the proceedure in next Chapter to alter the directory, if desired. This drive can be different from the Default data file drive (refer Chapter 13) but is initially set to this drive for convenience. The choice of drives is made from the menu shown in Fig 14.3, the outcome is shown at the centre of the bottom line of the screen. This option would be used to say archive a job on a floppy disk in drive A:

Chapter 15

EXIT TO DOS COMMAND LEVEL

In brief this option performs the following functions

- Exits to DOS allowing execution of any DOS command
- Returns to the Lighting program when finished

This option allows the user to return to DOS to execute any command level function while temporarily suspending execution of the lighting program. This may be useful to say list the directory of a disk, copy a file, change a sub-directory or execute some other program. Performing any of these operations will not affect the status of the lighting program.

15.1 Re-entering Lighting program

To return to the lighting program simply type the word 'exit' in response to the DOS prompt and press the <Enter> key, the Main Application menu will then be re-displayed. If the original sub-directory containing Lighting programs etc. has been changed while in DOS then the program will automatically change it back (otherwise the program will not be able to find the required data files).

Chapter 16

USER INTERFACE TO SAASTAN

In brief this option performs the following functions

- Executes the shell program to interface with 'SAASTAN'
- Returns to the Lighting program when finished

Supplied with the Lighting program is further software which considerably simplifies the use of a program supplied with the Australian Standard AS1158.2s - 1986. This SAA program (SAASTAN.EXE) calculates light technical parameters for compliance with the code.

Refer to the seperate manual supplied for details of screens displayed and proceedure in running that program. As part of the install proceedure of Chapter 3 this program and initial data files are copied into a sub-directory named "\UIS" on the "C:" drive, they must remain there for this option to function. **N.B. Your copy of 'SAASTAN.EXE' supplied with the code needs to be copied into this sub-directory.** A batch file "UIS.BAT" is also created in the root directory on drive "C:" so that the program can be executed outside the environment of the Lighting program.

When the interface program is completed, the Main Application menu will be re-displayed.

Chapter 17

TERMINATE PROGRAM

On selecting this option, execution of the program will finish, the screen will clear and display the elapsed time

LOGGED ON FOR: ## Hours ## Minutes ## Seconds

since you logged into the program. This time may be useful for costing purposes on particular projects and will include any time that you may have returned to DOS using the option described in the Chapter before last or in execution of the 'SAASTAN' shell.

The operation of the computer will then return to the MS-DOS operating system and show the current DOS prompt.

17.1 Re-starting Lighting program

To restart the lighting program after this point simply type the word 'PL' and press the <Enter> key.